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Foreword

Welcome to the Autumn edition of Finance2I, a *World Commerce Review* supplement. This publication has been prepared in response to readership demand for an overview of the financial sector in these turbulent and unique times.

All aspects of the sector are examined, with the most respected authors providing the reader with the most comprehensive information available. Our brief is to provide all the data necessary for the readership to make their own informed decisions. All editorials are independent, and content is unaffected by advertising or other commercial considerations. Authors are not endorsing any commercial or other content within the publication. ■

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Free trade under Brexit

Many economists have claimed that Brexit would damage the UK economy. Patrick Minford considers the assumptions made and Brexit benefits to the UK have been widely underestimated

I was astonished during late 2015 to discover that most economists in the UK favoured staying in the EU on the basis of what appeared to be neo-protectionist arguments derived from recent 'gravity-related' trade thinking.

In late additions to the second edition of my book *Should the UK leave the EU?* Minford *et al* (2015) I pointed out that the gravity modelling was of a partial equilibrium nature (ie. did not include the full effects of Brexit) and that attempts hitherto made to turn it into general equilibrium (the full effects) were misconceived.

It soon became apparent that my professional colleagues were not going to take any notice of these points; and indeed the Treasury economists promptly enlisted help from the LSE's gravity trade group in developing the gravity-based case for retaining existing trade links with the EU regardless of the costs of its well-known protectionism.

I begin this article with some comments on the various rival 'gravity' approaches, all of which have had a strong bias against eliminating EU protection to get to free trade, arguing that the gains are trivial while the losses from abandoning protected trade with the EU are large.

I then go on to set out the quantitative analysis I reached on Brexit, using the models I developed with my Cardiff research group, together with realistic Brexit policy assumptions. As we will then see, these models with realistic assumptions find that there are substantial gains from free trade with the rest of the world.

Gravity trade models and Brexit: a review

At the heart of the Brexit debate there is a fundamental disagreement about how trade works and affects the economy. In the last few years debate has raged over whether EU trade arrangements are beneficial, in particular to the UK.

The EU is a customs union and so erects trade barriers around its Single Market where economic activity is regulated according to EU rules. The welfare effects of a customs union have always been controversial.

According to classical trade theory global welfare is reduced compared with free trade as is the average welfare of citizens inside the customs union; however one country's citizens may gain from the union if it is a net exporter to others in the union, as then its terms of trade gain may offset the losses experienced by its consumers (Meade, 1955).

According to [the classical] model there are big gains from free trade with the rest of the world and ironically a small gain from UK-EU tariff barriers

However, in recent times a new line of reasoning has become popular among trade economists: this 'gravity model' (eg. Costinot and Rodriguez-Clare, 2013) regards trade as an outcrop of internal trade, the only difference being that it crosses borders. Otherwise it grows naturally due to the specialisation and division of labour within neighbouring markets.

Viewed through the lens of the gravity model a customs union merely makes official what is already a fact of neighbourly inter-trade. Other sorts of trade, with more distant markets, grows analogously but more weakly, the greater the distance; size of distant markets may make up for their distance to some extent, because they are a 'neighbourhood' that naturally leads to inter-trade.

As part of this view of trade as dominated by inter-trade, substitutability between heterogeneous goods and services of different origins is treated as fairly low. 'Gravity' in trade creation can be thought of as a function of distance and size.

In this view of trade it makes no sense to put obstacles in the way of trade with close neighbours such as the EU in the hope of boosting trade with distant markets via new trade agreements that lower trade costs.

The disruption from the former will reduce welfare while the gains from the latter will be small, simply because the reduced trade costs will have little effect in switching demand from existing products in the presence of weak and imperfect competition.

Furthermore, protection is seen in a fairly positive light in the gravity model, because low substitutability between countries' goods implies that there is scope for protection to improve the terms of trade- the 'optimal tariff'

mechanism; He *et al* (2017) show that it pushes optimal tariff rates before and after retaliation above 100%- clearly a worrying policy implication, which in itself casts doubt on the model's realism.

Before we go further into the technicalities of different models and calculations of trade policy effects, it is worth spending a little thought on what light the history and structure of UK trade throw on the matter.

For centuries the UK has been regarded as the archetype of a 'trading nation', in that its great trading companies, such as the East India company, sought out trading opportunities around the world and in the process founded the British Empire, with trading links all over the world.

European neighbouring countries had little to do with it, other than the Dutch with whose Indies trading fleets the UK fought several wars, settled by the Treaty of Westminster in 1674.

In recent years UK trade has been dominated by services, whose weightlessness implies a total lack of 'gravity'; furthermore, the containerisation of goods transport has brought shipping costs down to almost trivial levels. The role of gravity, viz distance x size, seems on the face of it to be small in UK trade.

As for European trade, in spite of high EU tariffs against non-EU suppliers, the share of EU trade (imports plus exports) in UK trade has never gone over 25% of UK GDP. Currently it is running at 20% against around 30% with the non-EU world; so UK trade with the EU is about 40% of all its trade, in spite of massive trade barriers (around 20% in both food and manufactures) against non-EU countries.

It does not look as if gravity has much to do with it all, certainly European gravity. It is perhaps not a surprise that classical trade theory, with its strong relevance to far-flung UK and other Northern European (Swedish/ Dutch)

trade, was developed by British and northern European economists such as Ricardo, Heckscher and Ohlin, while the more recent gravity theory has mainly been developed by economists based in the US or continental Europe where distant trade plays a minor role in GDP.

Compare the UK with a country like the Czech Republic with limited trading activity other than with the EU by which it is surrounded; 80% of its trade is with the EU, reflecting its quite different trade opportunities, which are indeed naturally describable by gravity.

It would certainly be unsurprising if our test of UK trade rejected the gravity model; as indeed it does (Minford and Xu 2019; Chen *et al* 2021)

I next review the various attempts that have been made by different groups of economists, using different approaches, to evaluate the trade effects of Brexit.

'Gravity model' estimates of Brexit trade effects

Clearly these two models, the classical and the gravity models, are different and so may well have different welfare implications.

However, while trade economists have recently tended to favour the gravity model over the classical, there has been no convincing empirical test of the two models as overall predictors of the data.

Gravity modellers do point to the Tinbergen (1962) gravity regressions as evidence in favour of the gravity model: these are statistical correlations between the size of two counties' GDPs and their distance from each other on the one hand, and the size of their trade on the other.

However, these regressions have long been familiar to trade economists, and classical trade models too can generate trade data in line with these regressions. Thus we face here an 'identification' problem: two models can both generate the same data, at least that would be the claim of their proponents. We need an empirical test that can discriminate powerfully between the two models.

Plainly one has to use the underlying model (ie. one in which all the interactions within trade and the economy are allowed for) to calculate policy effects, since these work through all the channels of the model; one surely, so we would say, cannot use the Tinbergen and related regressions, since these are simply correlations and associations generated by the model, and are not causal.

So we would argue that we must uncover the true model- which requires a test. Not surprisingly, such tests reveal that the gravity model is widely rejected, while the classical model largely fits the facts. Chen *et al* (2021) sets out the evidence.

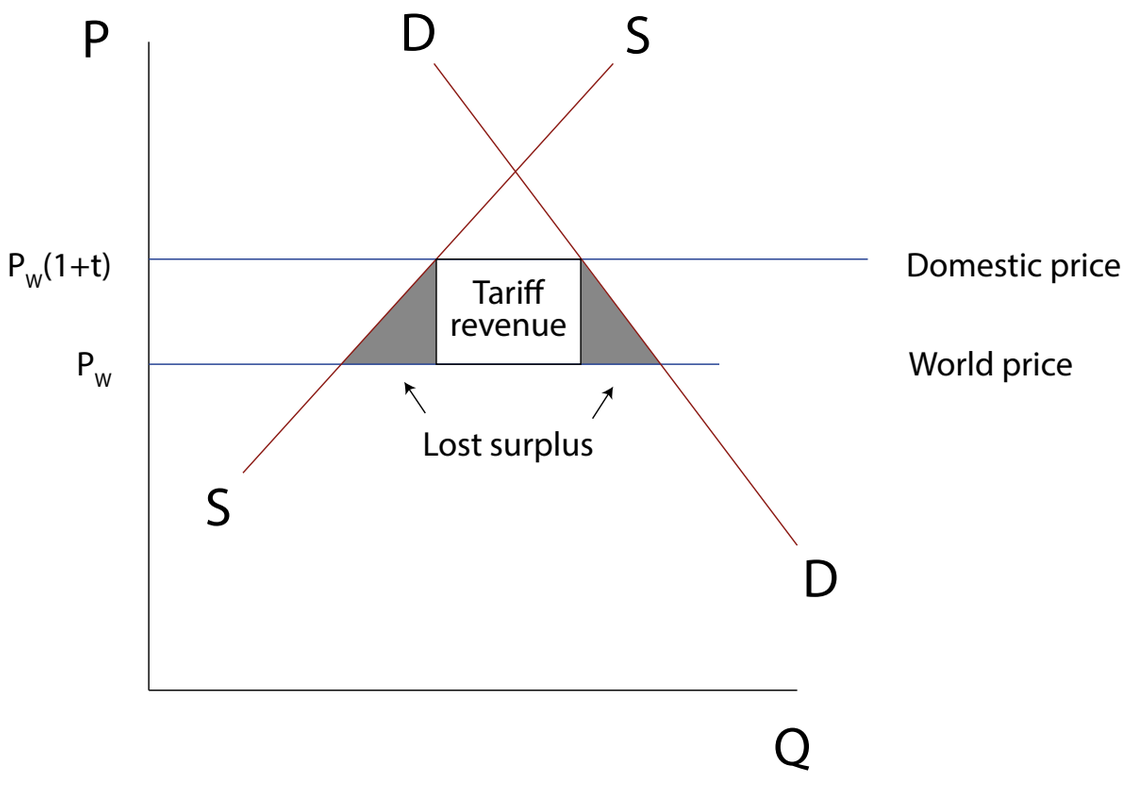
The gains from trade - how they are (mis)calculated

The effects of trade policies such as tariffs can be understood with the help of a simple diagram, showing demand and supply of imports. A tariff raises the home price of imports over the world price. Assume for now the world price stays the same. Then the loss of welfare is shown by the shaded area of reduced consumer surplus.

This shows the loss to consumers from higher prices, causing lower consumption, and also their loss as producer households from over-production, in which the extra output does not cover rising costs.

In effect the tariff revenue, redistributed by the Treasury to households after paying more to producers for uneconomic output expansion, fails to compensate households for their higher costs of purchase.

Figure 1. Loss of surplus due to tariff



If the tariff causes world import prices to fall, there is a countervailing gain from better terms of trade, viz a lower ratio of import to export prices. The size of this gain depends on substitutability between goods, as we will see.

In a classical model, there is only substitutability between different commodity types; every country sells identical goods of each type at the same price. So to get a reduction of import prices a tariff-raising country has to reduce demand for the commodity worldwide. But as its share of world demand is low any reduction in demand the tariff creates will have only a small effect on world prices.

However, in the gravity model it is assumed that the substitutability between goods of different origins is quite low. So our diagram above applies to many different imports from differing origins.

We can now compute consumer surplus costs for each country-facing tariff; but also the terms of trade gain for each country-origin import. As each country now has a big import share in these markets, it can drive down the price in them by tariffs more strongly.

We see therefore that the temptation under gravity models to raise tariffs is high, owing to the low substitutability these models assume between goods of different origins.

On the one hand, there are losses of consumer surplus, but on the other there are terms of trade gains from protection. While all models differ in their exact assumptions, we can discern a pattern in the welfare estimates: gravity models will find a greater gain from the protection given by the EU customs union against the non-EU world, while it will find a consumer surplus loss from this and also from any EU-UK barriers. Because these barriers are mutual terms of trade effects favour the largest importer, namely the EU.

Hence we find that within a gravity model of the Computable General Equilibrium (CGE, ie. a full model that runs on the computer) type, there is a bias towards protectionism.

The latest Treasury calculations after the referendum, in which the Treasury uses the GTAP model, a gravity model in respect of low assumed origin substitutability, discarding its earlier pre-referendum methodology in response to our and others' criticism, find that Brexit is damaging in its trade effects.

However, in addition to using this gravity model, it uses policy assumptions about Brexit that we cannot accept as realistic. First and foremost, it assumes that there will be little adoption of free trade with the rest of the world.

Whereas on this GTAP model the full elimination of the 20% EU trade barriers (tariff and non-tariff) on food and manufactures would boost UK GDP by 4%, the Treasury assumes that only a twentieth of this would be eliminated in practice, so that the gain falls to 0.2%.

Table 1. Assumptions/models: differing estimates of gains/losses (% of GDP)

Model	Cardiff Classical		Cardiff Gravity		GTAP			
Policy assumption	Real(istic)		Real		Real		Treasury	
Trade deal	WTO	Canada+	WTO	Canada+	WTO	Canada+	WTO	Canada+
Total gains	15.6	15.0	1.5	3.0	2.6	4.0	-6.6	-4.7
Of which due to:								
Rest of World FTAs	15.0	15.0	3.0	3.0	4.0	4.0	0.2	0.2
EU barriers	0.6		-1.5		-1.4		-6.8	-4.9

Second, it assumes that the EU will erect non-tariff barriers both via standards and border difficulties even with a UK-EU Canada+ trade agreement. This causes a loss to the UK of no less than 4.9-6.8% of GDP, depending on the EU deal.

Yet this assumption is in fact illegal under WTO rules against discrimination and border inefficiency-so in effect it would not be allowed under the laws recognised by both the UK and the EU.

Thus under the Treasury's GTAP model, if realistic Brexit assumptions are inputted, then according to that model, there would be a welfare gain to the UK from Brexit due to the trade effects of 2.6% of GDP in an exit under WTO rules, or 4% in an exit with a Canada-plus EU FTA.

The Treasury assumptions yield losses under WTO rules of 6.6% of GDP and under Canada+ of 4.7% of GDP. So it can be seen that the Treasury's assumptions add an unwarranted 9% of GDP to the cost of Brexit, even if one accepts the gravity model.

Using the classical model, as estimated in Cardiff research, in place of the gravity one adds a further 9 or 10% of GDP to the calculated gains of Brexit.

If we assume that only half of the existing EU 20% protection of food and manufactures is abolished, then the gain to UK GDP is a bit over 7%, mainly via higher productivity, while consumer prices fall 6%; if we assume that the full 20% protection is abolished, these numbers double.

This is true both under the WTO-rules exit and the Canada-plus case; the reason these are the same is that once the UK has driven UK prices to world prices via FTAs with the non-EU world, it makes no difference what EU FTA we have.

EU producers, like our own home consumers and producers, can only sell and buy in our markets at world prices; EU trade barriers will simply be passed on to EU consumers, while UK trade barriers must be absorbed by EU suppliers.

Paradoxically, this implies that the UK Treasury can levy tariffs on the EU and gain at EU expense, while the EU can only raise any tariff revenue it gets from UK imports from its own consumers.

It is worth explaining how it is that these big gains come about. A key effect of agricultural protection is a large rise in the price of agricultural land. This acts as the base price in alternative use for all land that gets planning permission to be used in other sectors.

Hence it raises costs of production across the whole economy, strongly reducing services output. The non-traded sector also contracts, as costs and prices rise.

Capital and land are underutilised as outputs fall and we assume that they cannot realistically be sold off (eg. into foreign ownership), which if possible would create offsetting resource savings.

By moving to free trade through a comprehensive set of FTAs, these higher costs of land are swept away and both capital and land are supplied as needed to the different sectors as they expand.

Consumer prices fall generally as do costs of production; and at the same time the greater competition from falling import prices puts pressure on home producers to raise productivity.

Notice in all this that the gains from free trade come from abolishing our protection on imports, not-as widely suggested in popular writing-from the greater access to foreign markets granted reciprocally in these FTAs.

This greater access does give short run gains to our exporters, which helps to get political support for FTAs; however, in the long run these gains largely get eroded by the downward pressure on our export prices in other markets from other countries' exports displaced from the markets where we get better access.

We summarise these results in the table showing the gains/losses in % of GDP under the different model/ assumption combinations; we label the assumptions we have argued reasonably represent the policy reality as 'real(istic)', which of course contrast with those used by the Treasury.

As can be seen, the failure to compute sufficient gains in trade from Brexit come about half from poor policy assumptions, half from the gravity modelling mistake. The poverty of the policy assumptions we have already explained.

Conclusions

Economists in the UK and in international organisations, as well as in the British Treasury and civil service, have widely claimed that Brexit would damage the UK economy.

To support these claims they have used trade models in which 'gravity' is a major feature; according to this gravity theory trade is caused mainly by size and proximity, not by comparative advantage and there is little substitutability between the products of different countries.

This model favours protectionism because tariffs can force down import prices a lot. Hence it also supports EU protectionism through its customs union. Also it implies that the UK loses a lot from any UK-EU trade barriers and gains little from free trade with the rest of the world.

However, the model does not fit the UK trade facts. The classical model based on comparative advantage does fit them. According to this model there are big gains from free trade with the rest of the world and ironically a small gain from UK-EU tariff barriers, which under WTO rules are the only ones erectable.

The British Treasury, which has strenuously opposed Brexit from the referendum debate onwards, calculates large losses from Brexit; the difference of these from the properly calculated gains comes half from using the wrong gravity-based model and half from using false policy assumptions. ■

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Public finances in the EU

COVID-19 has led to governments borrowing at unprecedented levels. Mehmet Burak Turgut discusses EU government finances as well as relevant policy priorities to ensure healthier public finances in the future

The COVID-19 pandemic, which broke out in March 2020 and continued through subsequent waves in fall 2020 and spring 2021, resulted in a fallout in the global economic activity and world output contraction by 3.3% during the last year, as shown by the recent IMF survey.

The losses in the output led to lower income and revenues of the taxpayers, which in turn diminished the tax revenue generating capacity of the governments. At the same time, the governments responded to the crisis with extensive fiscal support measures, amounting to more than USD13 billion globally[1]. These increasing expenditures paired with decreasing tax revenues pushed the governments to borrow at unprecedented levels, causing a huge spike in global public debt.

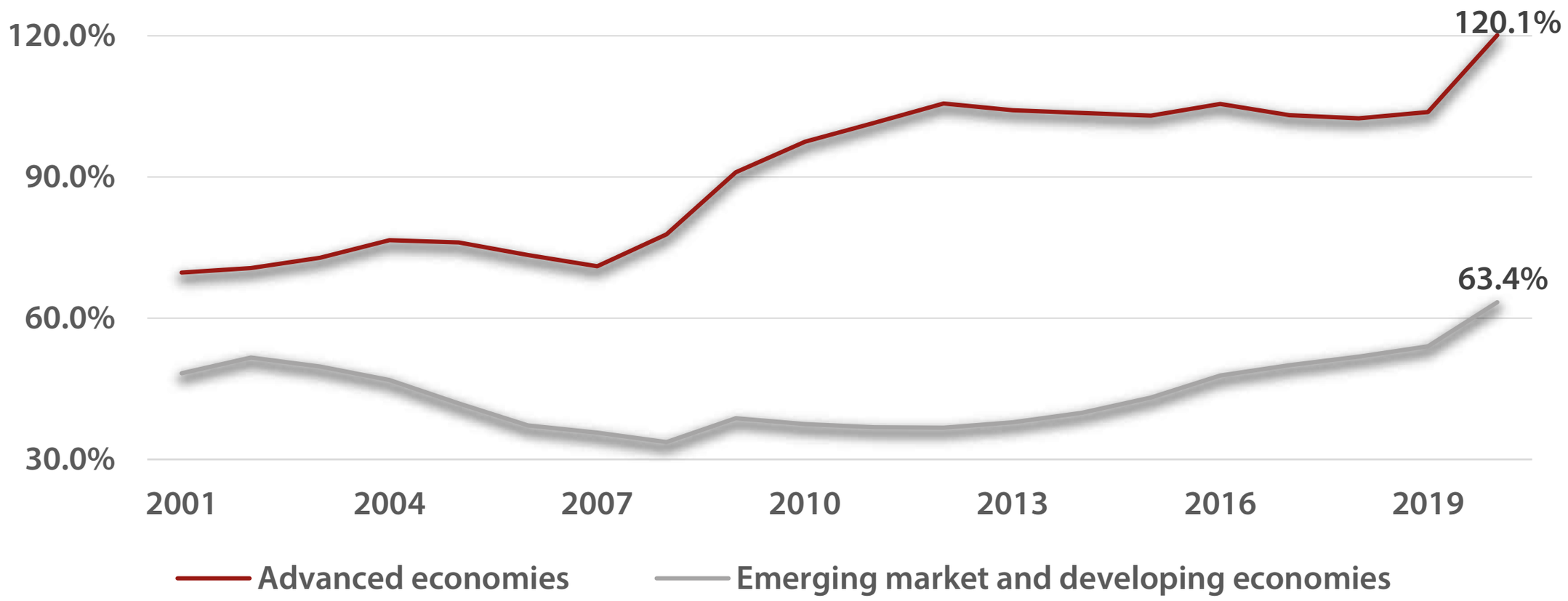
Figure 1 depicts the evolution of debt-to-GDP ratio over the last two decades for advanced (in red) and emerging market and developing (in grey) economies. The impact of the pandemic is visible for both groups – the debt-to-GDP ratio increased by 16.3 pp y/y for advanced economies and by 9.3 pp y/y for emerging market and developing economies, reaching, respectively, 120.1% and 63.4% in 2020.

During the same period, government expenditures increased, respectively, from 38.6% to 47.4% and from 31.0% to 34.0% of GDP with the government revenues halting at 35.0% and 26.0% for advanced and developing economies[2]. The higher borrowing needed to finance the increasing expenditures during the pandemic time thus fuelled the debt and elevated global government indebtedness to unprecedented levels.

The European Union perspective

The governments in the European Union swiftly responded to the COVID-19 pandemic with substantial fiscal measures. As of April 2021, the sum of the EU-wide announced support amounted to more than €4.6 billion[3],

Figure 1. The debt-to-GDP ratio in advanced and developing economies



Source: International Monetary Fund Fiscal Policy Responses to COVID-19, January 2021.

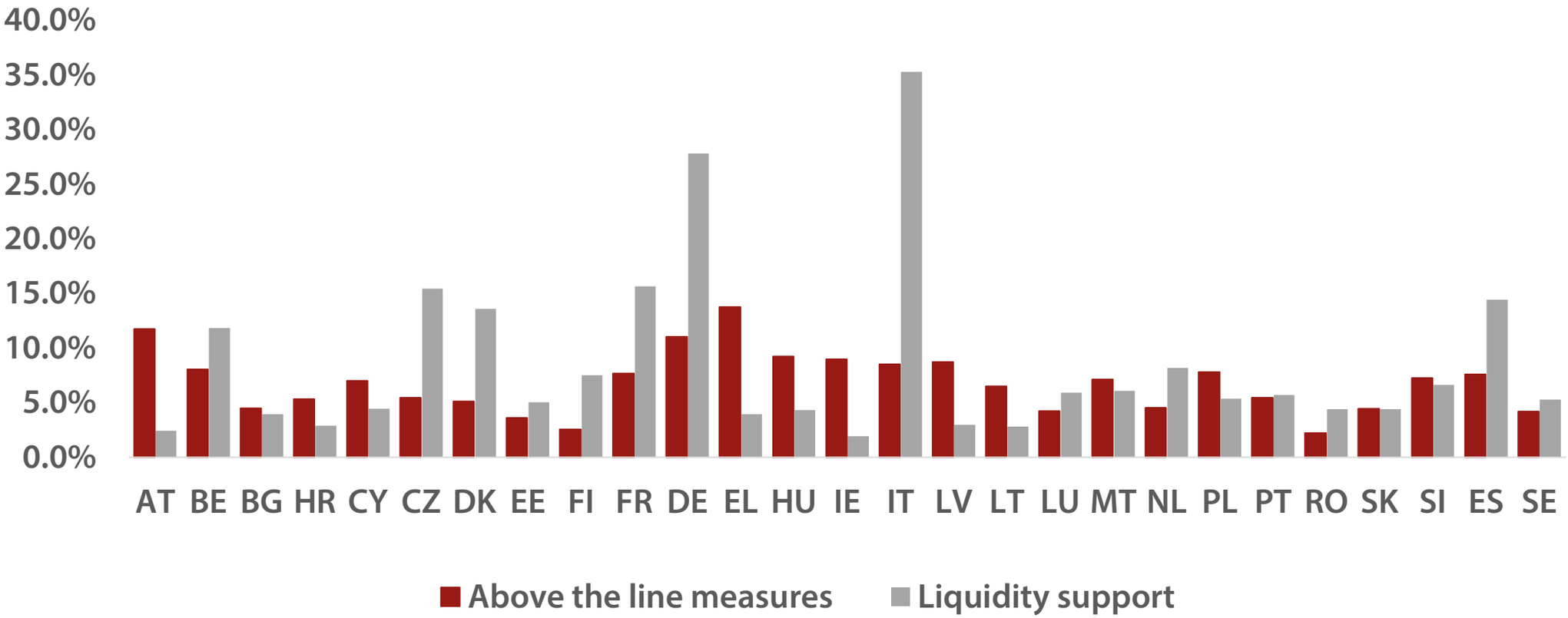
including €1.7 billion above-the-line measures such as additional spending or foregone revenues as well as liquidity measures mostly in the form of loan guarantees and asset purchases.

Figure 2 shows the distribution of these fiscal support measures throughout the EU member states (MS) as a percentage of GDP. The liquidity measures largely surpassed above-the-line measures in the four largest EU economies – Germany, France, Italy, and Spain – as well as Belgium and Czech Republic.

On the contrary, additional spending or foregone revenues highly exceeded liquidity measures in Austria, Greece, and Latvia. The allocation of fiscal support between the above-the-line and liquidity measures was balanced throughout the rest of the EU member states.

...the governments [in the European Union) responded to the crisis with extensive fiscal support measures

Figure 2. The fiscal support measures in the EU



Source: Author's own elaboration based on data available at Eurostat.

The scale of the national measures varied among the MS – from 8.2% in Croatia to 43.7% in Italy. Besides the individual country actions, the EU also introduced support measures from the Union's budget that made up approximately 10% of total EU GDP for year 2020[4].

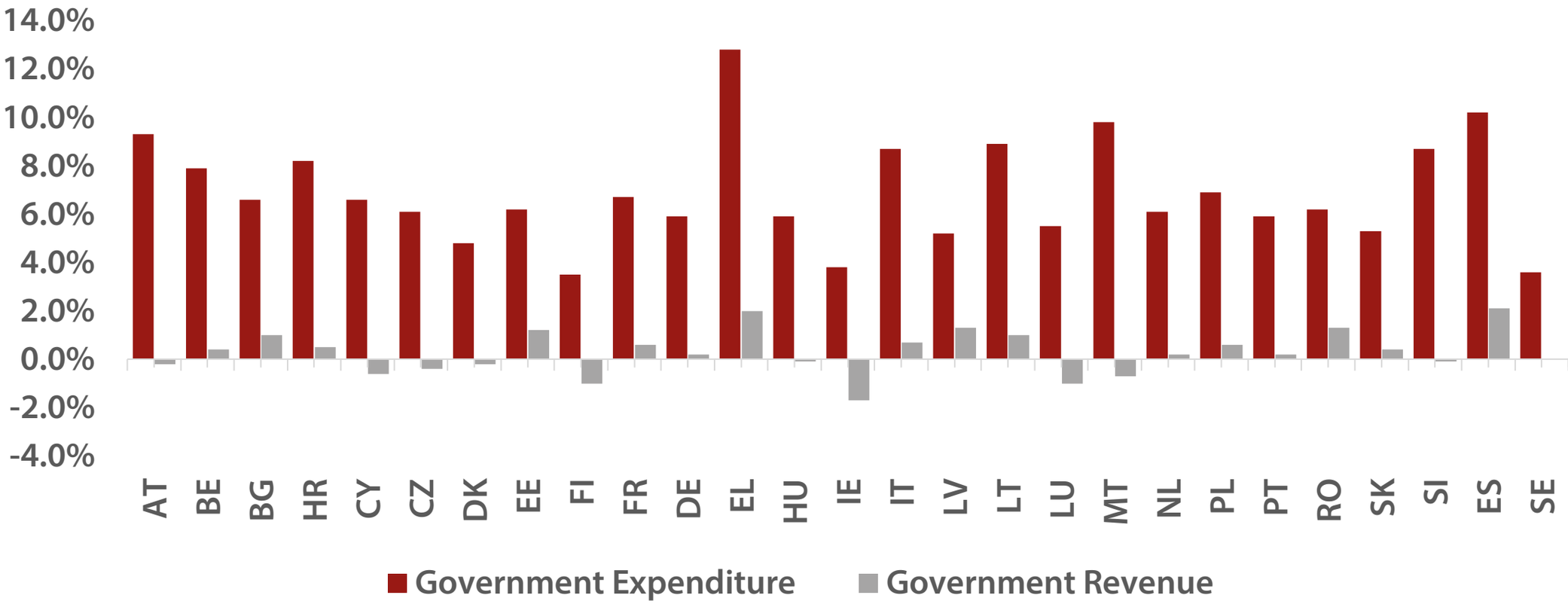
How have these fiscal support policies affected and will affect the finances of the governments in the EU? The majority of the liquidity support measures is in the form of guarantees and the impact of these contingent liabilities on public debt depends on the extent to which the guarantees will be activated.

Moreover, some parts of the above-the-line measures will be unfolded throughout 2021 and 2022 and may require additional amendments subject to the progress of economic recovery which means that their real impact on public debt is not yet certain.

Figure 3 shows the changes in the government expenditures and revenues of the EU member states measured as their share of GDP between 2019 and 2020. The government expenditure-to-GDP ratio increased in all MS in 2020 with y/y changes ranging between 3.5% (Finland) and 12.8% (Greece) throughout the EU. The automatic stabilizers and discretionary fiscal measures used to stabilize the economy in the wake of the pandemic are the main reasons behind the higher government expenditure-to-GDP ratio in the EU.

On the other hand, government revenue-to-GDP ratio did not experience substantial change in 2020 with y/y variations ranging between -1.7% (Ireland) and 2.0% (Greece). The main reason behind the relatively stable government revenue-to-GDP ratio during the pandemic was a proportional decrease in the levels of both components that resulted, respectively, from lower tax collection (fuelled by the marginal drop in consumption and introduction of tax relief measures) and a comparable fall-out in economic activity.

Figure 3. Change in the government spending and revenue in EU member states in 2020



Source: Author's own elaboration based on data available at Eurostat.

Figures 2 and 3 also showcase that not all of the announced fiscal support measures in the EU became government expenditure because only part of the liquidity support measures were realised in 2020[5]. As a result of the spike in expenditures paired with the slack in revenues, the EU governments needed to borrow funds to finance these expenditures which has driven up the public debt.

Figure 4 compares the public debt-to-GDP ratios of the EU member states in 2019 and 2020. The y/y change of the ratio varies between 2.1% (Ireland) and 25.1% (Greece) with the 13.2% y/y change for the EU-27 which raised average levels of public debt in the EU to 90.7% of GDP in 2020.

Even though spikes were observed between March and May 2020, the surge in indebtedness of the EU member states did not bring an increase in the sovereign debt risk premia which remained low in the major EU economies[6].

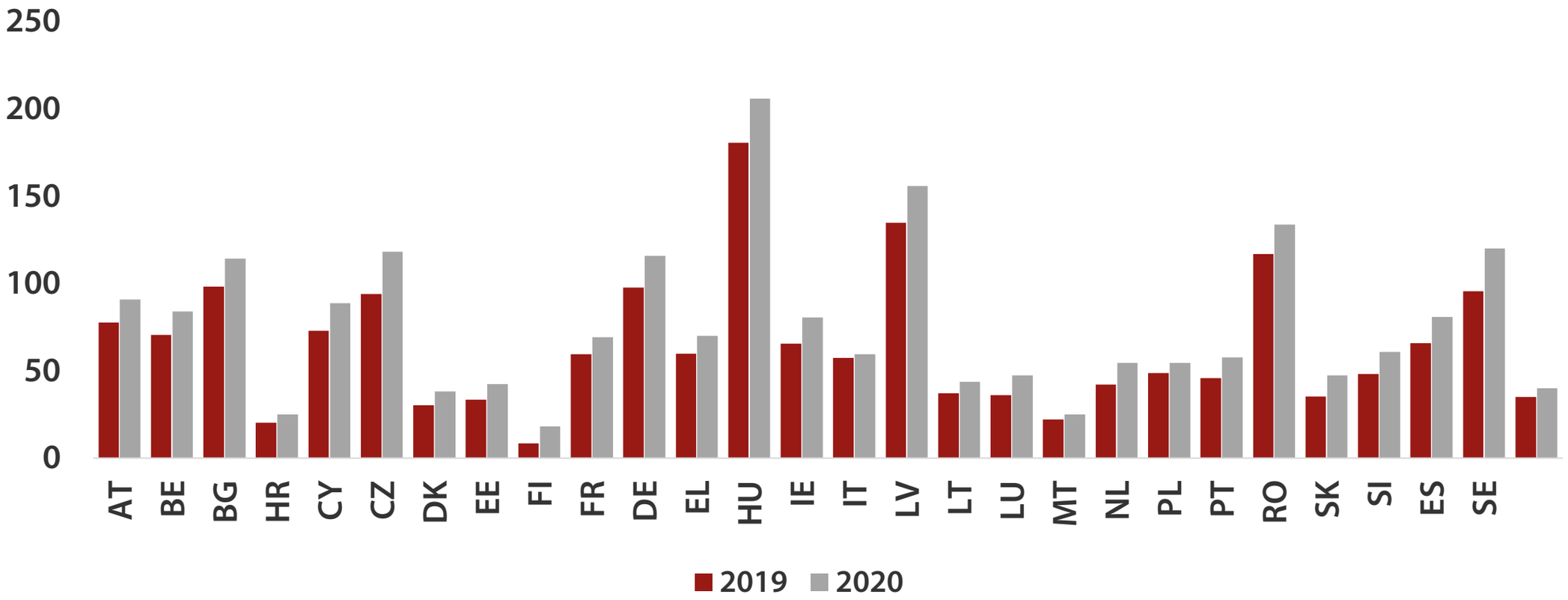
This is partly due to (i) low interest environment which kept the debt costs manageable and (ii) decisive actions of the EU and member states that repressed further collapse in economic activity. The rise of the public debt from the beginning of the pandemic has thus not exposed the EU economies to a higher sovereign debt risk so far.

Poland in the spotlight

The Polish Parliament introduced fiscal legislation packages titled 'Anti-Crisis Shields'[7] in March 2020 that, as of January 2021, have already amounted to PLN 312 billion[8] support in the form of additional spending, deferred revenues, loans and guarantees.

This drove the government expenditures from 41.7% of GDP to 48.7% of GDP between 2019 and 2020 whereas the government revenue remained at 41.7% of GDP[9]. These changes in the two main blocks of fiscal policy moved the deficit from -0.7% to -7.0% of GDP[10] between 2019 and 2020.

Figure 4. Public debt-to-GDP ratio in EU member states



Source: Author's own elaboration based on data available at Eurostat.

As a result, the debt-to-GDP ratio in Poland jumped by 11.9 pp y/y reaching 57.5% in 2020[11]. Despite such notable change in the debt-to-GDP ratio in 2020, it was still below the average EU change of 13.2 pp y/y[12].

The future

The current debt stock of governments is historically high and is approaching the post-World War II levels. Even such high level of debt, however, can be sustainable as long as the global trend on the sufficiently low interest rates continues.

Hence, what poses risks for the affordability of the public debt is a potential fast rise of the interest rates. Such a scenario would lead to large tax hikes and spending cuts that could curb the growth over the long term.

Other than that, there are still some risks present due to the elevated public debt, including:

- limited ability to implement counter-cyclical fiscal policy during economic crisis;
- decreased ability to respond to unexpected events, like wars, financial crises, and natural disasters which could result in larger negative effects on the economy and on people's wellbeing;
- private sector under-investment due to uncertainty about future taxes and crowding out of private debt.

Despite the presence of the aforementioned risks, the start of mass vaccination campaigns in all member states in 2021 has accelerated the return to a 'new normal' with the expected increase in economic activity.

While this will help to improve public finances, the recovered economy should, nonetheless, be supported with policy efforts for healthier public finances. These efforts can focus more on building resilient and inclusive economic structure to curb the rising inequality, boost productive capacity, and raise potential output.

For example, the Recovery and Resilience Facility of the Next Generation EU[13] plan allows countries to finance such policy efforts with non-repayable support which will make it possible to finance growth-enhancing public investment projects and cover costs of productivity-enhancing reforms without inducing higher levels of deficit and debt.

Besides, monetary policy can also play a role in strengthening these efforts. The ability of the central banks to maintain low interest rates despite rising inflation will allow to maintain price stability to serve the debt and prevent its further accumulation. ■

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Endnotes

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COVID-19 lessons from Nigeria

The pandemic has had severe impacts on Nigeria. Mma Amara Ekeruche and Adedeji Adeniran examine the macroeconomic policies adopted and what can be learnt by other developing economies

Executive summary

The COVID-19 pandemic has had severe impacts on Nigeria's macroeconomy and the livelihoods of households. The economy suffered from a recession in the third quarter of 2020, however, key sectors including telecommunications and information services (15.9%), financial institutions (13.34%), and quarrying and other minerals (21.16%) continued to experience significant growth, which led to a recovery.

The Nigerian government has responded notably to address the pandemic's impact on the economy. So far, $1.4 billion in additional spending has been executed, which is estimated at 0.3% of GDP. This paper examines the macroeconomic landscape and policy interventions in Nigeria with the objective of developing lessons not only for Nigeria but for other developing economies.

Introduction

The COVID-19 pandemic has had severe impacts on the macroeconomy and the livelihoods of households globally. The restrictions to movement alongside the associated uncertainty stimulated a sudden decline in the demand for commodities and disrupted production, leading to the underutilisation of capital and labour.

More specifically, as governments sought to curb the spread of the virus by implementing workplace and school closures, and encouraging social- distancing practices, these policies led to a significant impact on all economies.

A recent study on the impact of COVID-19 on gross domestic product (GDP) and trade finds that the pandemic caused a 2% decline in global GDP, a 2.5% decline in the GDP for developing countries, and a 1.8% for industrialised countries[1].

For Nigeria, which saw its first case in February 2020, the economic contraction was severe and sustained leading to a recession in the third quarter of 2020. The economic contraction is the result of the adoption of lockdown measures – which had an impact on nearly all sectors of the economy – along with the pandemic's impact on partner economies engaged in international trade and those providing foreign investment.

Meanwhile, the income of the majority of citizens has been affected, because a large share of informal workers has no recourse to unemployment insurance or paid leave of absence.

The independence of a central bank in low-income and lower-middle income countries with similar conditions to Nigeria is key to macroeconomic stability

Consequently, the Nigerian government has increased its spending plans – delivering an additional $1.4 billion, estimated to be 0.3% of GDP, through cash transfers, tax rebates, loans and loan guarantees, among other mediums – to counteract the effect of the pandemic on domestic and business income and spending.

Furthermore, the Central Bank of Nigeria (CBN) has adopted a more accommodating monetary policy stance and injected liquidity into the banking system to increase available credit to the private sector.

A fiscal year has elapsed since the pandemic started and the policies were put in place, and macroeconomic policy responses have begun to gain traction.

This research and policy insight examines the macroeconomic landscape and policy interventions in Nigeria in order to develop lessons to guide economic policymakers in developing countries to create sustained economic recovery.

Section 2 of the policy insight provides an overview of Nigeria's macroeconomic landscape and policy interventions, while section 3 details the impact of the pandemic on key development indicators and assesses the efficacy of government support. Section 4 discusses lessons for Nigeria as well as low-income and lower-middle-income countries, and section 5 provides concluding remarks.

Overview of the macroeconomic landscape and policy interventions

This section provides an overview of Nigeria's macroeconomic conditions since the pandemic began. It examines resilient sectors and growth challenges, volatility in the foreign exchange market and trends in inflation. Furthermore, policy interventions, including fiscal and monetary responses, are discussed.

How has the pandemic impacted Nigeria's macroeconomy?

Nigeria's economy has been weakened as a result of domestic and global developments since the emergence of the pandemic. The detection of the first case in the country February 2020 necessitated stringent lockdown measures from the end of 30 March 2020.

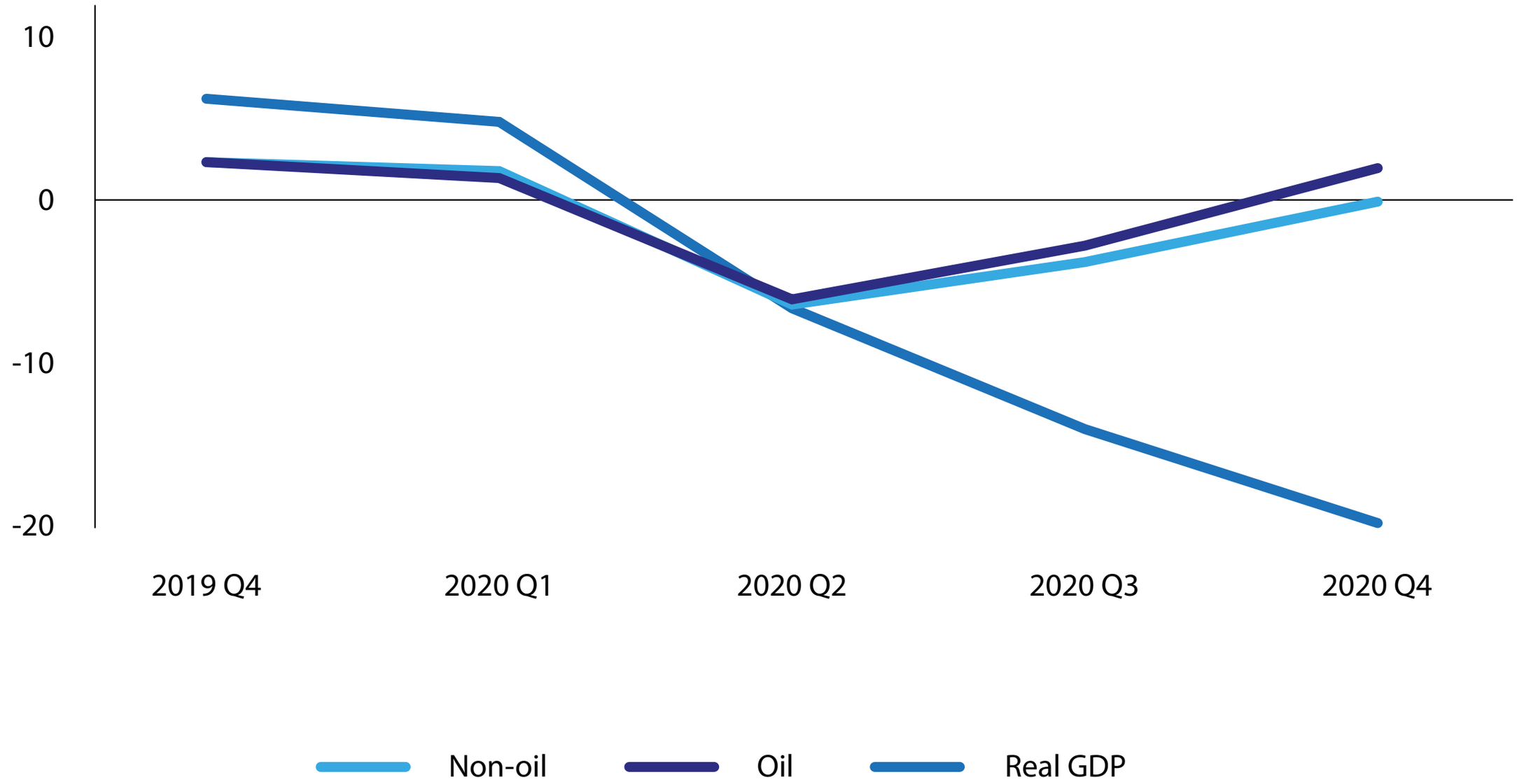
However, authorities mandated a gradual reduction in restrictions beginning in early May (phase 1), early June (phase 2) and early September 2020 (phase 3)[2]. These restrictions – as well as the impact of the pandemic on Nigeria's major trading partners, including China and Europe – have led to a severe economic contraction through a decline in demand, disruptions to production and increased uncertainty.

Figure 1 shows the steep decline in growth rates from the second quarter of 2020 when the economy contracted to -6.1%. The contraction continued in the third quarter (-3.6%) with the economy falling into a recession and exiting the recession in the fourth quarter (0.11%).

While the pandemic has had an impact on both the oil and non-oil sectors, the latter has driven the recovery. This is associated with the relatively low contribution (only 10% in 2019) of the oil sector to GDP[3]. Consequently, the agriculture and services sectors have been the major growth drivers (see Figure 2). Data from the National Bureau of Statistics shows the key sectors that recorded growth during 2020 included telecommunications and information services (15.9%), financial institutions (13.34%) and quarrying and other minerals (21.16%)[4].

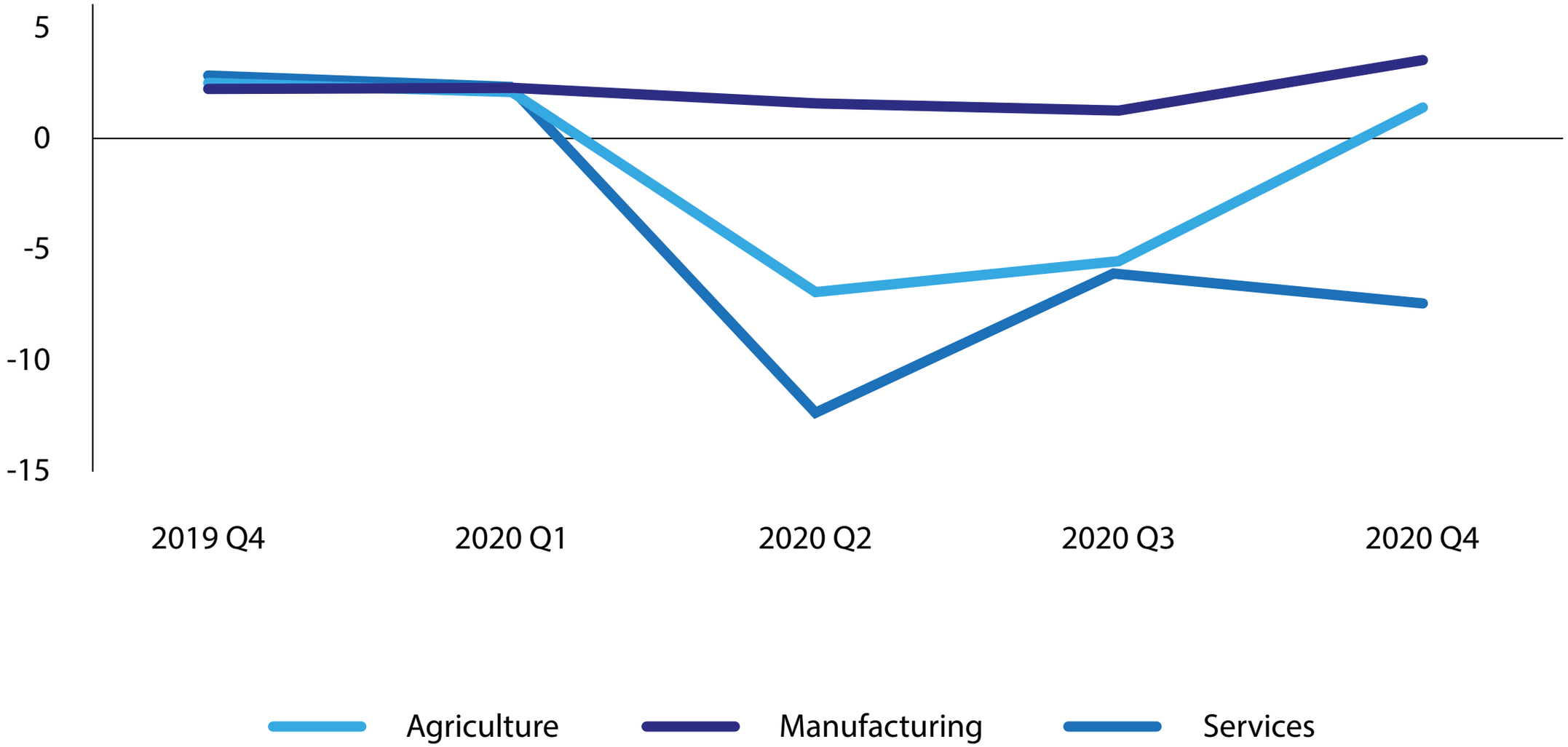
The persistent growth in these sectors is underpinned by the consistent demand for agriculture commodities, as well as mobile, internet and financial services, even during lockdown. Moreover, these sectors have weak links to global supply chains and, as such, were relatively unaffected by production disruptions.

Figure 1. Real GDP, oil and non-oil growth rates (%); 2019 Q4-2020 Q4



Source: National Bureau of Statistics, 2021. Nigerian Gross Domestic Product Report (Q4 and Full Year 2020)

Figure 2. Agriculture, manufacturing and services sectors growth rates (%); 2019 Q4-2020 Q4



Source: National Bureau of Statistics, 2021. Nigerian Gross Domestic Product Report (Q4 and Full Year 2020)

Furthermore, the pandemic's impact on the oil price led to volatilities in the foreign exchange market and reductions in the fiscal space. Presently, the oil sector accounts for 80% of export earnings and 50% of consolidated government revenue[5]. The decline in oil revenue also occurred alongside reductions in tax revenue – owing to the economic contraction – which has led to an estimated $10 billion decline in consolidated government revenue in 2020[6].

The most recent estimates show that government revenue declined from 8% to 5% of GDP between 2019 and 2020[7]. Meanwhile, reduced contributions from oil in export earnings necessitated the CBN's devaluation of the local currency (naira/NAN) on two occasions when the official exchange rate was adjusted from NAN 307/$1 to NAN 361/$1 in March 2020 and subsequently to NAN 379/$1 in June 2020[8].

Similarly, the naira depreciated from NAN 360/$1 to NAN 387/$1 at the investors' and exporters' window, which offers a more market-determined rate compared to the official window, which the CBN manages mainly by drawing on foreign reserves. The aim of the investors' and exporters' window is to offer a competitive rate closely aligned with the market rate.

As a result, reserves have declined by 10% since the pandemic began – from $38.5 billion in January 2020 to $34.7 billion in May 2021[9]. Historically, the naira has alternated between a fixed and floating exchange rate regime, with the CBN typically floating the exchange rate, while the parallel market premium widens.

As such, the devaluation occurred despite the CBN's intervention in the foreign exchange market and the sale of foreign exchange to currency exchange platforms.

As Nigeria is an import-dependent economy – importing about $100 billion worth of goods and services in 2019[10] – the devaluation of the naira has contributed to a persistent rise in commodity prices. In a single year, between February 2020 and 2021, inflation increased from 11.5% to 14% (see Figure 4).

The major driver of inflation is the rise in food prices, from 13.98% to 17.25% during the same period. The rise in food prices is linked to the insecurity in food-producing areas and the partial closure of Nigeria's land borders with countries contributing towards its food supply: Benin, Togo, Niger, Cameroon and Chad[11].

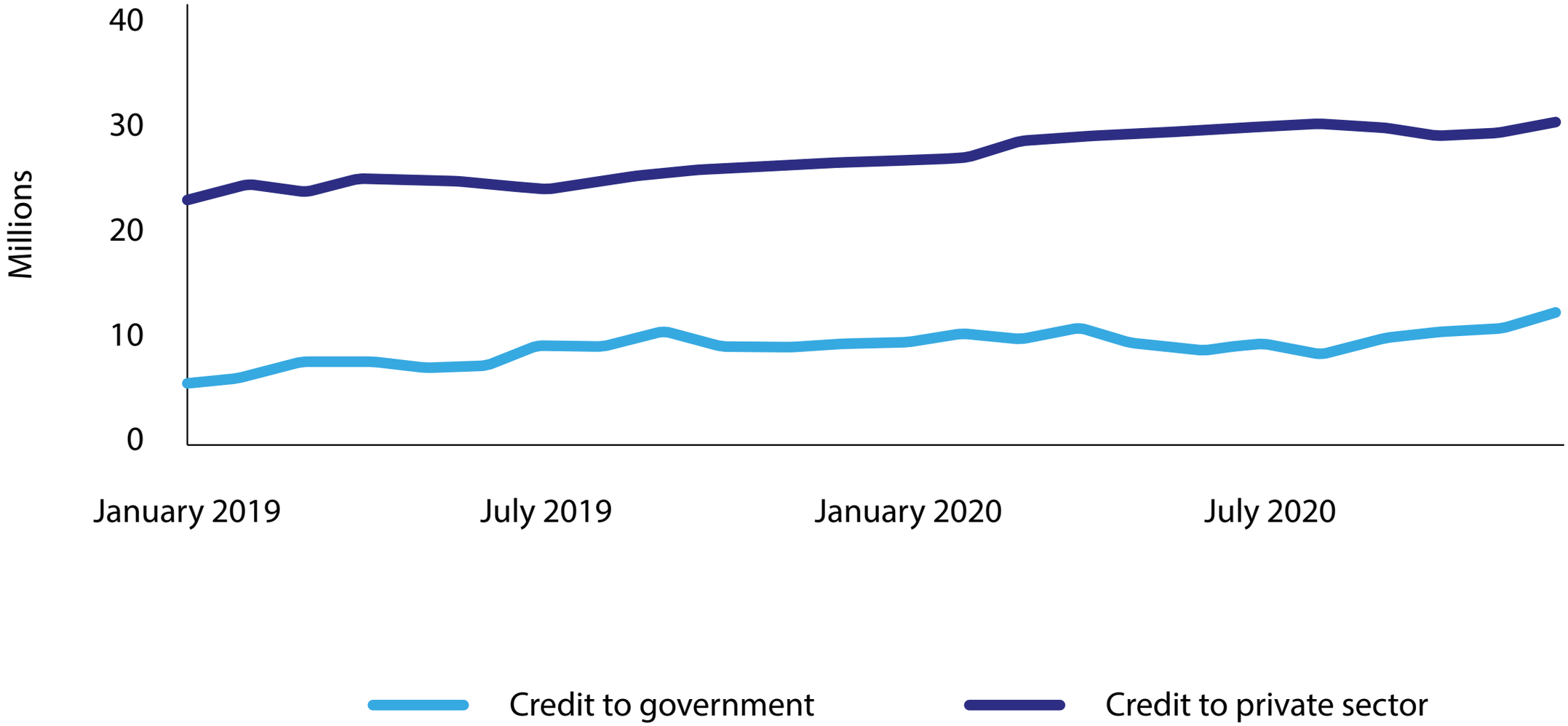
Furthermore, in order to conserve foreign exchange and increase local production, the CBN recommended banning imports of key agricultural commodities including maize (in September 2020), and sugar and wheat (in April 2021), which reduced the competition on the local markets with implications for food prices[12].

Other factors that have led to the continuous rise in prices include an increase in fuel and electricity charges due to subsidies being removed for both, and a rise in the VAT rate from 5% to 7.5% in February 2021.

However, the economic recovery is largely underpinned by the continuation of the CBN's development finance interventions in the real sector, and government's monetary financing to meet budget shortfalls. The agriculture, manufacturing and services sectors continue to benefit from similar levels of government support in the form of loans and loan guarantees as before the pandemic[13].

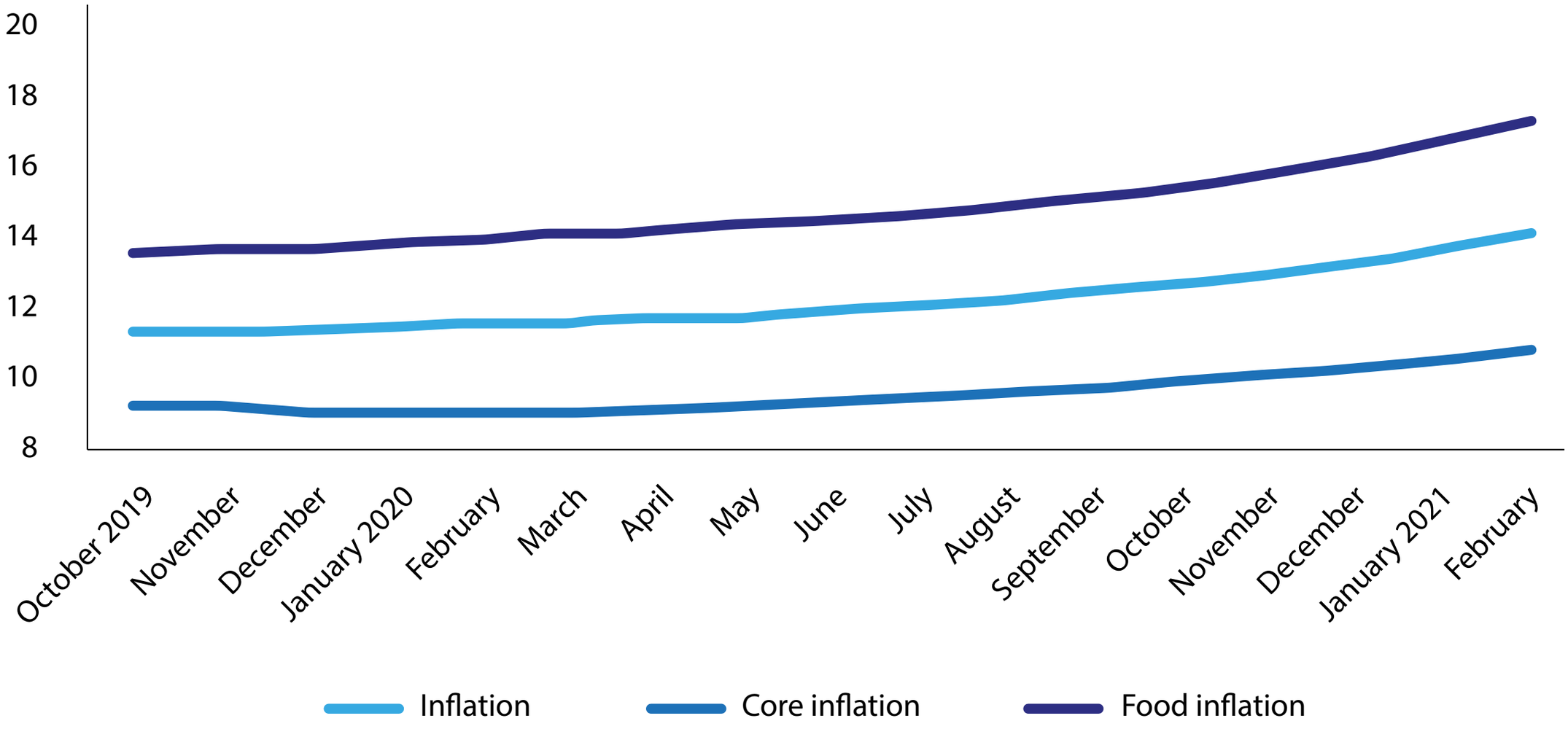
The CBN's credit to the private sector remains high at NAN 2.220 trillion in 2020, relative to NAN 2.224 trillion in 2019, pointing to the continuation of existing development finance interventions (Figure 3).

Figure 3. CBN's credit to the government and the private sector (N); 2019 and 2020



Source: National Bureau of Statistics, 2021. Nigerian Gross Domestic Product Report (Q4 and Full Year 2020)

Figure 4. Inflation (%); October 2019 to February 2021



Source: National Bureau of Statistics, 2020 and 2021. CPI and Inflation Report

Generally, these development finance interventions are in the form of the CBN providing two-step loans to commercial banks for onward lending to the private sector. In addition, the implementation of a fiscal stimulus in the wake of the pandemic amid declining government revenue has increased the CBN's monetary financing.

As shown in Figure 3, there was a 21% increase in the credit to the government from NAN 8.3 trillion to NAN 10.05 trillion between 2019 and 2020, which is attributed to the CBN's financing of the government's budget deficits. The fiscal stimulus package as well as government's intervention in the foreign exchange market have further aided economic recovery.

Digitisation is a key structural issue that hinders the country from reaching its economic goals – noting that individuals with access to internet as a share of the population was only 7% in 2017[14]. The low level of internet penetration has negatively impacted several sectors, including industry and trade, as well as financial, education and health service delivery.

For instance, trading across borders and gaining access to online markets is severely limited without internet access. Furthermore, the need for face-to-face interaction to deliver financial, education and health services reduces efficiency and reach of services.

What were the key macroeconomic policy interventions?

The weakening macroeconomic fundamentals fostered the government's response in the wake of the pandemic – this included the additional spending of $1.4 billion mentioned previously[15].

The majority of the fiscal stimulus – $1.1 billion – is targeted at non-health sectors that have been affected by the pandemic, such as the hospitality and manufacturing sectors, as well the pharmaceutical industry and social

protection programmes needed to mitigate the pandemic's effect. Furthermore, tax refunds were offered to businesses that did not lay off workers during 2020.

Meanwhile, the health sector benefitted from $0.3 billion. (See Table 1 for detailed government interventions.) The large spending plans amid the constrained fiscal space has implications on government indebtedness – the government debt-to-GDP ratio reached 35.1% in 2020 from 29.2% in 2019[16].

Similarly, the share of non-performing loans to outstanding loans stood at 6.1% in January 2021, which is above the 5% prudential requirement stipulated by the CBN[17]. While the current debt-to-GDP ratio remains below the 60% benchmark specified by the African Monetary Cooperation Programme, the share of revenue deployed towards debt servicing shows a more accurate picture of the fiscal and debt situation. Specifically, the shortage of finance led to the government spending up to 96% of revenue generated on interest payments in 2020[18].

Despite the upward pressure on the exchange rate and inflation, the CBN adopted an accommodating policy regime to increase available credit to the private sector through commercial banks. Consequently, the CBN cut the Monetary Policy Rate (MPR) from 13.5% to 12.5% in May 2020, and subsequently to 11.5% in September 2020[19].

In addition to reductions in the MPR, the CBN deployed other policy interventions. The interest rate to the aforementioned CBN development finance interventions targeted at the agriculture and manufacturing sectors was reduced from 9% to 5%, and a one-year moratorium was introduced on the interventions[20].

However, the ability of commercial banks to extend loans has been largely undermined by the limited availability of credit data on individuals for making lending decisions. In addition, the cash reserve ratio – the share of commercial

banks' liquidity reserved with the CBN – was increased from 22.5% to 27.5% in January 2020 with the aim of improving the resilience of the financial system largely due to the rise in inflation[21].

Since the pandemic, the cash reserve ratio has not been revised downwards, which has had an unintended consequence of limiting banks' credit creation capacity.

The CBN's interventions in the real sector have constrained expansion efforts in money market operations. In the first half of 2020, sales of the CBN bills offered at the open market operations auctions were valued at NAN 6.45 trillion, which is nearly half of the sales recorded in 2019 (estimated at NAN 1.83 trillion)[22]. The decline in open market operations resulted in the tightening of liquidity conditions.

There was also private sector support to complement the broad fiscal and monetary policies interventions. The Coalition Against COVID-19, working with the government, the Nigeria Centre for Disease Control and the World Health Organization, is the major private sector task force dedicated to combating COVID-19 in Nigeria. Their interventions are anchored around the health sector, food relief programmes and awareness campaigns.

For instance, the Coalition equipped medical facilities across the country's six geopolitical zones, enhanced capacity for testing and treatment, and built test laboratories, and isolation and treatment centres. As of November 2020, its total expenditure amounted to NAN 43.27 billion ($113.88 million)[23].

Development impact of COVID-19 and the efficacy of government support

One of the major transmission channels of the pandemic's effect on the economy is the labour market given that the health burden (morbidity and death) on the affected population represents a productivity loss in the economy.

Table 1. Nigeria's macroeconomic policy responses

Type	Policy response
Fiscal policies	Conditional cash transfer programme to 3.7 million people and an increase of the social register by 1 million households. The selection process follows a funnel approach where the poorest households in the poorest local government areas within the poorest states are prioritised. However, according to the 2019 Nigerian Living Standards Survey, 83 million Nigerians live in poverty implying that 78.3 million Nigerians are excluded from the programme.
	Creating a NAN 50 billion ($139 million) targeted credit facility to the private sector.
	NAN 2 trillion ($5.3 billion) loan to the manufacturing sector.
	NAN 1.5 trillion ($3.9 billion) loan to the real sector.
	NAN 100 billion ($263 million) intervention to the health sector.
	NAN 3.6 trillion ($9.5 billion) injection to the banking system for loan creation.
	NAN 300 billion ($789.5 million) MSME Development Fund targeted at micro, small, and medium-sized businesses.
	NAN 75 billion ($197.4 million) Nigerian Youth Investment Fund targeted at young entrepreneurs.
	Increase in VAT from 5% to 7.5%.
	Removal of fossil fuel subsidies, which was estimated at $2.7 billion in 2018[a].
	Removal of subsidies to the electricity sector, which was estimated at $377 million in 2018[b].
	Tax rebate to companies that did not retrench staff in 2020.
	Special Public Works Programme for the vulnerable particularly those with low skills and without employment.
Monetary policies	Reduction of the MPR from 13.5% to 11.5%.
	Reduction of the interest rate on CBN interventions from 9% to 5%.
	Provision of an additional one-year moratorium on all CBN interventions cutting across the agriculture, manufacturing and services sectors.
Exchange rate and balance of payment	Official devaluation of the naira from NAN 307/$1 to NAN 379/$1.

a. International Energy Agency, "IEA Fossil Fuel Subsidies Database", 2020.
b. International Energy Agency, "IEA Fossil Fuel Subsidies Database".

Source: Authors' compilation based on International Monetary Fund 2021 policy responses to COVID-19.

Similarly, the containment and mitigation strategies initially implemented severely constrained trade and production activities. These have had immediate economic effects in terms of job losses, lower revenue for businesses and increased poverty for households.

Based on the current labour market trends, the World Bank estimated that[24], without a holistic policy response, an additional 10 million Nigerians could fall into extreme poverty by 2022[25]. This will significantly worsen the poverty situation considering that 83 million Nigerians were estimated to already be living below the poverty line in 2019[26].

Evidence from the COVID-19 phone survey in Nigeria by the National Bureau of Statistics[27] points to a significant loss of livelihood at both the peak of economic restrictions and as the economy reopened. The rapid phone survey and polls have elicited responses on a number of important issues including employment, business performance and food security.

These are key to assessing macroeconomic performance and dealing with the pandemic. In April 2020, during the first phase of restrictions to movement (including inter-state travelling and shutdown of economic activities in commercial cities), about 57.4% of the adult population reported being out of work and 81% of businesses reported lower or zero revenue month-on-month (see Table 2).

The unemployment rate of 57.4% is significantly higher than the pre-pandemic unemployment rate, which was 23% in the third quarter of 2018[28]. By the third phase, specifically in the third and fourth quarters of 2020, most of the economic indicators had improved but none had reached the pre-crisis level.

By December 2020, only 29.8% of the adult population reported being out of work in both the formal and informal sectors, and 37% of businesses reported lower or zero revenue.

Food insecurity worsened significantly due to inflation and labour market shocks, and this affected household income and consumption patterns. Table 2 shows that more than half of the respondents were unable to purchase two key staple foods (rice and cassava) in April 2020.

Table 2. Impact of COVID-19 on key development indicators in Nigeria (%) April to December 2020

Dimension of impact	April	August	December
Employment			
% of adult population not working	57.44	30.55	29.86
Revenue losses: change in business revenue			
Lower/no revenue	81.20	46.02	37.37
No change in revenue	8.25	17.13	17.90
Higher revenue	10.54	36.85	44.74
Food security: % of respondents who are unable to buy Nigerian staple food			
Rice	59.14	36.56	20.33
Cassava	51.79	17.56	12.82

Source: Authors' analysis based on World Bank and National Bureau of Statistics, 2021. COVID-19 National Longitudinal Phone Survey 2020

However, the share of those unable to purchase food supplies had fallen to 20.3% for rice and 12.82% for cassava in December 2020, pointing to a gradual recovery. This has implications for the achievement of Agenda 2030 goals in Nigeria with respect to poverty alleviation (SDG 1) and ending hunger and achieving food security (SDG 2).

Nevertheless, the future trends in employment, business profitability and food security depend on the size and effectiveness of policy responses.

Insights from the survey show that access and coverage of government support is minimal. The share of respondents receiving assistance from the government stood at 0.77% of the population in April 2020 and rose to 2.17% in May but declined consistently afterwards (Figure 5).

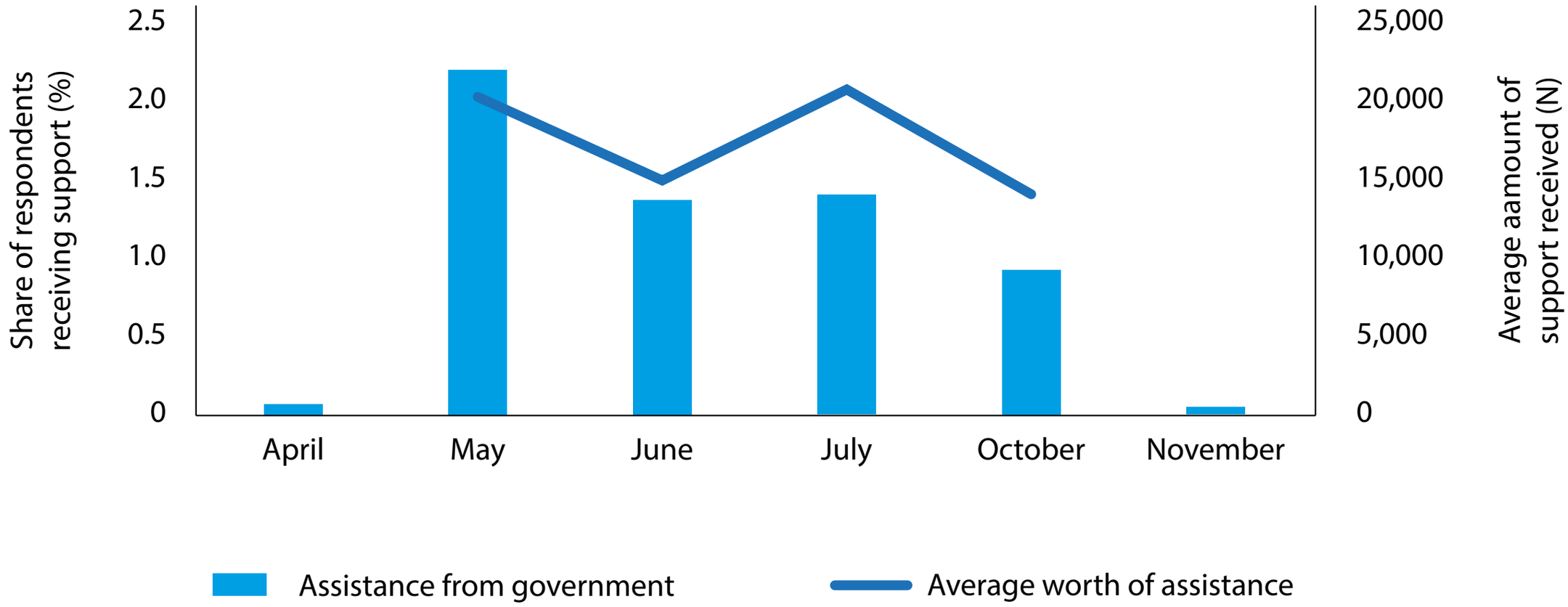
Although the majority of the population did not benefit from government's targeted social transfers, there is a gradual withdrawal of this support, indicating a shift in priorities. The rebound in employment, business revenue and food security reflect the pro-growth policy measures that have had an impact on both households and businesses.

This signals that stronger recovery efforts should be anchored on increasing government assistance towards sectors that drive growth and employment. However, social protection programmes still have a role to play particularly in providing food security.

Lessons for Nigeria and other low-income and lower- middle-income countries

The swiftness and scope of the CBN's response since the onset of the pandemic is notable. The availability of credit to the real economy since March 2020 has targeted sectors of importance to the economic recovery agenda including manufacturing and services.

Figure 5. Beneficiaries of the government support programme as a share of the population, and the value of government support, April to November 2020



Source: Authors' analysis based on World Bank and National Bureau of Statistics, 2021. COVID-19 National Longitudinal Phone Survey 2020

Moreover, the CBN's response occurred in the context of several ongoing development finance interventions to the real sector. Furthermore, the national data collection agency, specifically the National Bureau of Statistics, has been proactive in collecting timely and frequent data.

This has informed analysis and been used to develop insights on how the pandemic has affected both households and businesses. In many African countries where conducting regular surveys is uncommon, Nigeria serves as a leading example.

Nevertheless, the role the CBN has taken with regards to credit support points to several gaps in the policy response.

First, the support to businesses largely involves loans without leveraging other interventions, such as tax cuts, moratoriums on debt repayment and wage subsidies. For businesses with access to loans – and worse for those without loans – these financial commitments (tax, debt, and wage payments) could outweigh the support from government and have implications on business profitability and solvency.

Second, both federal and sub-national governments are fiscally handicapped because the country entered the crisis with a history of limited fiscal space. This limited government's capacity to respond to the crisis and widened the CBN's appetite for continued support to the private sector.

This poses a concern regarding the risk exposure of the CBN in the case of an extensive private sector default, and debt monetisation. This is of concern given the large share of revenue deployed towards debt servicing and also considering that non-performing loans as a share of outstanding loans remains above the 5% benchmark stipulated by the CBN.

The proclivity towards issuing new money in order to finance budget shortfalls has been associated with upward pressure on inflation[29]. As a result of the negative effects of monetary financing, central banks in the European Union are explicitly mandated not to engage in direct monetary financing under the Maastricht Treaty (Article 130 of the treaty of the functioning of the European Union)[30].

However, there is an ongoing shift in central banking – termed quantitative easing – that supports the large-scale purchase of government bonds to maintain low interest rates[31]. Quantitative easing has also been adopted by countries facing deflation, as was the case in Japan from 2001 to 2006 when the Bank of Japan sought to bring an end to deflation[32].

In the case of Nigeria, the CBN is undertaking direct monetary financing in the form of printing money within the context of persistent inflation. As such, the independence of a central bank in low-income and lower-middle income countries with similar conditions to Nigeria is key to macroeconomic stability.

Times of crisis are no excuse to flout the rules that govern macroeconomic stability. Achieving independence from the central bank is underpinned by a country's ability to build fiscal buffers and maintain fiscal prudence.

Accordingly, there is the need to build fiscal buffers to navigate future crisis. In Nigeria, as in several developing countries, this will involve expanding the tax base – not explicitly by increasing tax rates but by curbing tax evasion and avoidance.

More so, given that a large share of revenue is generated from oil, transparent and efficient management of natural resource revenues, including establishing a natural resource fund, will address revenue leakages.

On expenditure, streamlining governance structures for countries with a high cost of governance is a policy option towards building fiscal buffers. Nigeria, with one of the highest costs of governance globally, could lead in this regard[33].

Furthermore, commercial banks are largely unable to meet credit demands. On the demand side, asymmetric information in borrowing markets – owing to limited information on the credit worthiness of borrowers – has led to high interest rates on loans to cover risky borrowers.

As such, the loans and loan guarantees offered within the purview of the CBN's development finance interventions require collateral (in some cases). Moreover, the weak monetary policy transmission – common in developing countries owing to heavy central bank interventions in the foreign exchange market, low rates of interbank competition and a lack of market-determined interest rates[34] – has made it such that reductions in the MPR do not reflect on the interest rates offered by commercial banks.

On the supply side, banks in Nigeria are constrained, as the cash reserve ratio has not been reduced since the pandemic began. Moreover, the relatively high interest rates offered in treasury bills and government bond markets incentivises commercial banks to invest in government bonds (that are largely risk-free) rather than lend to the private sector.

As a result of these shortcomings, direct lending by the central bank can be adopted to mitigate against some barriers particularly the high collateral and interest rate associated with borrowing. This has been done by the United States' Federal Reserve in the wake of the pandemic[35].

Other gaps exist with regards to targeting and coverage of the government's spending plans. First, the government's limited spending plan, high level of informality and low financial inclusion has led to a large share of the population being left behind with regards to direct income support.

As noted elsewhere in this policy insight, only 2.17% of the population surveyed benefitted from the government's support in May 2020 with implications for vulnerability and poverty levels. Moreover, the lack of a gendered approach in the design and implementation of spending plans worsens the pandemic's effect on women.

For instance, failure to provide childcare subsidies (subsidising businesses and individuals for taking leave of absence for childcare purposes) is likely to affect the income and job security of women. South Korea stands out as a country with a gendered approach in its macroeconomic policy. It provided an emergency family care subsidy for workers taking a leave of absence for childcare during school closures[36].

Additionally, the reallocation of spending is not adequately targeted at achieving a green recovery, in particular, and sustainable development in general. While the government's Economic Sustainability Plan (2020–2021) seeks to increase spending allocated to agriculture, renewable energy and infrastructure, the plan remains vague as to the mechanisms through which the investments will be made and focuses on unsatisfactory aspects of the sector.

For instance, the focus on agriculture is to increase the farmland under cultivation rather than improve productivity and formalise the sector, which would increase the revenue generated from the sector. Other aspects such as education and health receive relatively less attention despite the fact that the pandemic has exposed structural weaknesses in these sectors.

Lastly, the use of anti-trade restrictive policies should be reversed, such as closure of borders in the wake of the pandemic. Burundi, Ethiopia, Rwanda and Somalia closed their borders in March 2020, and Kenya in May 2020, mainly to contain the spread of the virus[37].

Although Nigeria has reversed the closure of its borders, other countries are yet to reverse their border closure policies, which is inconsistent with the African Continental Free Trade Area Agreement that advocates for free trade within the continent.

One of the consequences of Nigeria's border closure was a negative impact on border communities (in both Nigeria and neighbouring countries) that rely on informal trade as a source of livelihood[38].

Similarly, the ban on the import of selected items in order to conserve foreign exchange earnings is not only anti-trade but could increase local food prices against the background of already rising food inflation. This has consequences for vulnerability and poverty.

A key lesson across the policy responses is the need to strengthen the systems that underpin the delivery of the responses. An improved social protection system will be useful to reach the vulnerable and those in the informal sector, the same way that the creation of fiscal buffers will lead to more robust spending plans in times of crisis.

Similarly, increased formalisation of the labour market will ensure that more workers have recourse to necessary benefits including paid leave, unemployment insurance and health insurance – and a more developed health systems will increase preparedness in times of a health crisis. Adopting a long-term approach and building systems rather than once-off solutions is of crucial importance to shaping the economy.

However, readjusting the spending plans to fit the present climate is important to ensure that the temporary fiscal stimulus does not become permanent, as this will have implications for sustainability.

Conclusion

The COVID-19 pandemic has led to unprecedented demand and supply shocks. However, governments have deployed macroeconomic policy responses targeted at providing relief for those affected. Nigeria has been severely affected by the economic shock with the economy falling into a recession in November 2020 but exiting soon after.

The economic recovery is largely as a result of the government's interventions in the form of an increase in spending plans and interventions in the foreign exchange market – much of which has been led by the CBN through monetary financing to the government and the provision of development interventions to the private sector.

Despite the proactive role of the government, several shortcomings have emerged with regards to Nigeria's macroeconomic policies. The increase in the CBN's appetite for continued support to the private sector poses concerns regarding the risk exposure to an extensive private sector default and debt monetisation.

Furthermore, commercial banks are largely unable to meet credit demands due to an interplay of several factors including limited information on the credit worthiness of borrowers, weak monetary policy transmission and a high cash reserve ratio.

Other gaps also exist, and a large share of the informal sector – the vulnerable population and women – are left behind in the government's policy responses. Similarly, the narrow range of interventions constricts businesses with outstanding financial commitments including tax, debt and wage payments.

A key lesson for Nigeria and other developing countries includes ensuring the independence of the central bank even in the face of the crisis. Furthermore, a long-term approach should be adopted to strengthen the systems that underpin the delivery of the responses, including strengthening social protection and public health systems, formalising the labour market and creating fiscal buffers.

The ICT sector, and others that can adapt to digital platforms, also showed more resilience and even growth during the pandemic, suggesting that anchoring recovery efforts and post-COVID economic structures in a digital economy could be beneficial.

Furthermore, policy responses should align with broader development agreements including the Sustainable Development Goals, the Paris Climate Agreement and the African Continental Free Trade Area Agreement. ■

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Endnotes

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About CSEA

The Centre for the Study of the Economies of Africa (CSEA) is an independent non-profit research organization established in April 2008. CSEA serves as a forum for quality research analyses, and policy dialogue by stakeholders from the private sector, government, national assembly, and civil society. The policy-oriented research carried out by the Centre, including the articulation of policy choices, tradeoffs and implications, is put forward to the general public and decision-makers to stimulate rigorous debates on the effects of government policies on economic growth and development in Nigeria and Africa. The Centre carries out applied research and presents policy options to enhance macroeconomic stability, fiscal transparency and accountability. Similarly, CSEA advocates for greater fiscal transparency and accountability, reduction in leakages of public funds and improvements in governments' delivery of social and public services.

About CoMPRA

The COVID-19 Macroeconomic Policy Response in Africa (CoMPRA) project was developed following a call for rapid response policy research into the COVID-19 pandemic by the IDRC. The project's overall goal is to inform macroeconomic policy development in response to the COVID-19 pandemic by low and middle- income countries (LMICs) and development partners that results in more inclusive, climate-resilient, effective and gender-responsive measures through evidence-based research. This will help to mitigate COVID-19's social and economic impact, promote recovery from the pandemic in the short term and position LMICs in the longer term for a more climate-resilient, sustainable and stable future. The CoMPRA project will focus broadly on African countries and specifically on six countries (Benin, Senegal, Tanzania, Uganda, Nigeria and South Africa). SAIIA and CSEA, as the lead implementing partners for this project, also work with think tank partners in these countries.

Regulating crypto assets

Crypto assets and blockchain technology have triggered a huge debate. Daniel Dăianu believes that updating the current regulatory framework is a must for governments and central banks

There is a growing debate worldwide on the relevance of crypto assets for the financial industry, and for the economy as a whole. Crypto assets (digital assets that use blockchain technology), among which Bitcoin and Ethereum are the best known, have experienced an explosive growth after the outbreak of the financial crisis in 2008; their number is currently about 11,000.

Digitalization has clearly enhanced this phenomenon. Libertarian propensities, which mistrust governments/public authorities (central banks included), view crypto assets (crypto currencies is, arguably, a misnomer) as an alternative to central bank money, with ensuing decentralization and democratization of finance that would ensure anonymity in transactions, transgress regulations and borders, exchange rates risks, etc. But it is not the political philosophy of some people that matters mostly, but the phenomenon itself and its wide and profound possible repercussions.

As the volatility of crypto assets is extreme (illustrated by Bitcoin, glaringly), stablecoins have emerged, which are assets that rely on currencies issued by central banks and financial assets that are perceived as relatively stable; stablecoins can be considered as synthetic variants of crypto assets. Ironically, financial assets that are seen as alternatives to the currencies issued by central banks are related value-wise to currencies such as the US dollar and the euro.

Crypto assets, which have a pronounced speculative nature, pose a formidable challenge to central banks since they make up parallel transactional circuits which are (until now!) outside their regulatory ambit. Not a few central banks are considering issuing digital currencies (central bank digital currency/CBDC).

The Bank for International Settlements (BIS) has set up an innovation hub for digital currencies; many central banks study digital currencies/assets. But the challenge posed by crypto assets is not related to competition in money

markets in the main. The stakes are much deeper and concern the monetary transmission process in the economy as well as overall financial stability.

Monetary transmission

Crypto assets can be seen as an expansion of a 'shadow financial system', which is escaping regulation and supervision, at least until now. For years now, monetary authorities have been struggling to cope with the expansion of the shadow banking sector, which is represented by non-banking entities (eg. investment funds, high-tech giants – remember the Facebook Libra project) that offer banking and various other financial services.

The lessons of the financial crisis show that there is a need for strict regulation and supervision of the entire financial system, and, it goes without saying, of the shadow sector with the extensions represented by crypto assets

The problem here is related not only to poor regulation of the shadow sector, but also to the efficiency of monetary policy: the link between the monetary base (M0), the base money issued by a central bank and the overall amount of money (which has its counterpart in the volume of credit, of overall financial services) circulating in the system. It is known that the monetary base issued by a central bank is multiplied by commercial banks, which keep mandatory reserves at the central bank in local currency and hard currency.

To the extent that crypto assets are perceived as a means of payment and even of hoarding (some see crypto assets as 'a new gold'), one can speak of an expansion of transactions that are no longer mediated by the money supply itself, but, instead, by crypto assets that are improperly called quasi-currencies.

The process of monetary transmission, the control the central bank exerts through money creation (outside money/high-powered money) over the money supply, gets a new twist of uncertainty and undesirable complexity; and the efficiency of monetary policy is impaired consequently.

It could be asserted that the relationship between the monetary base and the money supply (M2, M3), which had become increasingly unstable decades ago and which motivated the adoption of the inflation targeting regime (which uses as its main tool the policy rate, which replaced the quantitative control of monetary aggregates), would make this relationship, and the ensuing worry of central banks, irrelevant.

But central banks, either through quantitative controls of monetary aggregates, or through monetary policy rates, influence monetary/financial conditions in markets and they seek to ensure monetary stability and maintain liquid financial circuits.

It is true that a zero lower bound demands qualifications as monetary policy efficiency is dented by a very low natural interest rate and very low inflation. But the relationship between base money and the money supply does not disappear fundamentally.

Central banks can broaden and refine their policy instruments, can overhaul the monetary policy regime by taking into account the configuration of finance (the financial industry) and the objective of price stability.

The means of payment, financial assets, do not have the same liquidity (credibility) and they carry different risk premia; some of them can actually 'freeze' in times of crisis and trigger runs on them and on other assets.

As periods of crises show, it is only central bank money (outside money, base money, high powered money) that can unfreeze markets and make money flow again. I refer to credible central banks primarily, like those that issue reserve currencies. This is what happened in the financial crisis more than a decade ago, as well as during the current pandemic.

Crypto assets add parallel circuits that do complicate the monetary transmission. It is to be assumed that the ECB's new policy framework (as well as those of other central banks) will factor in the parallel circuits that are created by crypto assets.

Financial stability

Closely related to the issue of monetary transmission is financial stability, which is also likely to be impaired by crypto assets, including stablecoins (Tether is the best known among the latter). Stablecoins have as collateral the money issued by central banks, sovereign bonds and other financial assets (eg. commercial securities).

With a strong shock to financial markets there may be a flight from some assets which are behind stablecoins. An analogy can be made with the money market funds, which were supposed to offer quasi-safe investments with a very low degree of volatility, but which, in moments of panic, needed Fed intervention in order not to harm the stability of the financial system as a whole. As a matter of fact, the Fed, had to act as a lender of last resort in the capital markets as well (as a market maker too).

Stablecoins need to be regulated, and their functioning should be accompanied by adequate capital and liquidity requirements, as is the case with commercial banks. Crypto assets, all of them should be regulated and adequately supervised.

Central banks must cooperate in this regard with capital market regulators and supervisors (in the US these are the Treasury and the Securities and Exchange Commission mainly, in the EU it is ESMA - the European Securities and Markets Authority).

Macroprudential rules must take into account the number and volume of transactions operated with crypto assets. Disturbances in markets where crypto assets are used can have spillover effects on regulated markets, they can contaminate them and cause great damage in the absence of timely intervention. And in order for interventions not to be too costly to central banks, to governments, it is necessary that the regulation and supervision of crypto assets be adequate, that macroprudential rules be extended to them too.

The money issued by central banks is the foundation of the financial system!

The big moral is that, in the end, the money created by the central bank (Fed, ECB, BoJ, BoE, etc.) is vital, it is the one that guarantees credible support in times of great distress. This has happened in all financial crises in

developed countries. It also happens in times of stress in capital markets, as it occurred in March 2020 in the US, as in September 2019.

Only central bank currency can provide the function of lender of last resort, without which a viable, credible financial system cannot operate. The clearest evidence in this respect is, that during crises, commercial banks cannot issue the means of payment to unfreeze the system, to save the whole system; it is the central bank that must step in and be the mainstay of the system.

It goes without saying that I refer to developed economies, with credible central banks and strong institutions. In emerging economies, with a poor track record of central bank policies and heavy dollarization, the strength of central bank money is questionable and help from outside (from international institutions and from various countries, or their central banks, on a bilateral basis) is frequently needed in periods of deep crisis.

It can be argued that major central banks have invited the Great Recession, that 'boom and bust' cycles are part and parcel of the market economy. And it is unquestionable that the profound deregulation of the 90's (light touch regulation, whose trigger was set by the Big Bang of 1986 in the City of London and by the rescinding of the Glass-Steagall legislation in the US in 1998) is to blame in this regard, as are also the plethora of toxic financial products, the madness of speculations with fancy derivative products tolerated by market regulators in those years.

But myopia, a misguided paradigm embraced by central banks up to the Great Recession, do not obliterate the central bank's essential function as a lender of last resort. This situation has been seen across the Ocean, it has been seen in Europe with the ECB, which saved the euro area through its special operations. That such operations may be excessive and fuel speculative bubbles, aside from the moral hazard issue, calls for another discussion.

The lessons of the financial crisis show that there is a need for strict regulation and supervision of the entire financial system, and, it goes without saying, of the shadow sector with the extensions represented by crypto assets.

The big stake is not to allow a new era of free banking

I return to the idea that central bank digital currencies are not to be seen primarily as competitors of crypto assets, although, in a deep sense, they show the danger and risks posed by these highly speculative assets. As some central bankers' remark, monetary systems were hitherto largely digitized, with much of the transactions made electronically.

It is noteworthy, in this regard, how much the monetary base is in relation to money supply in developed economies (through the system of fractional reserves), and how many transactions are made electronically – in the UK, for example, M0 (monetary base) is about 3% of the entire money supply.

Digitization and digitalization are favoured by new technologies, by a Zeitgeist, by the desire of not a few people to decentralize financial systems and more. The fundamental problem for central banks, however, goes beyond being in step with new technology, to digitize money creation.

The big stake is not to let the financial system get into a binge of new free finance/banking, with a detrimental impact on financial stability and the economy; safe public money is a public good, on which economic and social cohesion depends. We must not go back tens, even hundreds of years ago in terms of the configuration of finance, allow by negligence/omission that a financial system in growing disarray amplify economic and social disturbances.

The deep, big stake for governments and central banks, when it comes to crypto assets, is augmented by the need to combat money laundering, financing of terrorism and organized crime, fraud of all kinds, cyber attacks, ransomware. A geopolitical dimension gets into the picture here too.

But I do not see how, for example, the competition between the US dollar, the euro, the Chinese currency, would be fiercer through the full digitization of money creation, the disappearance of cash. It is not digitization and digitalization in the financial industry that will dictate the dynamics of global clout in the end, but the economic and technological power of various societies.

The proposal by the European Commission for the regulation of crypto assets (MiCA) is to be welcomed, as are similar measures envisaged by authorities in the USA, Great Britain and other countries. (PS. The states where crypto assets are viewed with nonchalance most often have weak institutions, are heavily dollarized, and some of them have a clear status of tax havens.) ■

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The impact of fintech on central bank governance

Central banks are facing unprecedented technological transformation. Marianne Bechara, Wouter Bossu, Yan Liu, and Arthur Rossi consider the key legal issues central banks face from fintech on their governance

Introduction

Fintech presents unique opportunities for central banks. The rapid changes in technology that are transforming the financial system will allow central banks to enhance the execution of various of their core functions, such as currency issuance and payment systems[1].

But some aspects of fintech pose major challenges. Central banks have always been at the cutting edge of financial technology and innovation. In the past, the invention of the banknote, the processing of payments through debits and credits in book-entry accounts, and the successive transitions of interbank payment systems from the telegraph to internet protocols were all transformative innovations.

Today, however, central banks are facing new and unprecedented challenges: distributed ledger technology, new data analytics (artificial intelligence [AI] and machine learning), and cloud computing, along with a wider spread of mobile access and increased internet speed and bandwidth.

As with previous health crises (for example, the 2003 SARS epidemic), the ongoing coronavirus disease (COVID-19) pandemic plays an accelerating role. Furthermore, building on their agile embrace of technological changes, the private sector reinvigorated its efforts to develop financial services and asset classes that can compete in the traditional domain of central banks.

This could have a major impact on central banks. For instance, major components of the national and international payment infrastructure could be dominated by private firms and networks. This, in turn, could impair their capability to deliver on monetary policy mandates and undermine their issuance monopoly for currency.

Those challenges increasingly pose questions for the governance of central banks. What is the impact of fintech on central bank mandates? Is the structure of their decision-making bodies conducive to a sound response? Will fintech affect their autonomy? How should central banks be transparent about, and accountable for, their response?

The purpose of this note is to discuss the authors' preliminary views on how, from a legal perspective, central banks can best deal with the impact of fintech on their governance. These preliminary views are based on a review of central banks' reaction thus far to the challenges posed by fintech to the legal foundations of their governance[2].

Fintech could have a major impact on the legal foundations of the governance of central banks, although fundamental changes to those foundations are not likely to be required

At any rate, there is no 'one size fits all' approach to the issues discussed in the note. The central bank response to fintech is going to be influenced by a broad set of factors that would likely lead to different models. Moreover, fintech covers a diverse and complex set of technological advances. Some aspects of fintech may not require central bank actions and are beyond the coverage of this note.

After a brief conceptual introduction to central bank governance, the note will assess how each component of that concept is likely to be impacted by fintech, review how central banks have reacted, and discuss how they may need to (further) adjust the legal foundations of their governance to respond to the challenges posed by this impact.

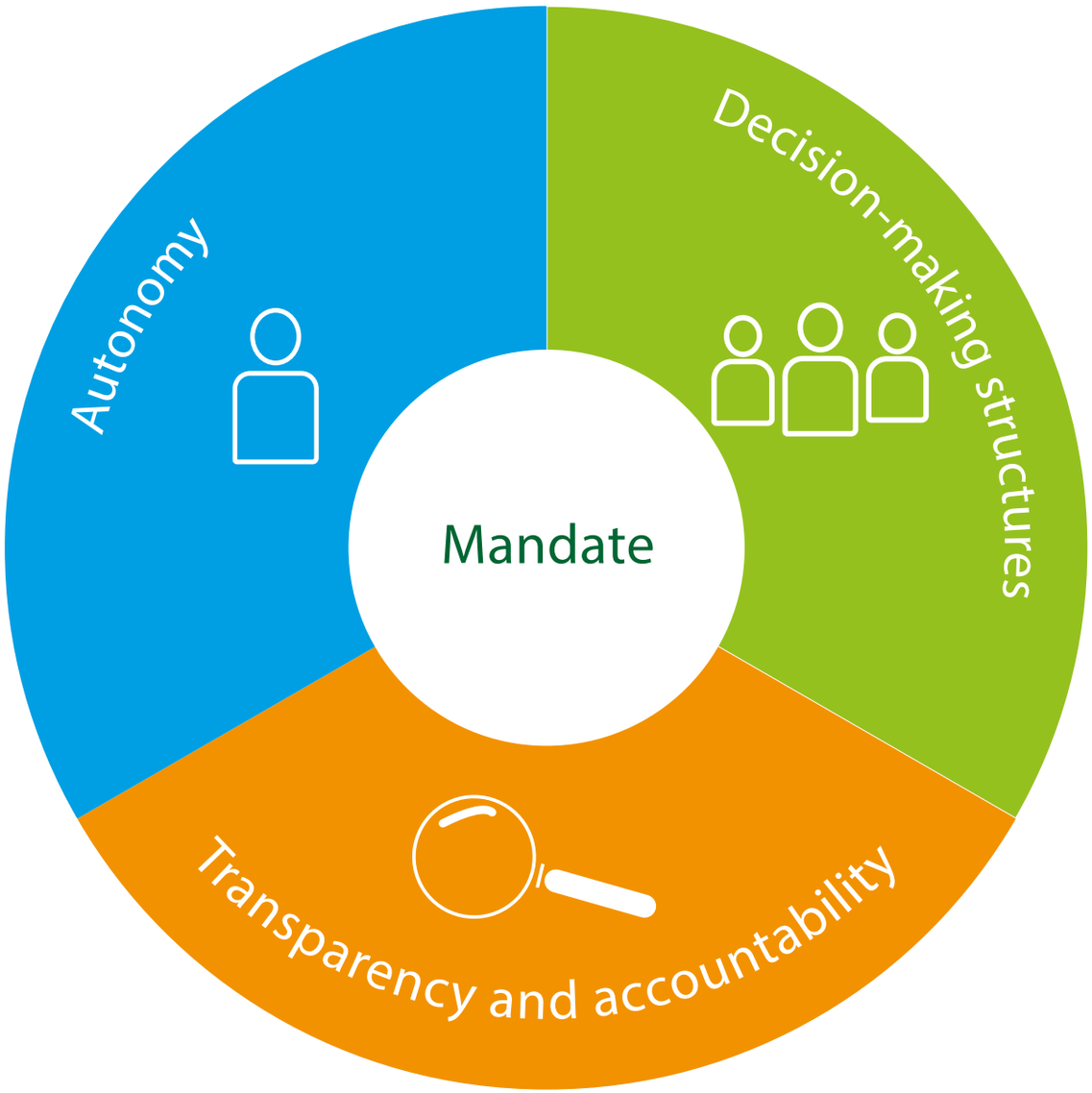
Central bank governance

Central bank governance is a complex, multi-faceted concept. In general, governance can be defined as the ensemble of structures and arrangements by means of which an organization makes decisions in the pursuit of its mandate[3].

Central bank governance, in turn, is a concept composed of four constitutive and interrelated components: a central bank's (i) mandate, comprising its objectives (the why), functions (the what), and powers (the how); (ii) decision-making structures; (iii) autonomy; and (iv) transparency and accountability.

The underlying idea is that the mandate shapes the three other components, which, in turn, interact with each other. These concepts can visually be represented as in Figure 1. From a formal perspective, the main features of that governance are typically established in the *organic* central bank law/act (often interpreted considering corporate laws or principles of general application).

Figure 1. Central bank governance—the concept



Source: IMF staff.

The mandate (objectives, functions, and powers)

Objectives

Any actions taken by central banks in response to fintech must be in pursuit of their legal objectives as established in their central bank law. This raises two legal questions.

First, are those actions appropriately anchored in their current *traditional objectives*, such as price and financial stability? For some central bank initiatives, such as the modernization of interbank payment systems, such anchoring appears to be non-controversial.

However, other possible endeavours raise questions and require careful legal consideration. For instance, it might be challenging to justify the issuance of central bank digital currency (CBDC) in the context of the pursuit of price and financial stability objectives, since for some countries, this link is far from obvious[4].

In assessing the legal basis of their fintech response, some central banks will also need to consider the constitutional perspective (including its specific interpretation rules), as their constitution may include core monetary and central bank law principles[5].

Second, to support an innovative fintech agenda, will central bank laws be expanded with *new*, less traditional *objectives*? These could include promoting financial inclusion or financial innovation or fostering competition in and open access to payment systems.

- Some central banks have had such an objective for a while. For instance, the Monetary Authority of Singapore has the objective *"to grow Singapore as an internationally competitive financial centre."* Similarly, the

Reserve Bank of Australia is required to pursue, in its payment systems policy, the objectives of *"promoting the efficiency of the payments system and (…) competition in the market for payment services."*

- More recently, the organic law of the Monetary Authority of the Cayman Islands was modified to require the central bank *"in performing its regulatory functions and its co-operative functions"* to *"recognize the desirability of facilitating innovation in financial services business."* Similarly, the recent Brazil Central Bank Autonomy Law includes the objective of promoting the efficiency of the financial system.

It remains to be seen whether other countries will follow these examples. At any rate, central banks need to manage trade-offs between their different objectives. The more objectives a central bank has, the more complex those trade-offs become, especially in the absence of a clear hierarchy between such objectives.

Functions and powers

In light of the transformations caused by fintech, three legal questions arise regarding the statutory functions and powers of central banks: (i) what are central banks expected or required to undertake to perform their current functions? (ii) will fintech impose changes to the legal formulation of current functions and powers? and (iii) is fintech likely to lead to the development of novel central bank functions and powers?

Currency issuance

Fintech is likely to have a major impact on the legal foundations of the currency issuance function. Today, the use of currency can, in some countries, come under pressure because of digital payment solutions, large technology companies exploring the possibility of issuing their own digital money to their massive consumer base[6], and the issuance of CBDC by foreign central banks potentially causing *"currency substitution."*[7]

To ensure continued public access to some form of central bank money, many central banks are considering the issuance of CBDC. This will require a sound legal basis in the central bank law, which will depend on the design features chosen for the CBDC.

Specifically, for token-based CBDC, it may be necessary to reform the currency issuance function and powers, which today often are limited to banknotes and coins only. Issuing account-based CBDC, in turn, will often require enhancing the power to offer central bank cash current accounts to the general public[8].

Monetary policy

Fintech will likely impact the implementation rather than the legal wording of the monetary policy function, in particular by exposing excessive constraints in the related legal powers. This function is typically broadly worded in the central bank law: *"The central bank shall formulate and implement monetary policy."*

In contrast, the legal powers authorizing financial transactions with eligible counterparties are often restricted. For instance, open market and credit operations are only authorized with banks. This may pose two challenges.

- First, if, due to fintech, traditional monetary policy counterparties were to become less relevant in the new financial system and economy, this could limit the effectiveness of the central banks' monetary policy tools[9]. As one way to palliate this, central banks could consider enlarging the category of monetary policy counterparties. This may, in due course, require reform of the central bank law, for instance by granting more 'guided flexibility' to the central bank's decision-making bodies to determine the categories of eligible counterparties[10].

Box 1. The Sand Dollar and the Central Bank of Bahamas Act, 2020

The Central Bank of Bahamas is the first central bank to issue a widely used digital currency: the Sand Dollar. This issuance is underpinned by various provisions of the central bank's newly enacted organic legal framework: the Central Bank of Bahamas Act, 2020.

While the act conflates the objectives and functions of the central bank, the currency issuance function is broadly worded (Section 5(1)(h)) and the definition of 'currency' explicitly includes not only banknotes and coins, but also the 'electronic money' issued by the central bank (Section 8(1)).

In turn, the act specifically grants the central bank the power to issue currency in the form of 'electronic money' (Section 12(7)). To support this, the act also grants the central bank regulatory powers to prescribe *"the framework under which electronic money issued by the Central Bank (…) may be held or used by the public"* (Section 15).

The choice to authorize the issuance of CBDC in the form of 'electronic money' is interesting. The Payment Systems Act, 2012, defined this form of money earlier as *"monetary value represented by a claim on the issuer which (a) is stored electronically, (b) issued on receipt of funds for the purpose of making payment transactions but does not amount to a deposit under the regulatory laws; and (c) accepted as a means of payment by persons other than the issuer"* (Section 29).

The 2012 act contemplates the issuance of 'electronic money' only by banks and trust companies licensed by the central bank, but the 2020 Act has extended this to the central bank itself.

- Secondly, some fintech firms may seek a specific regulatory status (for example, as 'bank') that offers access to monetary policy operations as a means to access an additional liquidity backstop, even though those firms do not engage in maturity transformation. This could eventually also push central banks to review their access policies and rules.

Beyond the issue of enlarging monetary policy counterparties, central banks may also require new and explicit powers to charge interest on token-based CBDC[11].

Payment system soundness

Fintech could have a major impact on the legal foundations of the payment system function. To achieve their price and financial stability objectives, most central banks are tasked with promoting the safety and efficiency of payment systems.

To that end, central banks can act as operator, catalyst, regulator, and overseer of payment (and sometimes other) systems. This responsibility is as critical as ever with the payment system being transformed through new digital means of payment, service providers, and payment rails.

It is therefore imperative to review the legal foundation of the central bank's oversight responsibilities in detail. Fintech does not challenge the establishment of safety and efficiency as the core purposes of payment system oversight.

In fact, safety and efficiency are gaining more traction and importance given the new risks stemming from new payment technologies, such as distributed ledger technology.

Box 2. The legal formulation of the central bank's payment system oversight mandate

Over the last decades, many central banks have received strengthened payment system oversight mandates (including to implement Responsibilities A and B of the Committee on Payments and Market Infrastructures of the Bank for International Settlements/International Organization of Securities Commissions Principles for Financial Market Infrastructures). Several central banks (for example, Mexico and Sweden) have received explicit *objectives* with regard to the payment system. Almost all central banks now have an explicit payment system *function*. An increasing number of central banks are also given express *powers* (for example, registration or licensing, inspection, regulation, and sanctioning) to execute the oversight function, thus transitioning it from a 'soft law' ('moral suasion') to a 'hard law' approach.

Legally, the payment system oversight function and powers can thus take four forms:

- a broad function implemented through 'soft law' powers;
- a broad function implemented through 'hard law' powers;
- a narrow function implemented through 'soft law' powers; and
- a narrow function implemented through 'hard law' powers.

A broad oversight function is not limited to specific systems or firms, but instead refers to '*the* payment system' as a whole. This allows the central bank to flexibly include all kinds of infrastructures and firms under its oversight purview, which would provide a legal basis to bring new fintech firms under the scope of oversight. In contrast, a narrow payment system function is limited to 'payment systems' only—that is, cash settlement

infrastructures. Central banks with a narrowly worded function could find it challenging to extend their oversight to new fintech firms and products.

'Soft law' central bank powers are by definition broad and can be more flexibly applied to newcomers, but the moral suasion of the central bank may not be as strong vis-à-vis disruptive fintech firms as it is vis-à-vis traditional interbank infrastructures. Broad 'hard law' powers would cover the former, whereas narrow 'hard law' powers may not.

Thus, it can be argued that payment system oversight mandates established as a broad function combined with broad hard law powers are useful to avoid under-regulation of, and regulatory arbitrage by, fintech firms active in the payments space.

Without a sound legal foundation for this function, the central bank is at risk that the courts may overturn their oversight framework. This is particularly relevant for infrastructures that go beyond traditional interbank payment systems. This challenge is illustrated by the European Court of Justice (ECJ) decision to annul aspects of the European Central Bank's (ECB) oversight framework for central counterparty clearing for securities transactions (ECJ, UK *et al* v. ECB *et al*, C-T-496/11).

However, fintech tests the limits of the scope of the legal provisions governing the oversight function and powers (including regulation), which should extend to new payment systems, instruments, and firms. Box 2 explains in more detail the interaction between the legal foundation of this responsibility and fintech.

The same is true for the role of central banks as payment system operators. When they leverage fintech to modernize their own payment systems (for example, by setting up digital IDs or by expanding access to settlement accounts in central bank money to nonbank participants), central banks need to ensure that their laws allow them to do so[12].

Additionally, when central banks are considering issuing CBDC for the purpose of establishing a more resilient and diverse payment system, they must ascertain that such issuance falls within their legal mandate.

The establishment by central banks of 'innovation facilitators' in support of fintech innovations raises several important legal governance issues (see Annex 1 for an overview of all innovation facilitators).

First, the type of facilitator (see Box 3) will depend on whether the central bank is legally entrusted with a payment system oversight (and/or a micro-prudential) function. Innovation hubs are suited for central banks without such functions, whereas regulatory sandboxes can only be developed by central banks with such function(s).

Secondly, central banks should carefully consider their deployment of fintech 'accelerators', as this can pose risks to financial autonomy, conflicts of interests, and regulatory capture. Legal analysis is required as to whether central banks have the legal power to set them up and to participate in, and fund, the ensuing fintech projects.

Given that a sizable number of central bank laws specifically prohibit the acquisition of equity stakes in commercial entities, most central banks that have launched accelerators prefer offering grants to fintech firms instead of equity participations[13].

Lender of last resort

For those central banks with an explicit Lender-of-Last-Resort (LOLR) function and/or powers, the question arises whether its legal formulation will need to be adjusted to fintech. As a starting point, a considerable group of central banks do not have an explicit legal LOLR function and/or powers.

Relying on general legal provisions has the advantage of flexibility. However, for those central banks with such explicit legal function and/or powers, it will be necessary to analyse their legal formulation against the backdrop of the policy needs arising out of fintech.

Typically, that legal formulation restricts LOLR lending to banks and other deposit-taking institutions. As discussed in the context of monetary policy, some fintech firms could acquire a regulatory status that fits within one of those statutory categories to gain access to central bank funding, but that might not be possible for other fintech firms. If there were to be a policy preference to make the latter firms eligible for LOLR lending—and this is a big 'if'[14]—reform of the central bank law would be required.

Statistics

Fintech could help central banks carry out their statistical function more efficiently. Facing an explosion of financial and other data produced in real time, central banks are increasingly using Big Data (that is, the massive volume of data that is generated by the use of digital tools and information systems) and AI to exploit new data sources (for

example, social networks, ecommerce, and the internet of things) and new collection and analysis techniques (for example, machine learning and text mining).

This use does not raise fundamental issues under the legal wording of the statistical function and powers of central banks, but some other legal issues require attention. For instance, central banks may have to abide by complex data protection legal frameworks if they were to process (for example, collect and store) qualifying 'personal data'.

This was admittedly not the case under traditional statistical collection and could increase legal and reputational risks, which need to be mitigated by adjusting decision-making structures as well as internal rules and procedures to ensure the proper use of data (see below).

Cross-border collaboration

Central banks are increasingly entering into arrangements with their peers to collaborate in responding to fintech (for example, on wholesale CBDC). Important motivations for this could be to enhance effectiveness and achieve economies of scale and thus reduce costs. Inter-central bank collaboration can take many forms, ranging from participation in working groups to *bilateral* arrangements and *multi-party* structures.

From a legal perspective, two issues arise. First, many central banks will require a firm legal basis in their central bank law to enter into the more structural forms of cross-border inter-central bank collaboration arrangements.

Second, this type of arrangement will need to be documented in the form of the most appropriate legal instrument. In that regard, whereas inter-central bank arrangements traditionally took the form of nonbinding memoranda of understanding, the question arises whether legally binding contracts would be a more appropriate legal instrument

for some of those activities. This would specifically be the case if a (larger) central bank were to provide fintech-related services against fees to other (smaller) central banks.

Novel functions and powers

Legislatures have started to charge central banks with new fintech-related functions. In some cases, this link is indirect, in others more direct. The following examples illustrate this.

- The **Bank Negara Malaysia** has a primary function *"to promote a sound, progressive and inclusive financial system"* (Section 5(2)(f)). While the soundness is a traditional purpose of central banks, the progressivity and inclusivity are not, and both combined constitute an interesting, indirect but broad legal basis for fintech initiatives.

- In contrast, the recent organic law of the **Central Bank of the UAE** is more explicit and narrow: it charges the central bank with the function to *"regulate, develop, oversee and maintain soundness of the Financial Infrastructure Systems in the State, including electronic payment systems, digital currency, and Stored Value Facilities"* (Art. 4(g)).

- The organic law of the **National Bank of Ukraine** includes a somewhat older yet similarly explicit and narrow function to *"shape the development of modern electronic banking technologies (…); con- trolling the creation of (…) banking automation systems"* (Art. 7.7).

Some central banks have been granted new legal powers with respect to non-traditional areas, such as data management or digital ID, with a view to establish a safe and secure public digital infrastructure aimed at improving the provision of fintech services[15].

Box 3. Innovation facilitators in central banks

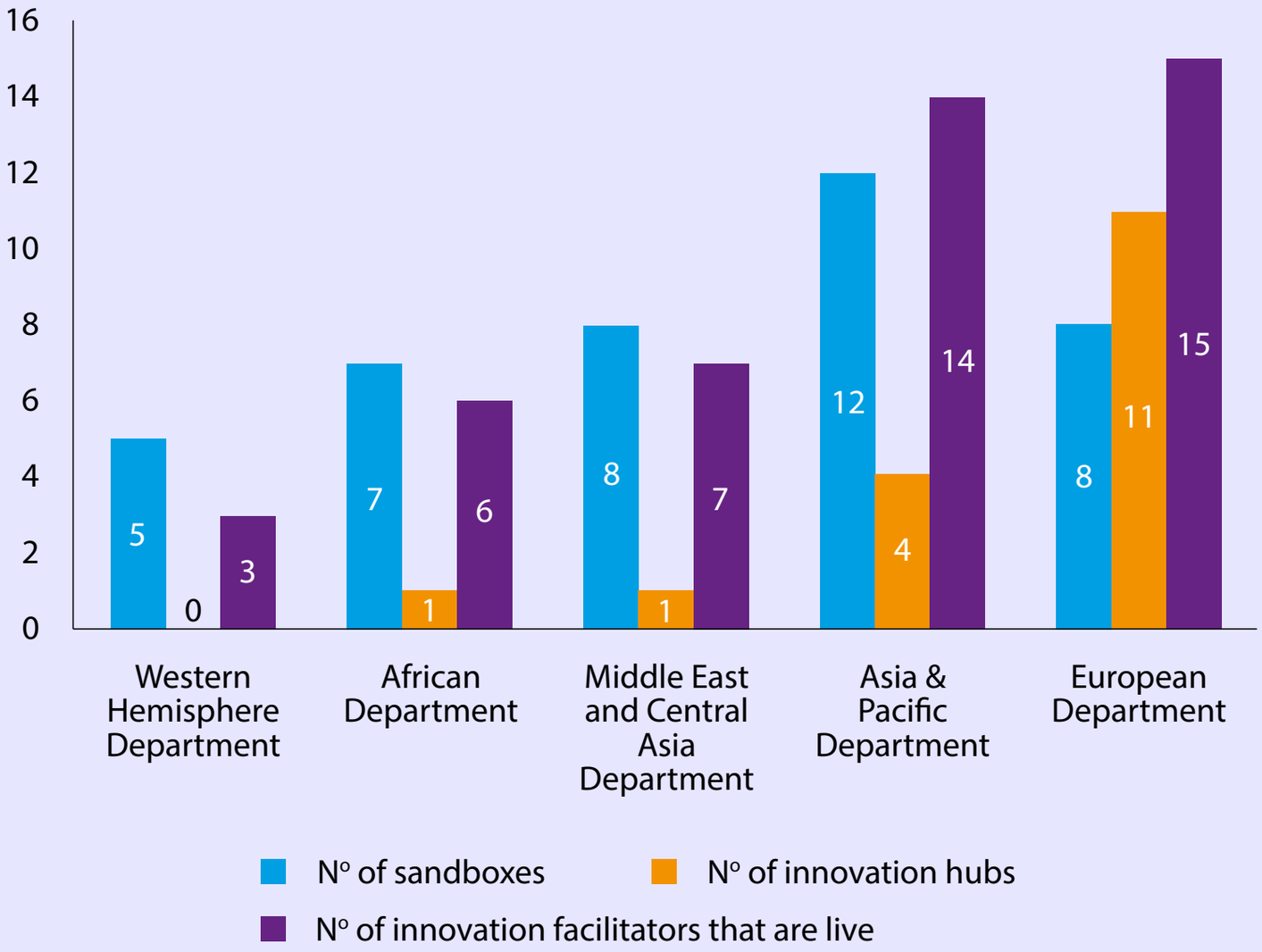
Given the increased pace of financial innovation and the competition to attract talent and capital raging among major financial centres, there is a pressing urgency for regulators to better understand fintech innovations and the ensuing risks, while allowing for testing in a controlled risk environment. A further complication is that the financial services industry is heavily regulated.

This led central banks and other regulators to develop three types of 'facilitators' to advance innovation in their jurisdictions. *Innovation hubs* provide a dedicated point of contact for fintech firms to address competent authorities and provide non-binding guidance and interpretation of the regulatory framework[1].

Regulatory sandboxes offer a controlled testing environment for new financial services, products, or business models. Of the 73 sandboxes included in a recent World Bank Group Survey[2], 39 were either hosted exclusively by a central bank or co-hosted by a central bank in coordination with other regulatory agencies. This said, sandboxes are expensive and complex to set up, and therefore not all sandboxes that were either announced or legislated are currently 'live'. Finally, *accelerators* are arrangements that allow fintech providers to develop use cases that may be granted fund support and/or endorsement from the authorities.

Endnotes
1. See the chart titled, "Guidance is the main benefit that innovation facilitators offer to participating firms," in CGAP World Bank Group Regulatory Sandbox Global Survey (2019).
2. See World Bank Group," Key Data from Regulatory Sandboxes across the Globe," November 2020.

Box Figure 3.1. Overview of central bank-hosted sandboxes and innovation hubs among IMF membership



Sources: IMF, European Supervisory Agencies, World Bank Group, Consultative Group to Assist the Poor (CGAP), and Columbia University.

It is expected that other jurisdictions will follow. This could include developing a digital ID or signature systems to be used by the financial sector and maintaining digital records related to the latter.

Decision-making structures

Fintech has an impact on three components of central bank decision-making structures: policy formulation, executive management, and oversight.

Policy formulation bodies

The decision-making bodies charged with the formulation of monetary and financial policy need to have a sufficient understanding of fintech and its potential impact on the monetary and financial system.

This responsibility can legally be attributed to Boards of Directors, Executive Boards, or dedicated specialized bodies, such as Monetary Policy Committees (MPCs) or Payment System Boards.

In all cases, such bodies need access to the necessary fintech expertise, but the degree of need and form of access will depend on the nature and tasks of each body. For instance, MPCs are typically composed of top executives, staff versed in macro-economics, and non-staff experts of monetary policy (typically academics and former financiers).

MPCs will need specific fintech expertise to under- stand the impact of that phenomenon on the monetary system and the effectiveness of monetary policy, including its transmission mechanisms. That may be more challenging than for Payment System Boards, which are likely to have members that are more closely connected to innovative technologies.

Can the central bank law require that the policy formulation bodies include members with sufficient understanding of fintech and its impact on the monetary and financial system? If that is not an option, one solution could be to rely on external fintech experts participating in meetings. For some countries, this may require changes to the central bank's primary or secondary legal framework.

Another solution would be to establish a body specifically dedicated to fintech[16]. Central banks can typically create purely advisory or coordinating bodies without a specific legal basis[17].

If, however, the intention is to create a decision-making body with real powers, the central bank law should provide an explicit legal basis for it and address a number of related legal issues, such as its remit, membership, and a clear hierarchy between its decisions and those of other bodies. This will avoid creating potential conflicts within the central bank's decision-making structure.

Executive management

In the decision-making set-up of a central bank, it is primarily executive management's prerogative and duty to take measures that allow the central bank to respond appropriately to the challenges it is facing.

To exercise such duty, executive management must keep abreast in a systematic manner of the rapidly changing developments to allow it to make organizational change to achieve a higher degree of responsiveness and agility in reaction to those developments.

This primary responsibility does not preclude executive management from engaging with the Oversight Board to seek its guidance and counsel on how to react (see Figure 2).

Figure 2. Executive Management (EM), fintech, and organizational change

Source: IMF Staff.

To ensure that their executive management keeps abreast of fintech developments and can adjust the organizational structure accordingly, central banks have taken two types of innovative steps: dedicated high-level fintech officer positions and iLabs or other dedicated units.

Chief fintech officers and other dedicated high-level officials

Several central banks have created dedicated, high-level officer positions within, or in support of, executive management. These positions have taken the form of a 'chief fintech officer' (Hong Kong Monetary Authority, Monetary Authority of Singapore), a dedicated executive technology position with a broad set of responsibilities including fintech (Magyar Nemzeti Bank's chief digital officer and the Bank of Finland's head of digitalization)[18], and an allocation of explicit technology responsibilities to existing top executives (for example, a deputy-governor in the Bank of Jamaica).

Such officers should have a clear position in the broader set-up of the internal governance structure. This will include clear lines of hierarchy and accountability (including with respect to iLabs: see below).

A key element has to do with potential conflicts of interest and 'revolving door' provisions. These officers often have the responsibility to promote the development of the fintech ecosystem in their own jurisdiction.

This may involve the disbursement of grants from central banks to fintech firms of their choosing, while being responsible for the design of the regulation over such fintech firms, including by overseeing sandboxes. These positions thus create governance risks that should be mitigated by ensuring that the relevant rules of the internal Code of Conduct or Code of Ethics applying to these executives are adequate.

A second legal consideration is whether, if the chief fintech officer-type of role is given to a very high-level executive, such as a deputy governor. This would have an impact on the total number of such executives.

In most central bank laws, the number of deputy governors is fixed, but in several other central bank laws, appointing authorities can appoint as many such executives as they deem fit. For the latter central banks, the appointing authority could decide to appoint a specific fintech-related deputy governor, given the workload of the other executives and the need to establish separation of functions.

This would cause the number of top executives at a central bank to grow and could have far-reaching governance implications, including by impacting the delicate balance between executives and non-executive members of Oversight Boards[19].

When such a position is created, the central bank's legal department should be consulted to ensure that key governance safeguards are not undermined.

iLabs and other dedicated units

Many central banks are adapting their internal structures to respond to fintech by establishing iLabs and other dedicated units. Traditionally, central banks have mainly relied on two types of internal departments to deal with technological innovation: the payment system department, which typically manages the payments infrastructure, and the information technology (IT) department, which typically is responsible for cybersecurity, procuring financial software, and developing new fintech products[20].

The acceleration of fintech has been the vector of three recent internal governance trends for central banks. First, given the increased number of fintech initiatives (including the acceleration of the work on CBDCs, for instance), certain central banks have created dedicated fintech units.

Second, other departments (for example, the statistics department) are increasingly involved in fintech work, leveraging new technologies, such as machine learning or AI solutions.

Finally, innovation laboratories, typically called iLabs, have been established mainly to promote innovation across departments (see Annex 2 for an overview of all central bank iLabs and their remits; Figure 3.)

While these structural changes aim to support executive management, the Oversight Board should have a proper role in their set-up. Given its legal responsibility for orienting the central bank's strategy, approving its structure, and overseeing its finances, the Board needs to ensure that the structural changes allow for an effective oversight of fintech outputs.

Moreover, a salient feature of fintech units is the level of involvement with private sector entities that are not necessarily typical central bank counterparts.

Since not all fintech companies are banks or regulated financial institutions, central banks should undertake appropriate due diligence, which could include some type of 'fit and proper' requirements for the fintech entrepreneurs they decide to engage with[21].

Evidently, this would be important not only in the context of sandboxes, but also in case central banks were to decide to materially aid such firms through an 'accelerator' program (see Box 3).

Oversight

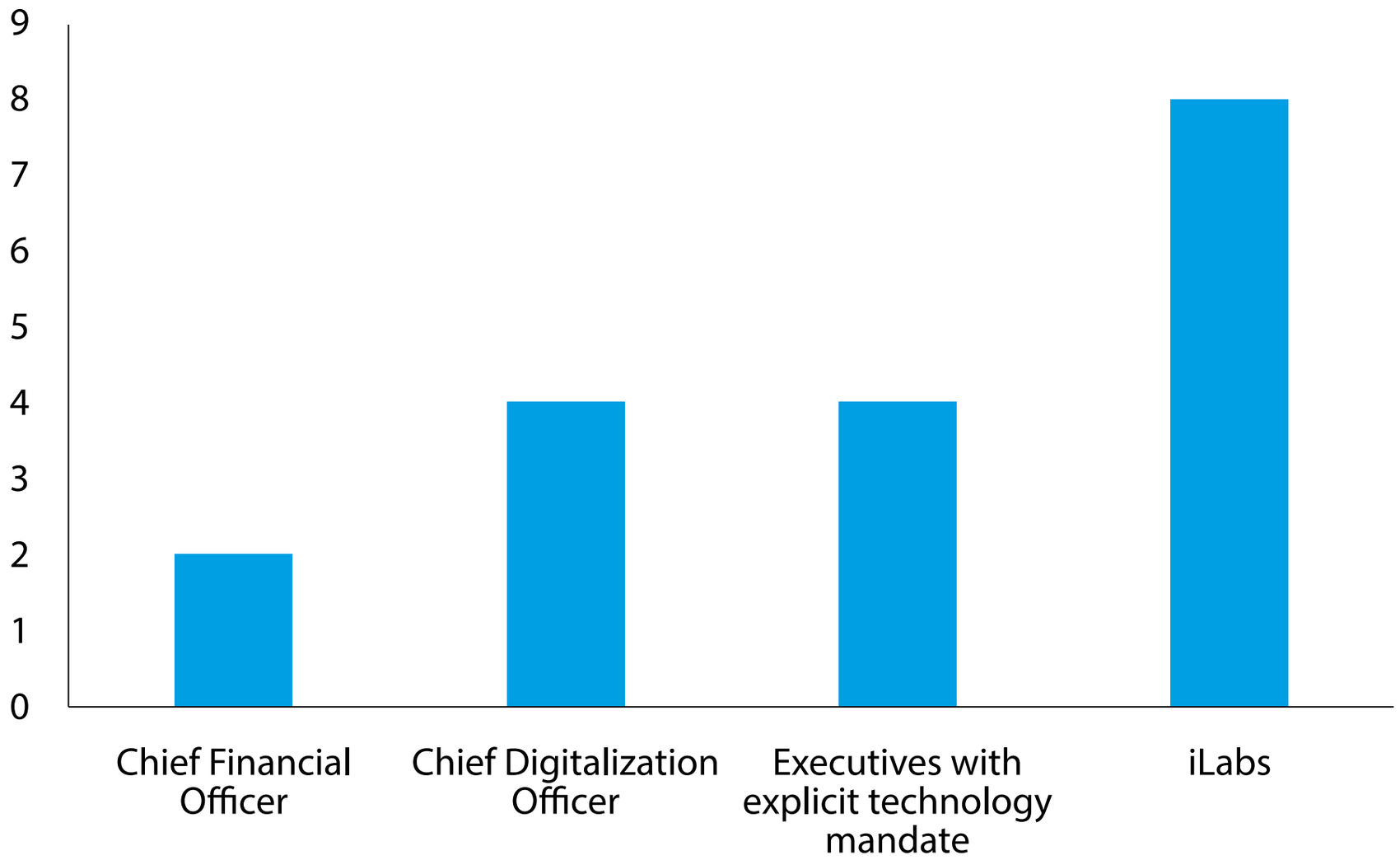
Fintech will exacerbate the increasingly challenging internal oversight task of Oversight Boards. These Boards will need to be actively engaged in enhancing their capabilities in terms of (a) cyber resilience; (b) operational risk; (c) data management and AI issues; and, (d) under certain CBDC issuance structures, anti–money laundering/ combating the financing of terrorism (AML/CFT) compliance.

This will require Oversight Boards (a) to ensure that they have sufficient know-how and (b) to discuss supportive structures to dedicate sufficient time and attention to these matters.

Ironically, the size of Oversight Boards has decreased over the past 50 years, even though central banks are facing ever increasing complexities and more decision-making responsibilities, including due to digitalization[22].

This raises three legal issues. First, what are the legal rules that can help ensure that the Board can rely on sufficiently knowledgeable human capital to acquit itself of its duties? As a general principle of governance, the members of the Oversight Board should individually and collectively be 'fit' to perform their duties.

Figure 3. Dedicated fintech officers and iLabs in central banks



Source: IMF staff.

What this entails concretely will depend on the responsibilities allocated to the Oversight Board. At any rate, whether central bank laws can and should legislate a diversity of skills within the Oversight Board is a difficult question.

While it is legally possible to legislate a diverse skillset in the Board[23], there are not many examples of central bank laws that endeavour to achieve this outcome. An intermediate solution would be to require the appointment of at least one member with certain necessary skills[24].

This said, the best way to achieve robust skill sets in Boards is the firm and deeply rooted conviction among the appointing authorities that professional skills should be the most important factor in determining suitability for appointment.

If, however, they fail to do so, it is expected that the pressure will increase to legislate the presence of certain skills on the Board, including fintech.

Second, with a view to support the Board in conducting in-depth oversight of fintech activities in the central bank, does the central bank law generally allow the Oversight Board to adjust the remit and composition of existing committees and/or new specialized sub-committees? Where a Risk and/or Audit Committee is already in place, such a general authorization would allow the Oversight Board to include fintech in its purview.

Alternatively, this would allow the Oversight Board to establish a separate specialized commit- tee, such as a 'Fintech Committee', if that would be the preferred option.

Finally, the extension of the Board's oversight mandate to include AI and data management will necessitate the adoption of a number of internal legal instruments. With the use of new fintech tools and Big Data in the performance of their functions, central banks will increasingly collect and use data, and could become subject to personal data protection laws of their own as well as foreign jurisdictions.

Consequently, the Board in collaboration with executive management should establish the decision-making structure, internal rules, and procedures to ensure that data is used and handled legally, only for appropriate reasons, accessed by a limited number of staff, and stored securely.

This should include (i) internal procedures to mitigate inherent limitations of data (for example, require documentation of the use of data collected by other parties); (ii) internal controls for decision-making processes using AI (for example, procedures to follow when an error is found in an algorithm); and (iii) making qualified staff available to monitor and periodically review algorithms.

Laws could require central banks to appoint a data protection officer (DPO). Charged with supervising data protection compliance, a DPO must be independent and not subject to conflict of interest, especially with the IT and human resources departments and executive management. Therefore, there is merit to involving the Oversight Board in the DPO's appointment and oversight, similar to the role that some central bank Boards play with respect to chief internal auditors.

Autonomy[25]

Institutional and personal autonomy

While fintech does not seem to fundamentally alter the legal foundations for institutional and personal autonomy, it can expose weaknesses in this regard.

For instance, if the government were to develop a highly ambitious national digitalization or fintech agenda, this could translate into pressure on the central bank to accommodate that agenda through its payment system oversight policy, especially in the absence of robust legislative protections supporting autonomy.

Similarly, weak incompatibility and ethics rules pose risks for conflicts of interest, and thus reduced personal autonomy, of senior central bank officials.

Functional autonomy

Legally, central banks' responses to fintech must be carefully designed to ensure appropriate levels of functional autonomy. Fintech does not alter the very high level of functional autonomy that central banks generally enjoy.

This said, some very specific challenges arise in respect to certain functions. In analysing this, one must bear in mind that central banks need not enjoy uniformly high levels of functional (and institutional) autonomy for all their functions.

More specifically, while the monetary policy function should enjoy the highest possible level of autonomy, other functions (for example, fiscal agent and implementation of exchange control frameworks) can operate with much lower levels, in the form of direct involvement of the government, either through instructions or co-decision-making[26].

The currency issuance function illustrates this principle well. While central banks require the highest level of autonomy to determine the total amount of central bank money in circulation, there is no need for similar levels of autonomy on some core aspects of currency issuance itself.

Because this function is a delegated sovereign activity with potential political ramifications (for example, the images on a banknote), it is not uncommon for the government to play some role in it. Specifically, ministers of finance are often empowered to authorize the issuance of a new banknote series as well as the main features of the banknote, or at least to be consulted[27].

From that perspective, central banks and political authorities will need to consider carefully the division of labour in designing CBDC. Some degree of political involvement in CBDC design is not inherently incompatible with high levels of functional autonomy in respect to monetary policy.

At any rate, functional autonomy will be buttressed by (a) delineating with clarity the competencies of central banks vis-à-vis those of other regulatory agencies and (b) close inter-institutional collaboration[28].

First, the respective roles and responsibilities of central banks and other agencies, such as competition and data protection agencies, must be legally well defined.

Second, care must be taken that powers of other regulatory agencies do not hinder central banks excessively in the execution of their mandate.

Third, to pursue a coherent and coordinated public approach, close collaboration between central banks and other regulatory agencies will be imperative[29]. Such close coordination could be buttressed by legal arrangements, for instance, requiring other agencies to consult with central banks on monetary and payment system matters. This would mitigate leakages and promote efficiency, inclusion, and other policy goals.

Financial autonomy

Fintech may have a mixed impact on the financial solidity of central banks, as illustrated by the following example. On the one hand, the issuance of CBDC may lead to a stabilization, or even growth, of money in circulation, and thus the seigniorage. This could allow the central bank to build up buffers to maintain a financially sound balance sheet in function of its size and risks.

On the other hand, issuing CBDC may be very costly and cause significant side-effects, including increased LOLR financing to banks witnessing a shift from deposits to CBDC, either to smooth the adjustment in balance sheet structure or in the context of a 'bank run'[30].

From a legal perspective, it is not certain at this stage that the current framework will need to be fundamentally changed. Rather, some existing issues might just come to the fore and need to be addressed.

For instance, the central bank's profit retention rules will regain prominence if the seigniorage earned by the central bank would significantly increase.

Second, central banks whose budgets are subject to legal limitations will need to carefully consider the impact of fintech-related expenses on their compliance with the said limitations.

Third, central banks should be careful in considering grants to fintech firms in their capacity as 'accelerator'. Even if this were to be legally allowed under the central bank law, it remains essentially a fiscal task that ideally could be undertaken by a governmental vehicle funded by the budget.

Transparency and accountability

To balance out the high degree of autonomy that they enjoy for most of their functions, good governance calls for central banks to be commensurately accountable and transparent. By explaining their policies and actions to stakeholders (general public, government, and market participants), central banks legitimize and retain trust in their autonomy.

Transparency

Central banks will have to be transparent about their response to, and use of, fintech and their related processes and decisions. They would be expected to engage in an open dialogue with internal and external stakeholders. In addition, they will need to take specific steps to report on their policies and actions, through either general or specific instruments.

For instance, for sandboxes and other innovation facilitators, eligibility requirements, procedures, rules, and outcomes should be widely accessible. Furthermore, the distribution of costs (between the central bank, users, banks, and merchants) for the issuance of CBDC should be transparent.

Finally, in using Big Data and AI, central banks should clearly communicate how associated insights are integrated into their decision-making process, transparently recognize the associated risks, and communicate about how they mitigate those risks through confidentiality protection, access rights, and data governance.

The application of general legal transparency requirements on fintech-related matters should be carefully assessed. Legally, transparency requirements in central bank laws typically take a two-fold form, requiring (i) the issuance of an annual report on the monetary, economic, and financial conditions of the country and the central bank's

monetary policy; and (ii) the publication of the audited annual financial statements[31]. Fintech could be relevant for both.

- First, the annual reporting requirement could legally be extended to cover the impact of fintech—or perhaps digitalization more broadly—on the economy and the financial system and how the central bank has reacted to those developments.

- Second, some aspect of fintech may have a direct impact on the financial reporting of central banks. For instance, if a central bank were to issue token-based CBDC, the chart of accounts could be adapted to reflect, under the liability account of *"currency in circulation,"* separate lines for banknotes (and coins) on the one hand and CBDC on the other hand.

  Since the chart of accounts is typically approved by the Oversight Board, this illustrates the link between transparency and the decision-making structures. Interestingly, in the Bahamas, the new central bank law does not require such a level of transparency by stipulating merely that *"the aggregate amount of currency in circulation issued by the Bank shall appear as a liability in a statement of the accounts of the Bank"* (Section 12(6)).

- Third, and more broadly, the International Financial Reporting Standards require the disclosure of risk mitigation policies related to key balance sheet items. This may become relevant when a central bank embarks upon a major fintech endeavour.

The IMF's Central Bank Transparency Code could offer further guidance on the matter[32]. New fintech innovations are relevant to all five pillars in the code (governance, policies, operations, outcomes, and official relationships).

For example, if CBDC is to be remunerated, this is an important monetary policy decision that should be explained to the public (for example, the nature of remuneration, rate, and what the motivations are). Central banks should publicly disclose their CBDC frameworks, and any targets used to pursue the objectives of monetary policy.

Fintech could also give rise to new and specific transparency requirements. Stakeholders could request an explanation of how and why the central bank took its decisions, which could be difficult to provide with the increasing opacity of algorithms and the complexity of the data.

In some countries, existing legal transparency requirements may already cover this issue, but in other countries specific new requirements could be tailored to respond to this development.

Accountability

Central banks must be held accountable for their actions in relation to fintech as they are for any other decisions or actions they make. Central banks account for their decisions and actions so that stakeholders (the general public, the government, and market participants) can scrutinize the achievement of the central bank's objectives.

As discussed above, fintech may result in an increase of central banks' responsibilities and powers, their embrace of fintech to better serve their objectives, and an increase in their use of third-party service providers.

It is unlikely that the legal arrangements for accountability, enshrined in the central bank law, will fundamentally change because of fintech. Rather, the question is how central banks and their stakeholders can best apply those arrangements in the context of fintech.

For instance, when the central bank relies on third-party service providers (for example, cloud providers), contractual and other legal arrangements will need to establish a clear division of responsibilities between the parties.

This will facilitate accountability, though the central bank will likely be held accountable for the choice of its counterparties notwithstanding any contractual arrangement.

The recent data breach experienced in a third-party file sharing software by the Reserve Bank of New Zealand illustrates this point[33]. Another aspect is that the enlargement of central bank functions will require additional levels of accountability.

For example, the direct issuance of CBDC by central banks to the general public will require central banks to be accountable for the way they conduct customer due diligence and other broader AML/CFT compliance and legal requirements.

One new area of accountability pertains to decision-making based on AI and Big Data, which have inherent limitations that must be addressed by central bank governance[34]. Central banks will remain responsible for their organization's action—AI cannot permit an abdication of responsibility.

Moreover, central banks should be accountable for the analytical tools and sources of data used to feed into their decision-making process. A focus point in this regard is the protection of personal data[35]. Data protection laws may require compliance with new and complex data management obligations. Furthermore, central banks will be accountable to the scrutiny of a new type of stakeholder (that is, data subjects) that could comprise a large portion of the general public.

Whatever the applicable 'data assurance framework', accountability should be clearly allocated to the central bank's decision-making bodies with regards to decisions related to the processing of personal data.

Conclusion

Fintech could have a major impact on the legal foundations of the governance of central banks, although fundamental changes to those foundations are not likely to be required. The following aspects will be particularly salient:

- Fintech is having an impact on the *mandate* of central banks in three areas. First, fintech calls for reconsidering the adequacy of the legal formulation of the currency issuance and payment systems functions and powers. Secondly, in a few instances, fintech may lead to new statutory objectives, functions, and powers, highlighting the need to manage delicate trade-offs. Third, fintech offers opportunities for central banks to perform some of their traditional functions (for example, statistics) more effectively and efficiently, though novel legal challenges arise especially with respect to Big Data and AI.

- Fintech puts pressure on the capability of the legal foundations of the *decision-making structures* of central banks to ensure their continued effectiveness in an increasingly digitalized world. The policy formulation bodies and Oversight Board should have sufficient fintech skills available to allow them to discharge their duties. In this regard, legal and other steps can be considered to bridge the gap.

  Executive management typically enjoys more flexibility to keep abreast of fintech developments, including by creating high-level chief digital officer positions and other internal structures, such as iLabs. However, these new positions and structures need to fit properly within the broader governance legal framework of the central bank.

- Regarding *autonomy*, while fintech will not fundamentally alter the legal foundations for institutional, personal, and financial autonomy, it could still expose weaknesses in this regard. Fintech's biggest impact will likely be on the functional autonomy for some key central bank functions. The role claimed by governments in designing CBDC will be an important issue to consider; the legal framework will need to carefully delineate the respective roles and responsibilities between the government and the central bank.

- Legal arrangements for *transparency* are in most cases flexible enough to allow central banks to report on their fintech policies and use, although in some cases overly constraining provisions may occur. Transparent reporting on, for instance, the total amount of CBDC in circulation and the use of AI and Big Data will require a sound legal basis.

- While the primary legal arrangements for *accountability* mechanisms are unlikely to change, their practical application will need to be adjusted to the advent of fintech, including through secondary legal instruments. A focus point should be policies and regulations governing the use of data and AI. Equally important, Codes of Ethics and Conduct can play a crucial role in regulating close contacts between central bank officials and fintech firms.

In response, central banks (and their political authorities) are taking steps to ensure that the legal foundations of their governance remain robust. For instance, legal mandates have been strengthened and new decision-making bodies or positions have been created to respond to fintech.

The experience thus far underscores that there is no 'one size fits all' solution: the response will be shaped by the context of central banks, including their mandate and legal-institutional set up. To assist central banks in the design

of their responses, Box 4 sums up 10 concrete legal steps that they should take to prepare their governance for fintech.

As a final point, central bank law reform must be sufficiently broad to achieve appropriate levels of 'agility' to provide a 'future-proof' legal framework. For instance, legislation (and by extension the legal framework to which the central bank is subject) should to the maximum extent possible be technology neutral.

In addition, the use of open legal categories and possibly also well-designed 'catch all' provisions should be given due consideration. ■

Box 4. Ten legal steps a central bank must take to prepare its governance for a world of fintech

1. Objectives—As the central bank formulates its fintech policies, consider carefully the stated objectives of those policies, and align those with the current statutory objectives of the central bank.
2. Functions and powers—Embark upon a comprehensive review of how the central bank will execute its statutory functions in a digitalized world and review the legal powers in the central bank law to ascertain whether the central bank can take all necessary actions to execute those statutory functions.
3. Data use—Establish robust governance structures and internal rules and procedures to ensure that data is processed, managed, and used in conformity with applicable laws and rules.
4. Cross-border collaboration—Where needed, review the legal basis to enter into cross-border inter-central bank collaboration arrangements and
document such arrangements in the form of the most appropriate legal instrument.
5. Oversight board—Review (i) the eligibility criteria in the central bank law regarding members of the Oversight Board to ensure sufficiently strong technical skill sets, and (ii) the legal authorization in the central bank law for the Oversight Board to establish specialized sub-committees or adjust the mandate and composition of such existing committees (for example, on risk).
6. Senior fintech executives—When a new, fintech-focused senior executive function is created within the central bank, consult the legal department to ensure that key governance safeguards (clear chain of command, sound accountability, and no conflict of interest) are not undermined.
7. Autonomy—In designing central bank actions in response to fintech developments, care must be taken to maintain appropriate levels of functional autonomy of central banks, taking into account the specific needs and contours of each relevant function.

8. Transparency—Assess the legal framework for the general and financial transparency of the central bank to determine (a) on which fintech-related issues the central bank should report and (b) under which modalities.
9. Accountability—Review the legal framework for the central bank's accountability to ensure that the central bank can be held accountable for its actions in response to fintech, paying special attention to data and AI governance.
10. Code of ethics—Review the effectiveness of the central bank's Code of Conduct/Ethics against the backdrop of the specificities of high-level executive officers and staff dealing with fintech firms.

Endnotes

1. For the purposes of this note, fintech means "the advances in technology that have the potential to transform the provision of financial services spurring the development of new applications, processes, and products" as defined in the IMF report, The Bali Fintech Agenda, 2018, p. 12.

2. Central banks encounter these challenges in different roles: as catalyst, users, and providers of fintech, but also as overseers or supervisors of private entities using or providing fintech services. In this regard, the note will not discuss the governance aspects of the micro- or macro-prudential functions that can be entrusted to central banks.

3. For a broader introduction to this theme, see Bossu, W, and A Rossi. 2019. "The Role of Board Oversight in Central Bank Governance: Key Legal Design Issues" IMF Working Paper 19/293, International Monetary Fund, Washington, DC.

4. For example, CBDC issuance will unlikely address the existing instability or loss of confidence in national currency: IMF. 2020. "Digital Money Across Borders: Macro-Financial Implications." IMF Policy Paper 2020/050: 28, International Monetary Fund, Washington, DC.

5. On constitutional provisions on currency: see Bossu, W, M Itatani, C Margulis, A Rossi, H Weenink, and A Yoshinaga. 2020. "Legal Aspects of Central Bank Digital Currency: Central Bank and Monetary Law Considerations" IMF Working Paper 20/254: Box 4, International Monetary Fund, Washington, DC.

6. See Auer, R, G Cornelli, and J Frost. 2020. "Rise of the central bank digital currencies: drivers, approaches and technologies." BIS Working Paper No. 880, Bank for International Settlements, Basel, Switzerland.

7. See IMF. 2020. "Digital Money Across Borders: Macro-Financial Implications." IMF Policy Paper 2020/050: 18, International Monetary Fund, Washington, DC.

8. For a detailed analysis, see Bossu, W, M Itatani, C Margulis, A Rossi, H Weenink, and A Yoshinaga. 2020. "Legal Aspects of Central Bank Digital Currency: Central Bank and Monetary Law Considerations" IMF Working Paper 20/254. International Monetary Fund, Washington, DC.

9. See Dabrowski, M "Potential Impact of Financial Innovation on Monetary Policy: In-Depth Analysis." European Parliament: p 13. https://www.europarl.europa.eu/cmsdata/118903/CASE_FINAL%20upload.pdf and Bofinger, P 2018

"Digitalisation of money and the future of monetary policy." VOXeu CPER, https://voxeu.org/article/digitalisation-money-and-future-monetary-policy

10. See IMF. 2021. "Central Bank Exceptional Measures in the COVID-19 Crisis: Key Legal Design Issues." IMF Special Series on COVID-19, International Monetary Fund, Washington, DC.

11. See Bossu, W, Itatani, M, Margulis, C, Rossi, A, Weenink, H, and Yoshinaga, A, o.c., Box 6.

12. See BIS. 2020. "Annual Economic Report" Bank for International Settlements, Basel, Switzerland: 80–81.

13. See for example, Table 1 of Hauser, Andrew. 2017. "Fintech Accelerator: what have we done and what have we learned?" Remarks made to fintech firms in Cambridge, Bank of England, October 6.

14. On broader policy considerations, see Dobler, M, S Gray, D Murphy, and B Radzewicz-Bank. "The Lender of Last Resort Function after the Global Financial Crisis." IMF Working Paper 16/10, International Monetary Fund, Washington, DC.

15. See for example, Article 7 26) and 26).1 of the National Bank of Ukraine Act and in Lebanon Article 133 of the law N81 of October 2018.

16. For instance, the PBoC has established the China Central Bank FinTech Committee to (a) reinforce the regulation, research and planning, as well as the coordination for the Fintech industry in China, (b) organize research to understand the impact of Fintech on monetary policy, capital market, finance market stability, payment and liquidation and (c) provide strategic planning and policy on the Fintech development in China.

17. Advisory boards could include mixed participants from the private and public sector. The Magyar Nemzeti Bank's Digitalization and Fintech Advisory Board is a good example of this.

18. Among the 2,500 largest publicly listed companies, 338 chief digital officers were hired as of 2019. See Péladeau, P, and O Acker. 2019. "Have we reached 'peak' chief digital officer?" strategy + business, March 26. An earlier study concluded that chief digital officers are typically responsible for strategic aspects of digital trans- formation, including its development and implementation and the communicative aspects, as well as the management of potential resistance: see Horlacher, A, and T Hess. 2016. "What Does a Chief Digital Officer Do? Managerial Tasks and Roles of a New C-Level

Position in the Context of Digital Transformation." Proceedings of the 49th Hawaii International Conference on Systems Sciences, January.

19. On this issue, see Bossu, W, and A Rossi. 2019. "The Role of Board Oversight in Central Bank Governance: Key Legal Design Issues" IMF Working Paper 19/293: paras. 69–80 and Box 3, Inter- national Monetary Fund, Washington, DC.

20. Other departments (for example, the research or monetary policy departments) can play a balancing role by assessing the potential risks of certain fintech developments.

21. This type of 'fit and proper' requirements would substantively be quite akin to those of banking and other forms of prudential supervision. On form, however, they would be quite different, in the sense that they would act not as formal legal requirements, but rather as 'access criteria' to the central bank. Procurement policies could also be an effective way to maintain oversight over a formal engagement with private sector stakeholders.

22 On this issue, see Bossu, W, and A Rossi. 2019. "The Role of Board Oversight in Central Bank Governance: Key Legal Design Issues" IMF Working Paper 19/293: Box 2, International Monetary Fund, Washington, DC.

23. On the challenges of legislating skill diversity, see Bossu, W, and A Rossi. 2019. "The Role of Board Oversight in Central Bank Governance: Key Legal Design Issues" IMF Working Paper 19/293: paras. 104–107, International Monetary Fund, Washington, DC.

24. For those Boards that are fully constituted but without fintech expertise, an additional legal question is whether the central bank law authorizes the appointment of an additional non-executive director specialized in fintech. To date, only a small group of central bank laws include provisions authorizing such an expansion.

25. For a brief overview of the various aspects of central bank autonomy, see Bossu, W, and A Rossi. 2019. "The Role of Board Oversight in Central Bank Governance: Key Legal Design Issues" IMF Working Paper 19/293: paras. 17–18, International Monetary Fund, Washington, DC.

26. On this important principle: See Bossu, W, S Hagan, and H Weenink. 2017. "Safeguarding Central Bank Autonomy: the role of transparency and accountability," in "ECB Legal Conference 2017—Shaping a New Legal Order for Europe: a tale of crisis and opportunities," European Central Bank, Frankfurt, Germany.

27. On Ministerial approval: see for example, Section 25(4) of the Bank of Canada Act, Section 27(1)(b) of the Bank of Tanzania Act, 2009, and Art. 17 in fine of the Act on the Central Bank of Iceland, 2019. On mandatory consultation of the minister, see for example, Section 22(2) of the Central Bank of Kenya Act.
28. See Taylor, Charles R, Christopher Wilson, Eija Holttinen, and Anastasiia Morozova, 2019, "Institutional Arrangements for Fintech Supervision and Regulation." IMF Fintech Note 19/02: 5, International Monetary Fund, Washington, DC.
29. For a more detailed discussion, see IMF. Forthcoming "The Macrofinancial Implications of Data in the Digital Age." IMF Staff Discussion Note, International Monetary Fund, Washington, DC.
30. See Smets, J 2016. "Fintech and Central Banks." Fintech and the Future of Retail Banking, Brussels. l_ec5decca5ed3d6b8079e2e7e-7bacc9f2_9467_suerf.pdf
31. Several central banks are also subject to Freedom of Information laws, which are beyond the scope of this note.
32. The Central Bank Transparency Code (imf.org)
33. On 15 February 2021, the RBNZ issued the following statement: Our response to Data Breach - Reserve Bank of New Zealand (rbnz.govt.nz)
34. For instance, not all data are well documented, some data suffer from coverage bias, and AI algorithms can have coding errors or could be biased.
35. IMF. Forthcoming. "The Macrofinancial Implications of Data in the Digital Age." IMF Staff Discussion Note, International Monetary Fund, Washington, DC.

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Annex 1. Breakdown of the innovation facilitators per central bank[1]

Country	Status	Type	Central Bank
Bahrain	Live	Sandbox	Central Bank of Bahrain
Bahrain	Live	Innovation Hub	Central Bank of Bahrain
Austria	Live	Innovation Hub	Oesterreichische Nationalbank
Barbados	Live	Sandbox	Central Bank of Barbados
Belgium	Live	Innovation Hub	National Bank of Belgium
Bulgaria	Live	Sandbox	Magyar Nemzeti Bank
Brazil	Live	Sandbox	Banco Central do Brasil
Bermuda	Live	Sandbox	Bermuda Monetary Authority
Brunei	Live	Sandbox	Brunei Central Bank
China	Live	Sandbox	PBoC
Croatia	Live	Innovation Hub	Croatian National Bank
Czechia	Live	Innovation Hub	Czech National Bank
Egypt	Live	Sandbox	Central Bank of Egypt
Eswatini	Live	Sandbox	Central Bank of Eswatini
Fiji	Announced	Sandbox	Reserve Bank of Fiji
France	Live	Innovation Hub	ACPR/BdF

Annex 1. Breakdown of the innovation facilitators per central bank[1]

Country	Status	Type	Central Bank
Georgia	Live	Sandbox	National Bank of Georgia
Ghana	Announced	Sandbox	Bank of Ghana
Greece	Live	Innovation Hub	Bank of Greece
Greece	Announced	Sandbox	Bank of Greece
Hong Kong SAR	Live	Sandbox	Hong Kong Monetary Authority
Hong Kong SAR	Live	Innovation Hub	Hong Kong Monetary Authority
Hungary	Live	Innovation Hub	Central Bank of Hungary
Hungary	Live	Sandbox	Central Bank of Hungary
India	Live	Sandbox	Reserve Bank of India
Indonesia	Live	Sandbox	Bank Indonesia
Israel	Announced	Sandbox	Bank of Israel
Italy	Live	Innovation Hub	Banca d'Italia
Ireland	Live	Innovation Hub	Central Bank of Ireland
Jamaica	Live	Sandbox	Bank of Jamaica
Japan	Live	Innovation Hub	Bank of Japan
Jordan	Live	Sandbox	Central Bank of Jordan

Annex 1. Breakdown of the innovation facilitators per central bank[1]

Country	Status	Type	Central Bank
Kuwait	Live	Sandbox	Central Bank of Kuwait
Lithuania	Live	Sandbox	Lietuvos Bankas
Lithuania	Live	Innovation Hub	Lietuvos Bankas
Malaysia	Live	Sandbox	Bank Negara Malaysia
Macedonia	Live	Sandbox	National Bank of North Macedonia
Mexico	Live	Sandbox	Banco de México
Mozambique	Live	Sandbox	Central Bank of Mozambique
Nigeria	Announced	Sandbox	Central Bank of Nigeria
The Netherlands	Live	Sandbox	Dutch Central Bank
The Netherlands	Live	Innovation Hub	Dutch Central Bank
Norway	Announced	Sandbox	Norges Bank
Papua New Guinea	Live	Sandbox	Central Bank of Papua New Guinea
Philippines	Live	Sandbox	Bangko Sentral Ng Pilipinas (BSP)
Portugal	Live	Innovation Hub	Banco do Portugal
Russia	Live	Sandbox	Bank of Russia
Rwanda	Live	Sandbox	National Bank of Rwanda

Annex 1. Breakdown of the innovation facilitators per central bank[1]

Country	Status	Type	Central Bank
Saudi Arabia	Live	Sandbox	SAMA
Serbia	Announced	Sandbox	National Bank of Serbia
Slovakia	Live	Innovation Hub	National Bank of Slovakia
Slovenia	Live	Innovation Hub	Bank Slovenia
Sierra Leone	Live	Sandbox	Bank of Sierra Leone
Singapore	Live	Sandbox	MAS
Singapore	Live	Innovation Hub	MAS
South Africa	Live	Sandbox	South African Reserve Bank
Sri Lanka	Announced	Sandbox	Central Bank of Sri Lanka
Thailand	Live	Sandbox	Bank of Thailand
Tunisia	Live	Sandbox	Central Bank of Tunisia
Ukraine	Announced	Sandbox	National Bank of Ukraine
Global sandbox	Live	Sandbox	Includes MAS, HKMA, Central Bank of Bahrain
Pacific Islands Regional initiative	Live	Sandbox	Banco Central de Timor-Leste, Bank of Papua New Guinea, Central Bank of Samoa, Central Bank of Solomon Islands, National Reserve Bank of Tonga, Reserve Bank of Fiji, and Reserve Bank of Vanuatu

1. Innovation Facilitators exclusively operated by non-central bank supervisory agencies are not included in this list.

Annex 2. List of central bank iLabs

Bank	Name of iLab	Mandate
South African Reserve Bank	Innovation lab	To practically explore the feasibility, desirability, and appropriateness of CBDC as an electronic legal ender
Reserve Bank of Australia	Innovation lab	Facilitate new ideas and new ways of thinking within our Bank's Departments and explore those areas through research and experimentation. Research the case for, and implications of, CBDCs
Central Bank of Bahrain	FinbHub 973	To create a collaborative ecosystem in the fintech sector by establishing a gateway for investment opportunities in the region, while fostering innovation and supporting integration between financial institutions and fintech startups.
MNB	Fintech Lab	The Financial Innovations Supervisory Lab initiates and contributes to the development of regulatory and supervisory procedures applicable for the newly established fintech that falls under the MNB's supervisory responsibility.
Banque de France	Le Lab	Le Lab brings together a specialist team of 12 to harness new technologies and integrate them into the institution's processes. It is helping to bring AI and advanced data analytics to the central bank's work.
MAS	Technology Innovation Lab	Experiment fintech solutions with financial institutions, startups, and technology vendors. Facilitate consultations for startups by industry experts.
UAE Central Bank	Fintech Office	Make the central bank a coordinating authority and an enabler and facilitator of fintech activities in the UAE.
Banco Central do Brasil	Laboratory of Financial and Technological Innovations	Foster research and innovation in the financial industry and in the supervision and regulation thereof.

The battle for the soul of the financial system

Stephen Cecchetti and Kim Schoenholtz argue that we don't need CBDC to solve financial system problems, and hope that central banks stop short of a universal, elastically supplied, interest-bearing digital currency

While the conflict is largely quiet and out of public view, we are in the midst of an epic battle for the soul of the financial system. Central banks are thinking about whether they should substitute publicly issued digital currency for the bank-issued digital money that people use every day[1]. How this plays out can profoundly reshape the financial system and make it less stable.

The forces driving government decisions are unusual because there is a widespread fear of losing an emerging arms race. No one wants to face plunging demand for their currency or surging outflows from their financial institutions should another central bank introduce an attractive new means of exchange. But that pressure to prepare for the financial version of military mobilisation can lead to a very unstable global system that thwarts monetary control.

Central bank digital currency (CBDC) can take many forms. While some may be benign, the most radical version – one that is universally available, elastically supplied, and interest bearing – has the potential to trigger destabilizing financial shifts, weaken the supply of credit, and undermine privacy.

Our current monetary system and the irresistible drive toward CBDCs

Over the past century, a variety of forces gave rise to the financial structure we see around us. First, through a combination of punitive taxes and outright bans, officials hinder the issuance of private paper money.

Second, governments license private intermediaries (normally commercial banks) to issue liabilities that are convertible at par into central bank liabilities.

Finally, the central bank runs a wholesale payments system for banks, while the private sector runs the retail payments system for the rest of us.

In combination, this means that we are living in a world in which nearly all what people think of as money is the digital liability of a commercial bank.

For example, in the UK, where the total quantity of M3 is 148% of GDP, demand and time deposits – digital entries on the ledgers of banks – account for 97% of the total (or 144% of GDP). For the euro area, 91% of M3 is digital. And, in China, where broad money exceeds 200% of GDP, 96% of it is digital.

In the current financial circumstances, the bad equilibrium is a world of multiple CBDCs in advanced economies that threaten financial stability domestically and pose a severe threat to monetary control in developing economies

As Bank of England Deputy Governor Jon Cunliffe (2021) notes in a recent speech, most people do not know this. They are unaware that when they pay for groceries, purchase a new phone, or renew a software subscription, they are using bank-created digital money.

Importantly, it is the central bank that provides the foundation that enables us to rely on this system. To do so, authorities credibly promise to convert certain bank liabilities into the means of exchange – the safe, liquid instrument known as reserves – under as many states of the world as possible.

Experience teaches us that this is something central banks committed to price stability can do under more states of the world than private actors. As Cunliffe puts it, we rely on this framework to *"tether private money to the public money issued by the state."*

Where does the system fall short? We see two principal shortcomings. Some payments are expensive and slow, and too many people lack full access to the financial system. Advocates see CBDC as the solution to both problems. In our view, we do not need CBDC and its attendant risks either to improve efficiency or to expand access.

Nevertheless, central banks are plowing ahead, often referring to motives such as payments efficiency, financial inclusion and monetary policy implementation[2]. We see two other important drivers. First, there is a desire to supplant cryptocurrencies like Bitcoin and head off the issuance of private monetary instruments like Libra (now Diem).

But governments know from long experience how to handle such private currencies when they become salient – impose either punitive taxes or an outright ban. Second, there is the fear of missing out: central bankers want to make sure that, if others issue CBDC, they can, too – and without delay.

In our view, this creates instability: in theory, an unanticipated event could trigger many central banks to mobilise their digital currencies within a short period, so as not to be left behind.

CBDC: properties and problems

This brings us to a few details about CBDC. Before issuing retail digital currency, a central bank will need to make a series of design decisions. Is it an anonymous bearer instrument? Will there be quantity restrictions on an individual's holdings? Are only residents of the issuing jurisdiction eligible to hold it? And, like paper currency, will it have a zero interest rate?[3]

For paper currency, we know the answers to these questions. It is an anonymous bearer instrument. It is supplied elastically to allow the conversion of certain bank liabilities at par into the medium of exchange without limit in as many circumstances as possible. Anyone can hold paper currency. And, it bears zero interest.

The likely characteristics of CBDC are equally clear. To avoid facilitating criminal activity, CBDC cannot be anonymous. To truly substitute for paper currency, it will have to be supplied elastically.

Individuals will be allowed to hold unlimited quantities; otherwise, there would be circumstances when bank liabilities will not be convertible into CBDC at par. Restricting holdings to residents is a version of capital controls, which are both impractical and unwise.

Finally, we see two reasons that CBDC would have to bear interest. First, in our view, it is politically unsustainable for a central bank to pay interest on commercial bank reserve deposits but not on the deposits of individuals. Second, without it, policymakers who wish to lower nominal interest rates below the effective lower bound could not do so.

The issuance of such 'universal' CBDC creates four critical problems: disintermediation, currency substitution, lack of privacy, and the inability to ensure compliance. On the first, while inertia (combined with interest rate increases and service improvements) might keep funds in the banking system for a while, financial strains eventually would prompt uninsured deposits to flee private banks for the central bank (Monet *et al*. 2021).

And, for highly trusted central banks that operate in relatively stable political and financial jurisdictions, these inflows will come from abroad as well. Given the current high foreign demand for US paper currency, imagine what would happen if the Fed offered universal, unlimited accounts – the consequences of this could be catastrophic for emerging market and developing economies.

The fact that CBDC is not anonymous leads to the final, related, challenges: privacy and compliance. On the first, everything we do becomes traceable. While we are neither libertarians nor advocates of free banking, in this case we agree with White (2021) – there are enormous risks in allowing governments to have this level of detailed information about our activities. As a result, it is difficult to see why democratic countries would allow such a concentration of power[4].

Turning to compliance, someone will have to do the work to ensure that the users of CBDC are law abiding. Such know-your-customer and anti-money laundering efforts are costly. We currently outsource these tasks to commercial banks. Banks also provide a host of other services. Who will do this, and who will bear the cost?

One way to manage the privacy and compliance challenges is through the creation of intermediated CBDC (Auer and Boehme 2021). In this framework, brokers (or banks) provide individual account services, guarding privacy, monitoring compliance and aggregating balances into accounts at the central bank (which would presumably bear interest).

However, this approach does not eliminate the risks of domestic disintermediation or currency substitution. Funds would still flow into the central bank, just indirectly through what are narrow banks in all but name (Cecchetti and Schoenholtz 2014).

Against this background, it is easy to see why the People's Bank of China is moving ahead of other central banks in creating a digital renminbi. Its large banks are typically state owned, so there is little risk of disintermediation – even in a financial crisis.

With stringent capital controls in place, there currently are effective limits on inflows into the currency. There already is little expectation of personal privacy. Finally, if the government wishes, state-owned banks can easily subsidize access.

We don't need CBDC to solve financial system problems

Returning to the question at hand: where is the current monetary system falling short? Our answer is that there is plenty of scope to improve the payments system and broaden financial access without turning to new digital currencies, either from central banks or private issuers[5].

We already see public and private sectors moving to provide cheaper, faster, more reliable, and more accessible retail payments systems that operate both within and across borders. For example, the euro area has the TIPS system, with a processing time of 10 seconds at a cost of €0.20 per transaction.

In addition, the UK has Faster Payments, Canada is testing Real-Time Rail (RTR), and the US Federal Reserve is set to launch FedNow in 2023. None of these requires CBDC.

As for financial access, the case of India is instructive. Started in 2014, the Pradhan Mantri Jan Dhan Yojana (PMJDY) provides no-frills bank accounts without charge, using the country's universal biometric personal identification to lower costs.

To date, over 420 million people have been brought into the system, with account balances averaging nearly US $50. Again, India's success required subsidies, not the issuance of CBDC (Cecchetti and Schoenholtz 2017).

Putting all of this together, we conclude that it is imprudent for a central bank to issue elastically supplied, interest-bearing CBDC with universal access. Domestically, it could disintermediate private intermediaries, with inflows of deposits directly into the central bank creating the temptation for authorities to steer credit directly.

Even if the central bank were to re-circulate the funds to potential lenders through an auction process, the need for an extensive collateral and haircut system would vastly expand officials' influence on credit allocation.

Internationally, there may be a tidal wave of funds fleeing places perceived as less stable and into those thought to be safe, adding to inequality and to the influence of the rich recipients. Finally, there is privacy. While this problem can be addressed, CBDC would surely tempt authoritarian governments by providing access to everything we do[6].

So, why are central banks preparing for CBDC?

This all leads us to be very concerned. To be clear, we are strong proponents of innovations that reduce costs and improve welfare. But the most important innovations – those that improve the payments system and the supply of credit – do not require universal CBDC and its inherent risks. So, why are central banks so intent on preparing? What is the purpose of such contingency planning?

The problem, as we see it, is that central banks fear being left behind in a way that damages the interests of their jurisdiction. Their solution is to create a form of shovel-ready CBDC programmes. But, the resulting framework is unstable.

The situation is analogous to the one prior to WWI, when countries prepared to mobilise rapidly for fear that delay meant losing a war. In the early 20th century, in the absence of trust, an obscure event in a far-off land tipped this fragile balance into war.

In the current financial circumstances, the bad equilibrium is a world of multiple CBDCs in advanced economies that threaten financial stability domestically and pose a severe threat to monetary control in developing economies.

We see no easy steps to prevent this poor outcome. As in a classic prisoner's dilemma, there is little way to enforce the cooperative equilibrium in which no one introduces CBDC. First, central banks cannot credibly commit to never issue CBDC. Second, with China already headed down the CBDC road, others now view it as too late to resist – even with full knowledge of the risks, they feel compelled to prepare.

Perhaps the best hope is that central banks will all proceed very slowly and, as Duffie (2021) emphasised, try to 'get the design right'. In our view, that means stopping well short of universal, elastically supplied, interest-bearing CBDC. ■

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Endnotes

1. Shin (2021) and the latest BIS Annual Report (2021) provide a thoughtful case arguing that CBDCs "are an idea whose time has come.".

2. According to a BIS-sponsored survey last year, a majority of central banks already are working on CBDC (Boar and Wehrli 2021).

3. We ignore certain technical issues, such as whether it is account-based or token-based (Carstens 2021).

4. We grant that there may be technical solutions to this problem (Duffie et al. 2021).

5. In a recent speech, Quarles (2021) notes some of the same problems we discuss and concludes that the benefits of CBDC are far from clear.

6. See Fatas (2021) for a further discussion of the need for regulatory changes to accommodate the issuance of CBDC.

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A solution in search of a problem?

The payment system is changing in profound ways. Christopher Waller focuses on whether a CBDC would address any of the problems affecting payments

The payment system is changing in profound ways as individuals demand faster payments, central banks including the Fed respond, and nonbank entities seek a greater role in facilitating payments. In all this excitement, there are also calls for the Federal Reserve to *"get in the game"* and issue a central bank digital currency (CBDC) that the general public could use.

Chair Powell recently announced that the Federal Reserve will publish a discussion paper on the benefits and costs of creating a CBDC. This topic is of special interest to me, since I have worked on monetary theory for the last twenty years and researched and written about alternative forms of money for the last seven[1].

My article focuses on whether a CBDC would address any major problems affecting our payment system. There are also potential risks associated with a CBDC, and I will touch on those at the end of my remarks. But at this early juncture in the Fed's discussions, I think the first order of business is to ask whether there is compelling need for the Fed to create a digital currency. I am highly sceptical[2].

In all the recent exuberance about CBDCs, advocates point to many potential benefits of a Federal Reserve digital currency, but they often fail to ask a simple question: what problem would a CBDC solve?

Alternatively, what market failure or inefficiency demands this specific intervention? After careful consideration, I am not convinced as of yet that a CBDC would solve any existing problem that is not being addressed more promptly and efficiently by other initiatives.

Before getting into the details, let me start by clarifying what I mean by 'CBDC'. Put simply, a CBDC is a liability of the central bank that can be used as a digital payment instrument. For purposes of this article, I will focus on *general*

purpose CBDCs—that is, CBDCs that could be used by the general public, not just by banks or other specific types of institutions.

A general purpose CBDC could potentially take many forms, some of which could act as anonymous cash-like payment instruments. For this piece, however, I will focus on account-based forms of CBDC, which the Bank for International Settlements recently described as *"the most promising way of providing central bank money in the digital age."*[3] Any such general purpose, account-based CBDC would likely require explicit congressional authorization.

After exploring many possible problems that a CBDC could solve, I am left with the conclusion that a CBDC remains a solution in search of a problem. That leaves us only with more philosophical reasons to adopt a CBDC

Central bank money versus commercial bank money

It is useful to note that in our daily lives we use both central bank money and commercial bank money for transactions. Central bank money (ie. money that is a liability of the Federal Reserve) includes physical currency held by the general public and digital account balances held by banks at the Federal Reserve.

The funds banks put into these accounts are called reserve balances, which are used to clear and settle payments between banks[4]. In contrast, checking and savings accounts at commercial banks are liabilities of the banks, not the Federal Reserve. The bulk of transactions, by value, that US households and firms make each day use commercial bank money as the payment instrument.

Federal reserve accounts and commercial bank accounts

Under current law, the Federal Reserve offers accounts and payment services to commercial banks[5]. These accounts provide a risk-free settlement asset for trillions of dollars of daily interbank payments.

Importantly, the use of central bank money to settle interbank payments promotes financial stability because it eliminates credit and liquidity risk in systemically important payment systems[6].

Congress did not establish the Federal Reserve to provide accounts directly to the general public; the Federal Reserve instead works in the background by providing accounts to commercial banks, which then provide bank accounts to the general public.

Under this structure, commercial banks act as an intermediary between the Federal Reserve and the general public. The funds in commercial bank accounts are digital and can be used to make digital payments to households and businesses, but commercial banks promise to redeem a dollar in one's bank account into $1 of US currency.

In short, banks peg the exchange rate between commercial bank money and the US dollar at one-to-one. Due to substantial regulatory and supervisory oversight and federal deposit insurance, households and firms reasonably view this fixed exchange rate as perfectly credible.

Consequently, they treat commercial bank money and central bank money as perfect substitutes—they are interchangeable as a means of payment. The credibility of this fixed exchange rate between commercial and central bank money is what allows our payment system to be stable and efficient. I will return to this point later.

This division of functions between the Federal Reserve and commercial banks reflects an economic truth: that markets operate efficiently when private-sector firms compete to provide the highest-quality products to consumers and businesses at the lowest possible cost. In general, the government should compete with the private sector only to address market failures.

Consideration of the case for a Federal Reserve CBDC

This brings us back to my original question: what is the problem with our current payment system that only a CBDC would solve?

Could it be that physical currency will disappear? As I mentioned before, the key to having credible commercial bank money is the promise that banks will convert a dollar of digital bank money into a dollar of US physical currency. But how can banks deliver on their promise if US currency disappears?

Accordingly, many central banks are considering adoption of a CBDC as their economies become 'cashless'. Eliminating currency is a policy choice, however, not an economic outcome, and Chair Powell has made clear that

US currency is not going to be replaced by a CBDC. Thus, a fear of imminently vanishing physical currency cannot be the reason for adopting a CBDC[7].

Could it be that the payment system is too limited in reach, and that introducing a CBDC would make the payment system bigger, broader, and more efficient? It certainly doesn't look that way to me.

Our existing interbank payment services have nationwide reach, meaning that an accountholder at one commercial bank can make a payment to an accountholder at any other US bank. The same applies to international payments—accountholders at US banks can transfer funds abroad to accountholders at foreign banks.

So, a lack of connectedness and geographic breadth in the US payment system is not a good reason to introduce a CBDC.

Could it be that existing payment services are too slow? A group of commercial banks has recently developed an instant payment service (the Real-Time Payment Service, or RTP), and the Federal Reserve is creating its own instant payment service, FedNowSM[8].

These services will move funds between accountholders at US commercial banks immediately after a payment is initiated. While cross-border payments are typically less efficient than domestic payments, efforts are underway to improve cross-border payments as well[9].

These innovations are all moving forward in the absence of a CBDC. Consequently, facilitating speedier payments is not a compelling reason to create a CBDC.

Could it be that too few people can access the payment system? Some argue that introducing a CBDC would improve financial inclusion by allowing the unbanked to more readily access financial services. To address this argument, we need to know, first, the size of the unbanked population, and second, whether the unbanked population would use a Federal Reserve CBDC account.

According to a recent Federal Deposit Insurance Corporation (FDIC) survey, approximately 5.4 percent of US households were unbanked in 2019[10]. The FDIC survey also found that approximately 75 percent of the unbanked population *"were not at all interested"* or *"not very interested"* in having a bank account.

If the same percentage of the unbanked population would not be interested in a Federal Reserve CBDC account, this means that a little more than 1 percent of US households are both unbanked and potentially interested in a Federal Reserve CBDC account.

It is implausible to me that developing a CBDC is the simplest, least costly way to reach this 1 percent of households. Instead, we could promote financial inclusion more efficiently by, for example, encouraging widespread use of low-cost commercial bank accounts through the Cities for Financial Empowerment *Bank On* project[11].

Could it be that a CBDC is needed because existing payment services are unreasonably expensive? In order to answer this question, we need to understand why the price charged for a payment might be considered 'high'.

In economics, the price of a service is typically composed of two parts: the marginal cost of providing the service and a markup that reflects the market power of the seller.

The marginal cost of processing a payment depends on the nature of the payment (for example, paper check versus electronic transfer), the technology used (for example, batched payments versus real-time payments), and the other services provided in processing the payment (for example, risk and fraud services).

Since these factors are primarily technological, and there is no reason to think that the Federal Reserve can develop cheaper technology than private firms, it seems unlikely that the Federal Reserve would be able to process CBDC payments at a materially lower marginal cost than existing private-sector payment services[12].

The key question, then, is how a CBDC would affect the markup charged by banks for a variety of payment services. The markup that a firm can charge depends on its market power and thus the degree of competition it faces.

Introducing a CBDC would create additional competition in the market for payment services, because the general public could use CBDC accounts to make payments directly through the Federal Reserve—that is, a CBDC would allow the general public to bypass the commercial banking system.

Deposits would flow from commercial banks into CBDC accounts, which would put pressure on banks to lower their fees, or raise the interest rate paid on deposits, to prevent additional deposit outflows[13].

It seems to me, however, that private-sector innovations might reduce the markup charged by banks more effectively than a CBDC would14. If commercial banks are earning rents from their market power, then there is a profit opportunity for nonbanks to enter the payment business and provide the general public with cheaper payment services.

And, indeed, we are currently seeing a surge of nonbanks getting into payments. For example, in recent years, 'stablecoin' arrangements have emerged as a particularly important type of nonbank entrant into the payments landscape.

Stablecoins are digital assets whose value is tied to one or more other assets, such as a sovereign currency. A stablecoin could serve as an attractive payment instrument if it is pegged one-to-one to the dollar and is backed by a safe and liquid pool of assets[15].

If one or more stablecoin arrangements can develop a significant user base, they could become a major challenger to banks for processing payments.

Importantly, payments using such stablecoins might be 'free' in the sense that there would be no fee required to initiate or receive a payment[16]. Accordingly, one can easily imagine that competition from stablecoins could pressure banks to reduce their markup for payment services.

Please note that I am not endorsing any particular stablecoin—some of which are not backed by safe and liquid assets. The promise of redemption of a stablecoin into one US dollar is not perfectly credible, nor have they been tested by an actual run on the stablecoin. There are many legal, regulatory, and policy issues that need to be resolved before stablecoins can safely proliferate[17].

My point, however, is that the private sector is already developing payment alternatives to compete with the banking system. Hence, it seems unnecessary for the Federal Reserve to create a CBDC to drive down payment rents.

Returning to possible problems a CBDC could solve, it is often argued that the creation of a CBDC would spur innovation in the payment system. This leads me to ask: do we think there is insufficient innovation going on in payments?

To the contrary, it seems to me that private-sector innovation is occurring quite rapidly—in fact, faster than regulators can process. So, spurring innovation is not a compelling reason to introduce a CBDC.

Could it be, however, that the types of innovations being pursued by the private sector are the 'wrong' types of payment innovations? I see some merit in this argument when I consider crypto assets such as bitcoin that are often used to facilitate illicit activity. But a CBDC is unlikely to deter the use of crypto assets that are designed to evade governmental oversight.

Could the problem be that government authorities have insufficient information regarding the financial transactions of US citizens? In general, the government has sought to balance individuals' right to privacy with the need to prevent illicit financial transactions, such as money laundering. For example, while the government does not receive all transaction data regarding accountholders at commercial banks, the Bank Secrecy Act requires that commercial banks report suspicious activity to the government.

Depending on its design, CBDC accounts could give the Federal Reserve access to a vast amount of information regarding the financial transactions and trading patterns of CBDC accountholders.

The introduction of a CBDC in China, for example, likely will allow the Chinese government to more closely monitor the economic activity of its citizens. Should the Federal Reserve create a CBDC for the same reason? I, for one, do not think so.

Could the problem be that the reserve currency status of the US dollar is at risk and the creation of a Federal Reserve CBDC is needed to maintain the primacy of the US dollar? Some commentators have expressed concern, for example, that the availability of a Chinese CBDC will undermine the status of the US dollar.

I see no reason to expect that the world will flock to a Chinese CBDC or any other. Why would non-Chinese firms suddenly desire to have all their financial transactions monitored by the Chinese government? Why would this induce non-Chinese firms to denominate their contracts and trading activities in the Chinese currency instead of the US dollar?

Additionally, I fail to see how allowing US households to, for example, pay their electric bills via a Federal Reserve CBDC account instead of a commercial bank account would help to maintain global dollar supremacy. (Of course, Federal Reserve CBDC accounts that are available to persons outside the United States might promote use of the dollar, but global availability of Federal Reserve CBDC accounts would also raise acute problems related to, among other things, money laundering.)

Finally, could it be that new forms of private money, such as stablecoins, represent a threat to the Federal Reserve for conducting monetary policy? Many commentators have suggested that new private monies will diminish the impact of the Federal Reserve's policy actions, since they will act as competing monetary systems.

It is well established in international economics that any country that pegs its exchange rate to the US dollar surrenders its domestic monetary policy to the United States and imports US monetary policy. This same logic applies to any entity that pegs its exchange rate to the US dollar.

Consequently, commercial banks and stablecoins pegged to the US dollar act as conduits for U.S. monetary policy and amplify policy actions. So, if anything, private stablecoins pegged to the dollar broaden the reach of US monetary policy rather than diminish it.

After exploring many possible problems that a CBDC could solve, I am left with the conclusion that a CBDC remains a solution in search of a problem. That leaves us only with more philosophical reasons to adopt a CBDC.

One could argue, for example, that the general public has a fundamental right to hold a riskless digital payment instrument, and a CBDC would do this in a way no privately issued payment instrument can[18]. On the other hand, thanks to federal deposit insurance, commercial bank accounts already offer the general public a riskless digital payment instrument for the vast majority of transactions.

One could also argue that the Federal Reserve should provide a digital option as an alternative to the commercial banking system. The argument is that the government should not force its citizens to use the commercial banking system, but should instead allow access to the central bank as a public service available to all[19].

As I noted earlier in my speech, however, the current congressionally mandated division of functions between the Federal Reserve and commercial banks reflects an understanding that, in general, the government should compete with the private sector only to address market failures. This bedrock principle has stood America in good stead since its founding, and I don't think that CBDCs are the case for making an exception.

In summary, while CBDCs continue to generate enormous interest in the United States and other countries, I remain sceptical that a Federal Reserve CBDC would solve any major problem confronting the US payment system. There are also potential costs and risks associated with a CBDC, some of which I have alluded to already.

I have noted my belief that government interventions into the economy should come only to address significant market failures. The competition of a Fed CBDC could disintermediate commercial banks and threaten a division of labour in the financial system that works well.

And, as cybersecurity concerns mount, a CBDC could become a new target for those threats. I expect these and other potential risks from a CBDC will be addressed in the forthcoming discussion paper, and I intend to expand upon them as the debate over digital currencies moves forward. ■

Christopher J Waller is a Member of the Federal Reserve Board of Governors

Endnotes

1. For example, in 2016, my coauthors and I published a research paper that examined how the use of a privately issued currency backed up by shares of a broad stock market index could replace publicly issued fiat currency. See David Andolfatto, Aleksander Berentsen and Christopher Waller, "Monetary Policy with Asset-Backed Money," Journal of Economic Theory 164 (July 2016): 166–86.

2. These views are my own and do not represent any position of the Board of Governors or other Federal Reserve policymakers.

3. See Bank for International Settlements, Annual Economic Report (Basel: Bank for International Settlements, June 2021). Note that any CBDC would require some kind of supporting technology. For example, many commentators have considered the possibility that a CBDC could operate using a 'distributed ledger'. Additionally, an account-based CBDC could potentially take different forms. For example, the infrastructure for an account-based CBDC could be designed so that the Federal Reserve would interact directly with the general public, or it could be designed so that banks or other

service providers would maintain all customer relationships with the general public. My comments today focus on the policy issues associated with providing a CBDC rather than on technologies or infrastructure that would be necessary to support a CBDC.

4. The Federal Reserve also provides accounts and payment services to the United States government, certain government-sponsored enterprises, designated financial market utilities, foreign central banks, and certain international organizations.

5. For this purpose, I use the term 'commercial bank' broadly to include banks, thrifts, credit unions, and other depository institutions.

6. See, for example, Committee on Payment and Settlement Systems, The Role of Central Bank Money in Payment Systems (Basel: Bank for International Settlements, August 2003).

7. Physical currency can effectively disappear, and everything still works. All the central bank needs to do is promise to provide the currency if requested.

8. These services will complement the existing automated clearinghouse (ACH) payment network, which now enables same-day settlement of ACH payments.

9. Financial Stability Board, "FSB Delivers a Roadmap to Enhance Cross-Border Payments," news release, October 13, 2020.

10. "Key Findings from How America Banks: Household Use of Banking and Financial Services," Federal Deposit Insurance Corporation.

11. See https://joinbankon.org/

12. Note that section 11A of the Federal Reserve Act (12 U.S.C. § 248a) directs the Federal Reserve to establish a fee schedule for its payment services. Over the long run, these fees are set "on the basis of all direct and indirect costs actually incurred in providing [a service], including interest on items credited prior to actual collection, overhead, and an allocation of imputed costs which takes into account the taxes that would have been paid and the return on capital that would have been provided had the services been furnished by a private business firm..."

13. See David Andolfatto "Assessing the Impact of Central Bank Digital Currency on Private Banks," The Economic Journal 131 (February 2021): 525–40.
14. The Federal Reserve's longstanding policy is to offer new payment services to its accountholders only when "other providers alone cannot be expected to provide [those services] with reasonable effectiveness, scope, and equity." See "The Federal Reserve in the Payments System" (issued 1984; revised 1990 and 2001).
15. A well-designed stablecoin would function similarly to a 'narrow bank', which has a long tradition in economic theory but has never existed in any serious way as a competitor for commercial banks. Narrow banks take deposits and issue liabilities on themselves much like a standard bank. However, narrow banks hold only liquid, very safe assets that back up their liabilities 100 percent. They do not make loans or hold risky securities.
16. However, stablecoin payment might not be free in the sense that stablecoin users would allow their financial transaction data to be harvested and monetized.
17. The President's Working Group on Financial Markets expects to issue recommendations related to stablecoins in the coming months. See https://home.treasury.gov/news/press-releases/jy0281
18. See Aleksander Berentsen and Fabian Schar "The Case for Central Bank Electronic Money and the Non-Case for Central Bank Cryptocurrencies," Federal Reserve Bank of St. Louis, Review 100, no. 2 (Second Quarter 2018).
19. See David Andolfatto "Fedcoin: On the Desirability of a Central Bank Cryptocurrency," Macromania Blog, February 3, 2015, http://andolfatto.blogspot.com/2015/02/fedcoin-on-desirability-of-government.html

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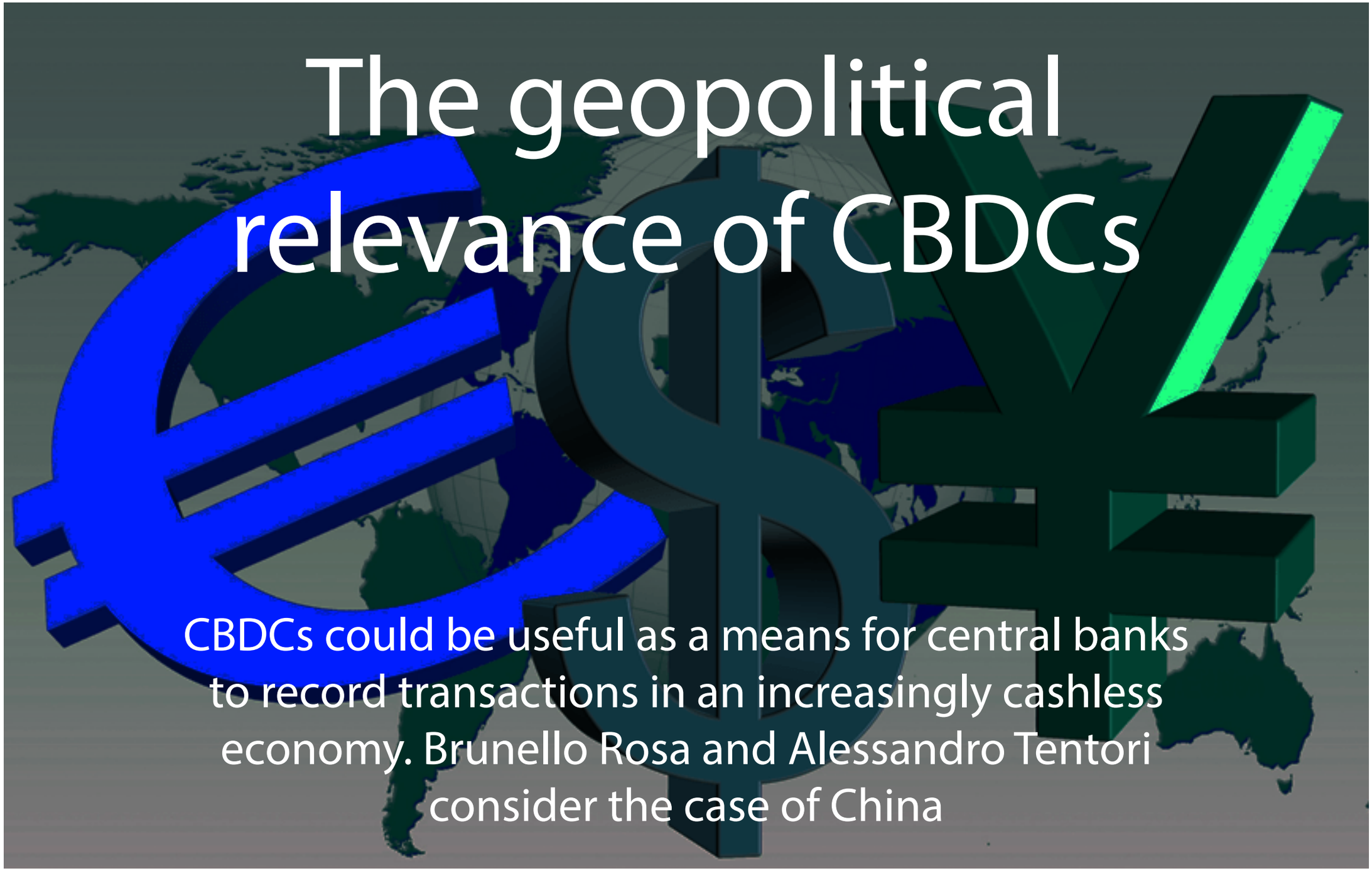
The geopolitical relevance of CBDCs



CBDCs could be useful as a means for central banks to record transactions in an increasingly cashless economy. Brunello Rosa and Alessandro Tentori consider the case of China

Digital currencies are becoming increasingly prescient on both research and policy agendas, including for central banks. This column explores the geopolitical role of central bank digital currencies, with a particular focus on China. It argues that such currencies could be useful as a means for central banks to record transactions in an increasingly cashless economy and could help improve central banks' monetary transmission. Nonetheless, the risk of cyber-attacks should not be overlooked.

When it comes to central bank digital currencies (CBDCs), the focus of market participants and regulators is mainly on optimal design and the risk of disruption for the banking sector (Andolfatto 2019, Auer *et al*. 2020, Bindseil and Panetta 2020, Niepelt 2020).

Instead, in this column we concentrate on the geo-strategic implications of central bank digital currencies, including the key business of foreign exchange reserves. As the digital revolution implies the need for countries to develop a new arsenal of strategic assets, such currencies are likely to become a key instrument on the geopolitical chessboard.

Digital reserve currencies: survival of the fittest

The IMF defines foreign exchange reserves as *"official public sector foreign assets that are readily available to and controlled by the monetary authorities"* (IMF 2001). This definition lends itself to be extended to the best practices of reserve management, like prudent liquidity and credit risk management or the generation of a steady cash flow.

Would a digital currency, or more generally a digital asset, qualify as a reserve instrument? So far, only a very limited subset of the existing asset universe enjoys reserve status. According to the IMF, worldwide allocated reserves amounted to $11.9 trillion at the end of 2020, of which roughly 80% were denominated in either US dollars or euros.

To tackle the question about reserve status, it might be worth taking a step back to recall the classic functions of money: means of payment, measure of value, and store of value. Ideally, money is a fungible, durable, portable, and identifiable medium with a stable value.

To put it bluntly: *"money is the most universal and most efficient system of mutual trust ever devised… even people who do not believe in the same god or obey the same king are more than willing to use the same money"* (Harari 2015).

With the digital revolution, money has acquired an additional new function: a store of information. In a cashless society – admittedly an extreme case – any exchange between two counterparties generates information about

... central bank digital currencies might play a key role in a wider portfolio of strategic assets, ready to be deployed on the geopolitical arena

the counterparties themselves, thus implying a tradeoff between the value of privacy/anonymity and the value of a digital marketplace.

As one of us argued in a recent paper (Tentori 2021), central bank digital currencies are a natural evolution of existing forms of money that satisfy all four characteristics of money described above. Furthermore, central bank digital currencies are designed to maximize the store of information function.

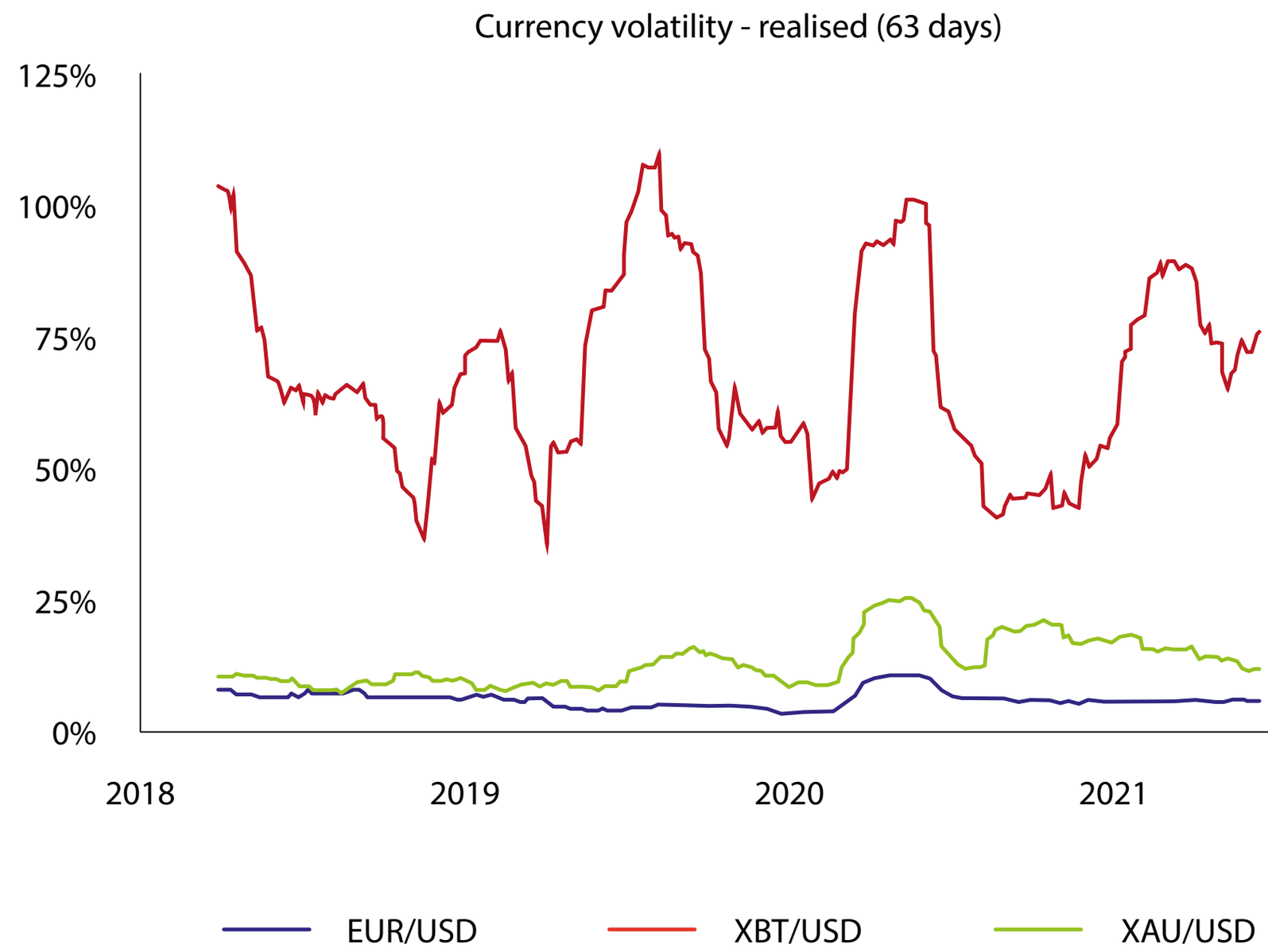
On the other hand, cryptos and private stablecoins might tick some of the boxes as well, but not all (Rosa and Tentori 2021). In particular, these 'private' digital assets are subject to excessive levels of volatility (Figure 1), questioning their function as a store of value (Cœuré, 2019).

Not all digital assets operate with a backstop. The backstop – a digital currency's collateral framework – is key in order to distinguish 'stablecoins' from the broader ecology of digital currencies. It is an essential design feature, one likely to influence the path of adoption of any nascent digital currency.

One could object that after the collapse of the gold standard, the value of traditional currencies is only implicitly backed by the sovereign (eg. via tax revenues or net wealth). Credibility, trust and confidence are therefore essential features of traditional and digital currencies alike.

Following this, we tend to regard central bank digital currency as a superior instrument in the context of (digital) reserves management. We deem other digital solutions at risk of being crowded out by central bank digital currencies.

Figure 1. Bitcoin's excessively volatile compared to gold or the euro



Source: Bloomberg

In this respect, we appreciate the global central banks' efforts to design and test digital liabilities, as monetary policy transitions into the digital realm. At present, 80% of the world's central banks are currently engaging in central bank digital currency research and development (Auer *at al*. 2020), including the ECB, the People's Bank of China, and the Federal Reserve.

Digital sovereignty: central bank digital currencies are a new strategic asset

The concept of sovereignty is often defined as a supreme authority within a territory. Identifiable signs like a flag or a currency typically outline the sovereign's sphere of influence.

Just like issuing and operating a traditional currency is a sign of monetary sovereignty, so is central bank digital currency's issuance a way of reasserting monetary sovereignty over a country's cyberspace.

Unfortunately, the concept of sovereignty is hard to grasp in cyberspace. The meaning of territory and authority is increasingly diluted as data gets stored outside a state's geographical and physical borders. We would argue that in a not-too-distant future governments will be forced to secure ownership of and access to their citizens' strategic data, even when stored via cloud technology.

Rosa (2020) suggests that the armies of the future might include strategic digital assets like cyber divisions, and that *"private-sector companies will play a crucial role, just as private contractors do today in traditional conflicts."*

Without dwelling excessively on the matter of cyber warfare, it seems rather unlikely that central bank digital currencies will be spared from cyberattacks. From the point of view of the information function of money, opening up a central banks' balance sheet to the general public might generate huge privacy costs in case of a data breach.

A cyberattack could represent a violation of both digital and traditional sovereignty akin to a digital-era declaration of war. As a result, we would expect the strategic importance of central bank digital currencies to put pressure on governments to re-shape and adapt their diplomatic framework.

Central bank digital currencies could also become a valuable strategic asset on more traditional macroeconomic grounds. In fact, like in every strategic game – including geopolitics – governments aim to exploit a potential 'first-mover advantage'.

For some central banks, time itself appears to be an existential asset in the digital currency race. In fact, modelling the introduction of a central bank digital currency in an international interest parity environment might partially explain central banks' interest in this policy instrument.

As suggested by Ferrari *et al*. (2020), *"a CBDC increases asymmetries in the international monetary system by reducing monetary policy autonomy in foreign economies, but not domestically, suggests in addition that introducing a CBDC sooner, rather than later, could give rise to a significant first-mover advantage."*

Digital future: China leads the race

Two countries have made the largest progress in the development of central bank digital currencies: China and Sweden. While Sweden does not seem ready to fully roll out its digital currency in the medium term, China's 'DCEP' system was conceived six years ago and is now in its experimentation phase – with local tests being conducted in Shenzhen, Suzhou, Xiongan, and Chengdu. Tests have been conducted in the pubic as well as the private economy (including several international companies).

From the point of view of domestic policy, central bank digital currencies are a valuable asset for two main reasons:

- Information: being able to record every transaction that takes place in a cashless society is an appealing proposition for any government looking to leverage both its fiscal efficiency and its ability to control the population.

- Monetary policy: being able to pass negative interest rates on the household sector is likely to improve a central bank's monetary transmission, albeit not without a potential cost in terms of financial stability (Schilling *et al*. 2020)

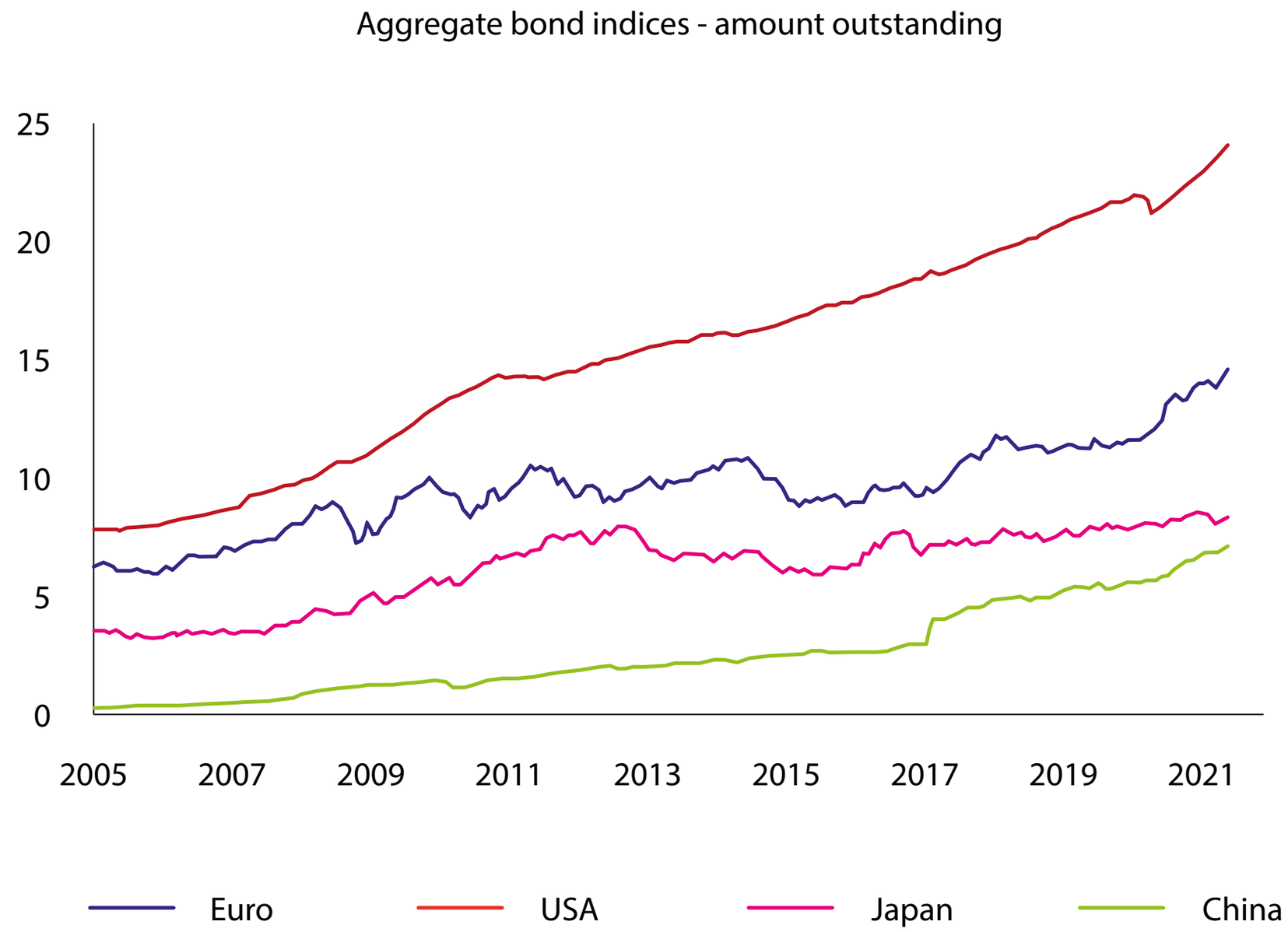
China is also active on the international front – for example, by addressing the issue of cross-border payments using its own central bank digital currency technology. In this respect, Beijing has joined the BIS Innovation Hub and Hong Kong Monetary Authority Bridge initiative and their proof-of-concept prototype for wholesale cross-border payments.

China had already begun a process of internationalisation of its currency way before the digital currency project was conceived. The Chinese financial market is evolving rapidly – its government debt is in the process of being added to major bond indices and it is becoming a serious competitor to established liquid sovereign issuers.

The introduction of China's digital currency will likely represent an acceleration of existing trends. It is relatively straightforward to imagine that China will 'incentivise' the adoption of its own digital currency in countries within the Belt and Road Initiative (BRI) and Asian Infrastructure Investment Bank (AIIB).

Similarly, it will likely offer its digital platform to countries joining the Regional Comprehensive Economic Partnership (RCEP).

Figure 2. China's bond market is systemically relevant



Source: Bloomberg

China is now openly campaigning for the adoption of its own governance model (a mix of state capitalism, freedom of enterprise, and political authoritarianism), especially in South-East Asia – a region that has experimented with democracy, with ambiguous results (Giordani 2021).

In this respect, we anticipate that central bank digital currencies might play a key role in a wider portfolio of strategic assets, ready to be deployed on the geopolitical arena. ■

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Parachute pants and central bank money

There is a global rush to roll out CBDCs. Randal Quarles suggests this is akin to the 1980s parachute pants fad and the fear of missing out

I have been reflecting recently on America's centuries-long enthusiasm for novelty. In the main, it has served us and the world well, by making America the home of so many of the scientific and practical innovations that have transformed life in the 21st century from that of the 19th.

But, especially when coupled with an equally American susceptibility to boosterism and the fear of missing out, it has also sometimes led to a mass suspension of our critical thinking and to occasionally impetuous, deluded crazes or fads.

Sometimes the consequences are in hindsight merely puzzling or embarrassing, like that year in the 1980s when millions of Americans suddenly started wearing parachute pants. But the consequences can also be more serious.

Which brings us to my topic: central bank digital currencies, or CBDCs. In recent months, public interest in a 'digital dollar' has reached fever pitch. A wide range of experts and commenters have suggested that the Federal Reserve should issue—and in fact may need to issue—a CBDC.

But before we get carried away with the novelty, I think we need to subject the promises of a CBDC to a careful critical analysis. In offering my views on this and other issues related to CBDCs, I am speaking for myself as a member of the Board of Governors, and not for the Board itself or any other Fed policymakers.

And, indeed, you will all have seen Chair Powell's recent announcement that we are preparing a comprehensive discussion paper on this issue that will be the first step in a thorough public process to conduct just this sort of critical analysis, which I do not want to prejudge.

But I do want to give some sense of the issues I think we will need to grapple with in this process, how I will be thinking about them, and the high bar that I think any proposal to create a US CBDC must clear.

So, let's begin with a basic question: what problem would a CBDC solve? To answer, we first need to define the term CBDC and assess the current state of the US payment system.

What do we mean by 'CBDC'?

The Bank for International Settlements has defined a CBDC as *"a digital payment instrument, denominated in the national unit of account, that is a direct liability of the central bank."*[1]

... our work is cut out for us as we proceed to rigorously evaluate the case for developing a Federal Reserve CBDC. Even if other central banks issue successful CBDCs, we cannot assume that the Federal Reserve should issue a CBDC

My first observation is that the general public *already* transacts mostly in digital dollars—by sending and receiving electronic balances in our commercial bank accounts. These digital dollars are not a CBDC, because they are liabilities of commercial banks rather than the Federal Reserve.

Importantly, however, digital dollars at commercial banks are federally insured up to $250,000, which means that for deposits up to that amount—which means for essentially all retail deposits in the United States—they are as sound as a central bank liability.

The Federal Reserve also provides digital dollars directly to commercial banks and certain other financial institutions. Federal law allows these financial institutions to maintain accounts with—and receive payments services from—the Federal Reserve. Balances in Federal Reserve accounts serve a vital financial stability function by providing a safe and liquid settlement asset for the US economy.

To summarize then, the dollar is already highly digitized. The Federal Reserve provides a digital dollar to commercial banks, and commercial banks provide digital dollars and other financial services to consumers and businesses. This arrangement serves the nation and the economy well: the Federal Reserve functions in the public interest by promoting the health of the US economy and the stability of the broader financial system, while commercial banks compete to attract and effectively serve customers.

So, given the existing digitization of the US dollar, how would a CBDC differ from the digital dollars we use today? The key distinction is that, when most commentators speculate about a Federal Reserve CBDC, they assume that it would be available to the general public directly from the central bank.

A CBDC of this nature could take different forms. One is an account-based model, in which the Federal Reserve would provide individual accounts directly to the general public. Like the accounts that the Federal Reserve currently provides to financial institutions, an account holder would send and receive funds by debit or credit to their Federal Reserve account.

A different CBDC model could involve a CBDC that is not maintained in Federal Reserve accounts. This form of CBDC would be closer to a digital equivalent of cash. Like cash, it would represent a claim against the Federal Reserve, but it could potentially be transferred from person to person (like a banknote) or through intermediaries.

I am sceptical that the Federal Reserve has legal authority to pursue either of these CBDC models without legislation. Nevertheless, the recent clamour over CBDCs makes it appropriate to explore the benefits, costs, and practicalities of implementing one in the United States if such legislative authority were granted. Let's start with a look at the current US payment system that a Fed CBDC would fit into.

Current state of the US payment system

The Federal Reserve and private-sector interbank payment services already offer an array of options that facilitate efficient, electronic US dollar payments. A few statistics related to the main large-value payment systems for US dollars are illustrative.

The Federal Reserve's large-value payment service (the Fedwire Funds Service) processes nearly $4 trillion in payments every day[2]. These payments settle instantly in a bank's account at the Federal Reserve. A private-sector entity (The Clearing House) operates a large-value payment system that settles nearly $2 trillion in payments every day[3]. These payments do not settle in Federal Reserve accounts, but they are underpinned by balances on the books of a Federal Reserve Bank.

Smaller-value payments often settle more slowly than large-value payments, but a variety of efforts to speed up settlement have been completed or are underway. For example, The Clearing House has developed an instant payments service that focuses on smaller-value payments.

Similarly, the automated clearinghouse (or ACH) network—a batch-based payment network that first developed in the long-ago 20th century—now enables same-day settlement of ACH payments. And the Federal Reserve is developing an instant payment service—FedNow[SM]—that will soon provide recipients of small-value payments with immediate access to their funds in commercial bank accounts.

The payment system is not perfect—some types of payments should move more quickly and efficiently. Payments across international borders, for example, remain a key area of concern because they often involve high costs, low speed, and insufficient transparency.

The Financial Stability Board, an international group that I chair, produced a roadmap last year that is intended to address these concerns[4]. Additionally, private-sector stablecoins (which I will discuss in more detail in a moment) may facilitate faster and cheaper cross-border payments.

In addition, some types of payments have not fully digitized or are subject to ongoing contention between businesses with competing economic interests. For example, paper cheques remain widely used for certain types of payments (although the interbank check collection process is now almost entirely electronic)[5].

Debit and credit card payments offer a convenient digital platform for consumers and retailers, but there has been considerable controversy between banks and retailers over who will capture the economics surrounding the fees associated with card transactions.

Finally, many more Americans could benefit from digital payments by increasing their use of banking services, which can be promoted by wider use of low-cost, basic bank accounts.

In summary, the US payment system is very good, and although it is not perfect, work is already underway to significantly improve it.

Policy considerations

Yet, proponents of a Federal Reserve CBDC believe that it would solve a number of significant problems. They suggest, for example, that a Federal Reserve CBDC may be necessary to defend the critical role the US dollar plays in the global economy. Others say that a CBDC would overcome longstanding economic inequalities in American society.

As we begin our Fed analysis of these issues, I will have to be convinced that a CBDC is a particularly good tool to address either of these issues, about which I am sceptical, and I will especially have to be convinced that the potential benefits of developing a Federal Reserve CBDC outweigh the potential risks.

Let's examine some of the arguments raised by CBDC supporters. The first argument is that the Federal Reserve should develop a CBDC to defend the US dollar against threats that would be posed by foreign CBDCs, on the one hand, and the continued spread of private digital currencies, on the other.

Taking the threat from foreign CBDC's first, this argument presumes that at least some foreign currencies—all of which are already highly digitized in our current international banking system in the same way the dollar is and yet which do not pose a significant challenge to the international role of the dollar—will suddenly pose a much greater challenge to the dollar if that digitization is accomplished through a direct central bank digital currency instead of

through the current digital payments system. In this view, the US dollar will lose its place in the global economy if the Federal Reserve does not offer a similar product.

I think it's inevitable that, as the global economy and financial system continue to evolve, some foreign currencies (including some foreign CBDCs) will be used more in international transactions than they currently are.

It seems unlikely, however, that the dollar's status as a global reserve currency, or the dollar's role as the dominant currency in international financial transactions, will be threatened by a foreign CBDC.

The dollar's role in the global economy rests on a number of foundations, including the strength and size of the US economy; extensive trade linkages between the United States and the rest of the world; deep financial markets, including for US Treasury securities; the stable value of the dollar over time; the ease of converting US dollars into foreign currencies; the rule of law and strong property rights in the United States; and last but not least, credible US monetary policy.

None of these are likely to be threatened by a foreign currency, and certainly not because that foreign currency is a CBDC.

CBDC supporters also suggest that private digital currencies pose a threat to the US dollar. Private digital currencies come in multiple flavours, but for this purpose I will divide them into two categories: stablecoins and non-stablecoins, or cryptoassets, such as bitcoin.

Let's begin with stablecoins. The value of a stablecoin is tied to one or more other assets, such as a sovereign currency[6]. There are multiple existing and potential stablecoins that are or would be tied in value to the US dollar.

Some commentators argue that the United States must develop a CBDC to compete with US dollar stablecoins. Stablecoins are an important development that raise difficult questions.

For example, how would widespread adoption of stablecoins affect monetary policy or financial stability? How might stablecoins affect the commercial banking system? Do stablecoins represent a fundamental threat to the government's role in money creation?

In my judgment, we do not need to fear stablecoins. The Federal Reserve has traditionally supported responsible private-sector innovation. Consistent with this tradition, I believe that we must take strong account of the potential benefits of stablecoins, including the possibility that a US dollar stablecoin might *support* the role of the dollar in the global economy.

For example, a global US dollar stablecoin network could encourage use of the dollar by making cross-border payments faster and cheaper, and it potentially could be deployed much faster and with fewer downsides than a CBDC.

And the concern that stablecoins represent the unprecedented creation of private money and thus challenge our monetary sovereignty is puzzling, given that our existing system involves—indeed depends on—private firms creating money every day.

We do have a legitimate and strong regulatory interest in how stablecoins are constructed and managed, particularly with respect to financial stability concerns: the pool of assets that acts as the anchor for a stablecoin's value could—if use of the stablecoin became widespread enough—create stability risk if it is invested in multiple currency denominations; if it is a fractional rather than full reserve; if the stablecoin holder does not have a

clear claim on the underlying asset; or if the pool is invested in instruments other than the most liquid possible, principally central bank reserves and short-term sovereign bonds.

All of these factors create 'run risk' —the possibility that some triggering event could cause a large number of stablecoin holders to exchange their coins all at once for other assets and that the stablecoin system would not be able to meet such demands while maintaining a reasonably stable value.

But these concerns are eminently addressable—indeed, some stablecoins have already been structured to address them. When our concerns have been addressed, we should be saying yes to these products, rather than straining to find ways to say no.

Indeed, the combination of imminent improvements in the existing payments system such as various instant payments initiatives combined with the cross-border efficiency of properly structured stablecoins could well make superfluous any effort to develop a CBDC.

In contrast to stablecoins, cryptoassets like bitcoin are not tied to the value of an asset like a sovereign currency. Rather, they seek to create value in the coin through other means, usually some intrinsic mechanism to ensure scarcity, like bitcoin's mining process, or some characteristic of the coin that cannot be matched by the traditional payment system, such as inviolable anonymity.

Some commentators assert that the United States must develop a CBDC to counter the appeal of cryptocurrencies. This seems mistaken. The mechanisms used to create such cryptoassets' value also ensure that this value will be highly volatile—rather similar to the fluctuating value of gold, which, like bitcoin, draws a significant part of its value from its scarcity, and like bitcoin, does not play a significant role in today's payments or monetary system.

Unlike gold, however, which has industrial uses and aesthetic attributes quite apart from its vestigial financial role, bitcoin's principal additional attractions are its novelty and its anonymity. The anonymity will make it appropriately the target for increasingly comprehensive scrutiny from law enforcement and the novelty is a rapidly wasting asset.

Gold will always glitter, but novelty, by definition, fades. Bitcoin and its ilk will, accordingly, almost certainly remain a risky and speculative investment rather than a revolutionary means of payment, and they are therefore highly unlikely to affect the role of the US dollar or require a response with a CBDC.

A second broad argument raised by proponents of CBDCs is that a Federal Reserve CBDC would improve access to digital payments for people who currently do not keep bank accounts because of their expense, a lack of trust in banks, or other reasons. This is a worthwhile goal.

However, I believe we can promote financial inclusion more efficiently by taking steps to make cheap, basic commercial bank accounts more available to people for whom the current cost is burdensome, such as the Bank On accounts developed in collaboration between the Cities for Financial Empowerment Fund and many local coalitions[7].

Between 2011 and 2019, the percentage of households that are unbanked dropped from 8.2 percent to an estimated 5.4 percent[8]. Banks and regulators are working to shrink this percentage further still. I am far from convinced that a CBDC is the best, or even an effective, method to increase financial inclusion[9].

Last, some believe that a Federal Reserve CBDC would spur and facilitate private-sector innovation. This is an interesting issue that merits further study. I am puzzled, however, as to how a Federal Reserve CBDC could promote innovation in a way that a private-sector stablecoin or other new payment mechanism could not.

It seems to me that there has been considerable private-sector innovation in the payments industry without a CBDC, and it is conceivable that a Fed CBDC, or even plans for one, might deter private-sector innovation by effectively 'occupying the field'.

In brief, the potential benefits of a Federal Reserve CBDC are unclear. Conversely, a Federal Reserve CBDC could pose significant and concrete risks. First, a Federal Reserve CBDC could create considerable challenges for the structure of our banking system, which currently relies on deposits to support the credit needs of households and businesses.

An arrangement where the Federal Reserve replaces commercial banks as the dominant provider of money to the general public could constrict the availability of credit, fundamentally alter the economy, and expose the public to a host of unanticipated, and undesirable, consequences[10].

Among other potential problems, a dominant CBDC could undermine the consumer and other economic benefits that accrue when commercial banks compete to attract customers.

A Federal Reserve CBDC could also present an appealing target for cyberattacks and other security threats. Bad actors might try to steal CBDC, compromise the CBDC network, or target non-public information about holders of CBDC. The architecture of a Federal Reserve CBDC would need to be extremely resistant to such threats—and would need to remain resistant as bad actors employ ever-more sophisticated methods and tactics.

Designing appropriate defences for CBDC could be particularly difficult because, compared to the Federal Reserve's existing payment systems, there could be far more entry points to a CBDC network—depending on design choices, anyone in the world could potentially access the network[11].

Critically, we also would need to ensure that a CBDC does not facilitate illicit activity. The Bank Secrecy Act currently requires that commercial banks take steps to guard against money laundering[12].

Policymakers will need to consider whether a similar anti-money-laundering regime would be feasible for a Federal Reserve CBDC, but it may be challenging to design a CBDC that respects individuals' privacy while appropriately minimizing the risk of money laundering.

At one extreme, we could design a CBDC that would require CBDC holders to provide the Federal Reserve detailed information about themselves and their transactions; this approach would minimize money-laundering risks but would raise significant privacy concerns.

At the other extreme, we could design a CBDC that would allow parties to transact on a fully anonymized basis; this approach would address privacy concerns but would raise significant money-laundering risks.

A final risk is that developing a Federal Reserve CBDC could be expensive and difficult for the Federal Reserve to manage. A Federal Reserve CBDC could, in essence, set up the Federal Reserve as a retail bank to the general public. That would mean introducing large-scale, resource-intensive central bank infrastructure.

We will need to consider whether the potential use cases for a CBDC justify such costs and expansion of the Federal Reserve's responsibilities into unfamiliar activities, together with the risk of politicization of the Fed's mandate that would come with such an expansion.

To conclude, I emphasize three points. First, the US dollar payment system is very good, and it is getting better. Second, the potential benefits of a Federal Reserve CBDC are unclear. Third, developing a CBDC could, I believe,

pose considerable risks. So, our work is cut out for us as we proceed to rigorously evaluate the case for developing a Federal Reserve CBDC. Even if other central banks issue successful CBDCs, we cannot assume that the Federal Reserve should issue a CBDC.

The process that Chair Powell recently announced is a genuinely open process without a foregone conclusion, although obviously I think the bar to establishing a US CBDC is a high one. The upcoming discussion paper that constitutes the first step in this process will importantly ask for input from the public.

I look forward to reviewing public input on the discussion paper, which will inform the Federal Reserve's ultimate evaluation of a potential CBDC. ■

Randal K Quarles is Vice Chair for Supervision of the Federal Reserve Board

Endnotes

1. See Central Bank Digital Currencies: Foundational Principles and Core Features (Basel: Bank for International Settlements, October 9, 2020). Return to text

2. "Fedwire Funds Service—Monthly Statistics", Federal Reserve Bank Services, accessed June 27, 2021.

3. See "About CHIPS", The Clearing House, accessed June 27, 2021.

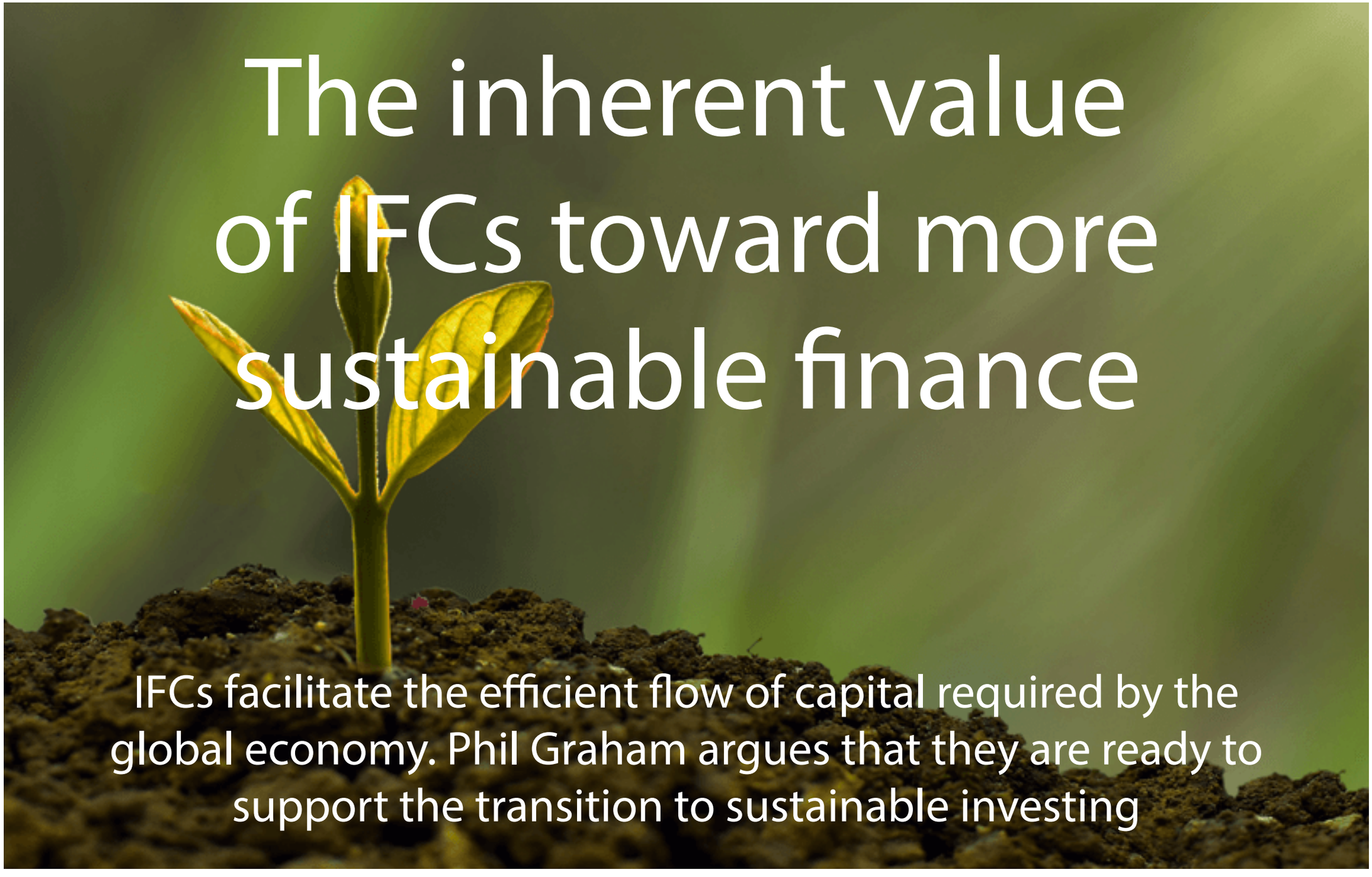
4. Financial Stability Board, "FSB Delivers a Roadmap to Enhance Cross-Border Payments," news release, October 13, 2020.

5. Board of Governors of the Federal Reserve System, 2019 Federal Reserve Payments Study (Washington: Board of Governors, December 2019).

6. Financial Stability Board, Regulation, Supervision and Oversight of "Global Stablecoin" Arrangements (Basel: Financial Stability Board, October 13, 2020).
7. See https://joinbankon.org/
8. "Key Findings from How America Banks: Household Use of Banking and Financial Services", Federal Deposit Insurance Corporation, accessed June 27, 2021.
9. It seems unlikely, for example, that people who avoid bank accounts because of concerns about privacy or trust in the banking system, rather than the cost of such accounts, will greatly prefer having accounts with the Federal Reserve.
10. The Federal Reserve also needs to consider whether private-sector stablecoins could disintermediate deposits out of the banking system, but in general, the risk of disintermediation should be lower for stablecoins compared to a CBDC. Importantly, if a stablecoin is backed by short-term securities, the stablecoin provider must take the funds received in return for the issuance of stablecoins and purchase short-term securities for the stablecoin "anchor" pool. The seller of those securities will then take the funds received and put them back into the banking system.
11. Private-sector stablecoins are also subject to cyber risk, of course, but any individual private stablecoin network would be less systemic than a CBDC for an entire advanced economy, and private companies are frequently better able to make the rapid and constant investment in technology required to keep current with technological security threats.
12. See, eg., 31 U.S.C. § 5318(h).

This article is based on a speech delivered at the 113th Annual Utah Bankers Association Convention, Sun Valley, Idaho, June 28, 2021

The inherent value of IFCs toward more sustainable finance



IFCs facilitate the efficient flow of capital required by the global economy. Phil Graham argues that they are ready to support the transition to sustainable investing

Sustainable finance and the integration of Environmental, Social, and Governance (ESG) considerations into financial decision-making is fast becoming an integral feature of the global investing environment, with a rising and palpable expectation on the part of investors for action on issues that deeply impact our world.

Indeed, this will be a key topic as leaders across the world meet in Glasgow in November for the United Nations Climate Change Conference, also known as COP26. With a track record of international collaboration on a wide range of global issues, International Finance Centres (IFCs) are ready to play a role in supporting the shift to a more sustainable global economy.

Defining sustainable investing

Sustainable investing is fundamentally motivated by organisations and their investors seeking to do business in a way that helps solve the world's most pressing challenges. These solutions can range from green bonds to thematic investing approaches that are aligned to specific environmental outcomes, for example the UN Sustainable Development Goals.

Interestingly, the world's largest asset manager, Blackrock, divides its focus into two main strategies for sustainable investment; 'avoid' or 'advance'. Avoid involves the removal of companies and sectors from the investment portfolio that are associated with negative ESG risk or violate certain fundamental values. Advance focusses on companies and sectors that have strong ESG credentials, targeting specific positive outcomes.

Time to make the change

Sustainable investing is no longer the future of investing – it is today's reality, widely recognised as creating favourable social and economic outcomes.

Investment funds and asset managers are continuing to enhance standards, increase transparency, and use the power of their capital and investment decisions to address key issues facing governments and global citizens alike - all while also of course trying to ensure that they generate better returns for shareholders. According to BlackRock's *2020 Global Sustainable Investing Survey*, over half (54%) of global investors consider sustainable investing to be fundamental to investment processes and outcomes.

In many ways, the COVID-19 pandemic has fuelled demand for sustainable investments. It has been a stark reminder of future exogenous risks that can shatter our world as we know it.

For the investment funds industry, many of which have vehicles domiciled in IFCs, non-financial sustainability is an increasingly important element of fiduciary duty

Historically, sustainable investing was simply about 'negative-screening', for example the exclusion of certain types of companies from investment mandates. But this is no longer the case. Across the investment community there is active consideration of non-financial impacts as well as pecuniary returns.

For the investment funds industry, many of which have vehicles domiciled in IFCs, non-financial sustainability is an increasingly important element of fiduciary duty.

Opportunity for IFCs

According to the Global Sustainable Investment Alliance (GSIA), global sustainable investment is now over US$35 trillion, accounting for over a third of global assets.

This incredible growth and mainstreaming of sustainable investments drives institutions to look at areas that will achieve the greatest possible outcome (both morally, socially and financially), which in turn provides numerous opportunities for IFCs which act as the essential plumbing for the international financial market.

A rapidly growing share of the opportunities are concentrated in markets well outside the well-trodden paths of Europe and North America and instead focus acutely on the emerging markets sector, especially where the opportunity to make a true impact is vital. But to cater for unstable political environments and investor bases many thousands of miles away, it is essential that the vehicles used to meet the needs of the industry fit certain key criteria.

Companies incorporated in the BVI are, by most measures, the most popular offshore holding structure in the world. BVI Business Companies hold approximately US$1.5 trillion of assets. Furthermore, investment mediated by

its international business and finance centre supports around 2.2 million jobs worldwide and, each year, contributes over US$15 billion to government coffers around the world.

Whilst vehicles domiciled in IFCs are of course used for a wide variety of different purposes, there are a number of common factors which feed into the success of the BVI product and make them highly advantageous in this environment.

These include the jurisdiction's essential tax neutrality, the speed and efficiency of its world-renowned Corporate Registry its common law legal system with final appeal to the Privy Council in London, and cost-efficiency as compared to any other equivalent IFC.

The BVI is also committed to ensuring that it meets the constant demands of international standards around money-laundering and international crime, whilst also ensuring that the right to confidentiality is protected at all times.

The jurisdiction's adaptable and sophisticated legislative framework, which includes a focus on ensuring that anything from joint ventures, M&A, ListCos, and fund vehicles are adaptable to both international markets and the private and public sector, guarantee that in this very fast moving ESG environment, the products available to clients are constantly fit for purpose.

In fact, this final point is critical. The speed with which the market is growing and changing plays to one of the many strengths of all IFCs, but the BVI in particular: a commitment to innovation and adaptability that has been consistently demonstrated for over 35 years now.

It is with that in mind that IFCs are seeing the ESG momentum become an industry sector in its own right and indeed, the BVI has seen a significant uptake in the number of fund vehicles and joint ventures formed and launched this year with a green and sustainable focus.

IFCs: nurturing sustainable finance and ESG projects

The in-flows and out-flows of vital capital through BVI vehicles has facilitated domestic investment in homes, factories, hospitals, railways, broadband, machinery, entrepreneurs and a host of other assets which otherwise would not have found proper funding.

The BVI's robust legal system provides not only the neutral platform, but also a critical layer of protection for global investment to take place into these emerging economies.

What's becoming more and more clear though, is that we need to commit to ensuring that sustainable finance truly works. To do this, the regulation in this area needs to be smart – flexible to meet the challenges without putting up roadblocks, but still penalising irresponsible behaviour at a systemic level.

Such regulation doesn't need to be onerous, and for the BVI this fits well with its robust regulatory framework that provides protection, without unnecessary complexity.

From the side-lines to centre-stage

In the last five years, the importance and value placed on sustainable finance has increased dramatically and shows no signs of slowing down.

IFCs have always looked to provide the critical framework to facilitate the efficient flow of capital that the global economy needs, and their role now has never been more important. IFCs are ready to play their part in supporting the transition to more sustainable investing. ■

Phil Graham is Global Head of the Investment Funds & Regulatory Department at Harneys British Virgin Islands

The green transition, finance and biodiversity: aim high, shoot higher

René Karsenti and Apostolos Thomadakis argue that financing the energy transition requires a comprehensive shift in how the financial system works

The urgency to succeed in financing the energy transition and reorienting private capital to sustainable investments requires a comprehensive shift in how the financial system works. The role of major market participants, investors, and policymakers in facilitating this shift is essential. To develop more green and sustainable economic growth, there is a need to:

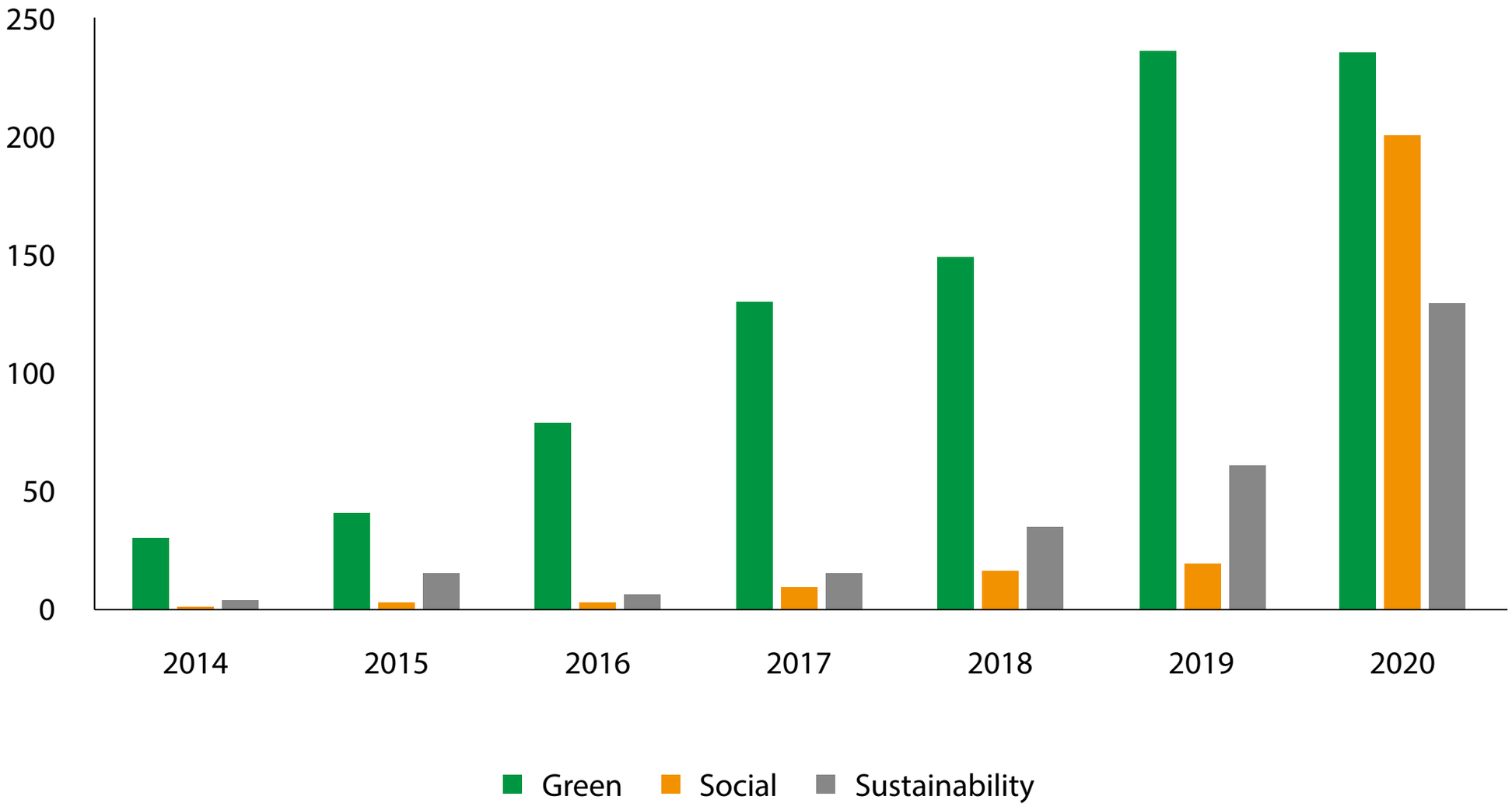
1. broaden access to the market through innovation and diversification;
2. further develop global standards and taxonomies;
3. enhance disclosure and reporting;
4. fully incorporate fintech and digitisation;
5. fully address biodiversity and nature-related risks

Beyond its quasi-moral obligation, mobilising finance for the energy transition is a historic opportunity, especially for the EU to act and lead as a true pioneer, that should not be missed.

Fifteen years ago, green, social and sustainability bonds (or sustainable bonds, collectively) were non-existent, while the green issuance volume was still a miniscule share of the bond market. Institutions such as the European Investment Bank (EIB), the World Bank Group (WBG), the International Capital Market Association (ICMA), and the International Finance Facility for Immunisation (IFFIm), have been trailblazers and put forward several significant initiatives.

As a result, building on such and other subsequent initiatives, the market has grown exponentially and moved from an aggregate issuance of €35 billion in 2014 to €568 billion in 2020 (see Figure 1). Today, the total value of outstanding sustainable bonds is at €1.6 trillion[1].

Figure 1. Global issuance of green, social and sustainability bonds (€ billion, 2014-2020)



Note: The process followed by the CBI to classify a green bond as eligible covers the following steps: i) identification of climate- themes and self-labelled debt; ii) screening sectors and green credentials to determine if the proceeds will finance eligible green expenses/assets/projects/activities; iii) evaluating the use of proceeds threshold. For more information on the Green Bond Database Screening Process, see here.
Source: Climate Bonds Initiative.

In the shadow of the pandemic

The COVID-19 pandemic has caused colossal damage since the beginning of 2020. It has been estimated that the cumulative cost to the global economy in 2020-21 would be over €10 trillion[2]. More importantly, it has pushed hundreds of millions of additional people into poverty across the world, while it has disrupted progress towards achieving the United Nations (UN) Sustainable Development Goals (SDGs)[3].

The decade ahead promises to be exciting, with new tools, participants, practices, and standards coming to the fore that will help us to navigate the climate transition

But, at the same time, it made clear the important role that capital markets play in intermediating capital to rebuild shattered economies. Indeed, the pandemic has served as an accelerant for growth in the sustainable bond markets. sustainable bond issuance totalled around €411 billion in the first half of 2021, nearly a 60% year-on-year growth from H1 2020[4].

In particular, social issues have gained momentum and emerged as a key instrument in financing a post-COVID 'sustainable recovery'. This segment represented 36% of the total sustainable bond issuance in 2020, up from 6% in 2019.

This is a remarkable development since the creation of the first IFFIm Vaccine Bond in 2006. Although many were concerned that the focus on social bonds would detract from progress in the green bond market, in fact the complete opposite has been the case.

Green and environmental considerations have been hard-wired into the countries' post-COVID programmes, both on the funding and disbursement side. What's also noticeable is that more than 95% of the sustainable bonds issued in 2020 reference ICMA's Green and Social Bond Principles[5].

Despite these positive developments, more needs to be done. Below we identify five key areas in which renewed focus should be given. For the remainder of this particular piece we will concentrate primarily on the fifth and final area.

- Broaden the market through innovation and the diversification of market participants and products in the green and sustainability space[6].

- Develop global standards further and ensure taxonomies are as harmonised as possible – in close consultations with market players – to avoid fragmentation.
- Enhance disclosure in reporting by issuers and investors, including on their climate transition strategy to generate even more confidence and robustness[7].
- Incorporate fintech and digitalisation as the main driving forces for the development of capital markets[8].
- Fully address biodiversity and nature-related risks, which has been identified as one of the top five risks in terms of likelihood and impact in the coming 10 years[9].

Assessing the risks

To effectively address biodiversity, it is important to first distinguish nature-related risks from climate change-specific risks, and then to find ways to properly measure them. Nature-related risks (encompassing biodiversity loss and ecosystem degradation) and climate-related risks, are both essential components for the accurate assessment of environmental risks.

Although they are highly interconnected, at the same time they are distinct from each other. Nature-related risks broadly refers to the risks to an organisation posed by the linkages between its activities and the natural world[10]. These can be shorter-term risks, as well as longer-term risks arising from its impact and dependency on nature.

On the other hand, climate change risks can be categorised into two broad categories, those risks related to the physical impacts of climate change (eg. acute risk, chronic risk), and risks related to the transition to a lower-carbon economy (eg. policy and legal risks, technological risks, market risks, reputational risk)[11].

However, some of these risks have been carried over into nature-related risks – namely physical (eg. the loss of mangrove swamps), transition (eg. the closure of soft drinks plants in India due to their impact on water

shortages), and litigation (eg. bond investors taking legal action against a Californian energy utility company for misrepresenting the risks of wildfires).

Moving into the measurement of such risks, Gross Domestic Product (GDP) has so far failed to clearly capture the depreciation of changes in biodiversity[12]. Nevertheless, according to the World Economic Forum (WEF), half of global GDP in 2019 was moderately or highly dependent on natural capital[13].

Although the depreciation and loss of natural capital has been a primary source of 'economic growth', it has not been taken into account in the calculations. Thus, there is need to capture the true value (or 'accounting prices')[14] of natural capital. This will allow for accurate measurements of the financial costs and risks and avoid further rapid destruction of our common biodiversity.

Developing comprehensive risk measures beyond the impact on GDP, are critical for market participants in their investment decisions. Banks and investors may be adversely affected by climate change risks, for example by holding the sovereign bonds of countries that are highly dependent on the over-exploitation of natural resources. In a case like this, the risk is under-priced by the market and needs to be clearly assessed and reported.

There is also need for a new set of international impact-weighted accounting standards, similar to the introduction of the international accounting standards after the 1929 Great Depression.

In essence, a standardised tool to measure the net impact that companies have on both the environment and people. More generally, although metrics that incorporate nature loss into risk models already exist[15], there is no single and widely accepted method for measuring biodiversity foot printing. Risks are far from negligible.

A 2018 assessment exercise found that 13 of the 18 sectors in the FTSE 100 (at that time having a total of approximately €1.4 trillion in net market capitalisation) have a high dependence on natural capital (including assets such as forests, water, fish stocks, minerals, biodiversity and land)[16].

This poses significant challenges to achieving the sustainable development objectives and poverty reduction.

Global commons – a radical proposition?

The long-term objective is to bring aggregate demand in line with aggregate supply; meaning that global demand must equal the biosphere's ability to meet the supply on a sustainable basis. This so-called 'impact equation' illustrates how the biosphere can heal itself over a set period[17].

But the current rate of depletion, driven by activity to create physical and human capital, threatens our fundamental life support system – the natural environment.

Perhaps a more visionary – and at the same time controversial – proposal for preserving natural capital, calls for the creation of a global Commons Fund (Dasgupta, 2021)[18]. Such an initiative would require an international organisation to monitor and manage forms of natural capital as global public goods.

This would be similar to the way the World Bank advances the cause of global economic development, and to the International Monetary Fund (IMF) when it comes to the rescue during instances of financial instability.

Global commons are like the Seven Seas – no one pays for their use as long as access to them is free. Such a rather controversial proposal might essentially entail the introduction of a new form of rent, to be collected through a

global organisation. The money raised would pay the compensation required to prevent further deterioration of the natural world.

However, this should not be perceived as an additional taxation to financial preservation, but instead as a way in which the global commons could (themselves) generate the funds needed to restore natural capital (ie. the air, water and land).

Conclusions

In 2015 Mark Carney – at that time Governor of the Bank of England – warned about "*the tragedy of the horizon*" and highlighted the important role of finance in accelerating short- and long-term climate change[19].

Progress in green and sustainable finance has been impressive since then, while the COVID-19 pandemic has proven its importance going forward.

The decade ahead promises to be exciting, with new tools, participants, practices, and standards coming to the fore that will help us to navigate the climate transition. The future of finance should be green and sustainable.

But to achieve this, it needs to be mindful of its environmental and social impacts, invest in the future, and also protect the ecosystem, and save lives. Let's not miss the opportunity to make a real and lasting impact. ■

René Karsenti is Senior Adviser and former President of the International Capital Market Association (ICMA), former Board Chair of the International Finance Facility for Immunisation (IFFIm), Honorary

Director General of the European Investment Bank (EIB) and former Chairman of the European Capital Markets Institute (ECMI) Board, and Apostolos Thomadakis is a Researcher at ECMI and CEPS

Endnotes

1. Based on data from the Environmental Finance Bond Database, accessed on September 9, 2021.

2. See IMF (2020), "World Economic Outlook Update: A Crisis Like No Other, An Uncertain Recovery", June, International Monetary Fund.

3. Latest estimates put the number of newly poor people as a consequence of COVID-19 in 2020 to rise to between 119 and 124 million. See WB (2021), "Global Economic Prospects", June, World Bank.

4. See the Climate Bonds Initiative's Sustainable Debt Market Summary for H1 2021.

5. See Green Bond Principles (GBP) and Social Bond Principles (SBP).

6. The last few months have proved to be a period of remarkable innovation, with the launch of the ICMA's Sustainability-Linked Bond Principles last June and the Climate Transition Finance Handbook in December.

7. There is a need for a new set of international Impact-weighted accounting standards, similar to the introduction of the international accounting standards after the 1929 Great Depression. This would be a standardised tool to measure the net impact that companies have on the environment and on the people.

8. A striking commonality between FinTech and sustainability is the need for common standards and harmonisation. FinTech could be used to develop common platforms, particularly in the sustainable finance sector for oversight, to facilitate comparability, and provide dynamic insights into environmental, social and governance (ESG) performance and reporting. For data providers, regular and more frequent ESG reporting is paramount to harness analytics and create greater transparency.

9. See WEF (2020), "The Global Risks Report", 15 January, Word Economic Forum. Moreover, it has also been advocated by market participants and investors through the United Nations' Principles for Responsible Investment (PRI), as well

as the international alliance Act4Nature, while it is one of the six environmental objectives under the EU Taxonomy which is central to the EU's Biodiversity Strategy 2030. Other important initiatives towards this direction include: the Natural Capital Financial Facility (NCFF), a partnership between the EIB and the European Commission which has already resulted in the EIB issuing a Sustainability Awareness Bond with a biodiversity theme in early January, the Taskforce on Nature-related Financial Disclosures (TNFD), the Finance for Biodiversity (F4B) which proposes a dedicated international Nature and Climate Sovereign Bond Facility, the Biodiversity Finance Initiative (BIOFIN), and the Sustainable Blue Economy Initiative. More recently, it was released in the UK as part of the Dasgupta Review on the Economics of Biodiversity, commissioned in 2019 by HM Treasury.

10. See the TNFD (2021), "Nature in Scope: A Summary of the Proposed Scope, Governance, Work Plan, Communication and Resourcing Plan of the TNFD", June, Taskforce on Nature-related Financial Disclosures.

11. See TCFD (2017), "Recommendation of the Task Force on Climate-related Financial Disclosures", June, Task Force on Climate-related Financial Disclosures.

12. See Dasgupta (2021), "Economics of Biodiversity: The Dasgupta Review", February, HM Treasury.

13. See WFE (2020), "Nature Risk Rising: Why the Crisis Engulfing Nature Matters for Business and the Economy", January, World Economic Forum.

14. A capital good's accounting price refers to the contribution an additional unit of it would make to the flow of social benefits.

15. Such as the Exploring Natural Capital Opportunities, Risks and Exposures (ENCORE) tool, developed by the Natural Capital Finance Alliance (NCFA), or the Integrated Biodiversity Assessment Tool (IBAT).

16. This is based on NCFA's ENCORE database.

17. See footnote 11.

18. Such a proposal might be carried by the UK to the 26th United Nations Climate Change Conference of the Parties (COP26) taking place later in November, and promoted more widely.

19. See "Breaking the Tragedy of the Horizon – Climate Change and Financial Stability", speech on 29 September 2015.

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Can climate change be tackled without ditching economic growth?

Klaas Lenaerts, Simone Tagliapietra and Guntram B Wolff explore whether decarbonisation and economic growth are compatible to reach net zero by 2050

Higher levels of economic activity tend to go hand-in-hand with additional energy use and consumption of natural resources. As fossil fuels still account for 80 percent of the global energy mix, energy consumption remains closely related to greenhouse gas emissions and hence to climate forcing.

This paper explores whether decarbonisation and economic growth are compatible or whether the world economy needs to grow less to be able to reduce greenhouse gas emissions fast enough to reach net zero in 2050. The literature provides profoundly different answers to this question, with scholars positioning along a spectrum that extends from the most optimist version of 'green growth' theories to sceptical 'degrowth' theories.

While globally, CO_2 emissions per unit of GDP are declining, the decoupling rate from 1995 to 2018 was only -1.8 percent annually. To achieve net zero by 2050, the rate would have to accelerate to -8.7 percent, assuming population and GDP growth projections as given, or by a factor of almost five.

To keep GDP growth and population at their projections and thus reject the proposition of degrowth, decoupling would have to accelerate massively. Two avenues are crucial: reducing the energy intensity of production and/or the emissions intensity of energy.

The huge fall in the price of renewable energy provides hope that decoupling can accelerate. Decoupling rates have accelerated in the last decade and decoupling is substantially faster in the European Union. In the EU, we estimate that decoupling only has to accelerate by a factor of 2.5.

We do not think degrowth propositions advanced in the literature will be pursued and therefore focus on the main challenges that must be tackled to achieve decoupling. Unprecedented efforts are required to achieve green growth. But hoping for humanity to sacrifice growth appears unrealistic.

1 Introduction

Climate change is one of the most pressing issues of our time. The science is clear: human activities have already caused approximately 1°C of global warming and at current rates will likely cause 1.5°C of global warming above pre-industrial levels between 2030 and 2050 (IPCC, 2018).

With the Paris Agreement, governments have committed to limiting the temperature increase to well below 2°C above pre-industrial levels and to pursuing efforts to limit it to 1.5°C (UNFCCC, 2015). Keeping global warming below this limit will require global greenhouse gas (GHG) emissions to quickly decline by at least 45 percent from 2010 levels by 2030, and to reach net-zero by 2050, with negative emissions thereafter (IPCC, 2018).

Economic growth has historically been the main driver of rising environmental damage and GHG emissions. To achieve such deep emission cuts, the world would have to either decouple global GHG emissions from gross domestic product (GDP) or face deep cuts to GDP.

The numbers we present in sections 2 and 3 are sobering: current projections of global population size and GDP per capita imply that the world must reduce the rate of CO_2 emissions per unit of real GDP by around 9 percent per year on average to reach the climate targets described above. Between 1990 and 2016, global emissions per unit of real GDP decreased only by 1.8 percent per year.

Confronted with these facts, scholars disagree about whether humanity can afford continued economic growth. The so-called 'green growth' literature is optimistic that suitable policies and technology will reduce emissions to sustainable levels while allowing for continued or even boosted economic growth.

This thinking is shared by several governments and institutions. For instance, the European Commission defines its European Green Deal as 'Europe's new growth strategy'. Degrowth scholars on the other hand dismiss this and argue that the global economy must be scaled down, and that systemic change and redistribution is necessary to accomplish this and address the *"fairy tales of eternal economic growth"*, as campaigner Greta Thunberg told world leaders in 2019[1].

On some level, this academic debate on extreme positions is largely theoretical. Developing countries will want to grow and will implement policies to that effect. The idea of deeper cuts to GDP in rich countries is also theoretical: economic growth is of central importance for welfare and issues such as debt sustainability, pensions and social security.

A shrinking or 'degrowing' economy could potentially also exacerbate the distributional implications of decarbonisation that will arise regardless (see for example Markkanen and Anger-Kraavi, 2019).

Yet, the sharp contrast in the theoretical positions of scholars is a way to conceptualise the magnitude of the challenge. Striving for green growth is an imperative, but no one can be certain ex ante that such a path is possible. What is certain is that it cannot happen without some key prerequisites.

It will require massive investment in existing green technologies and in the advancement of new breakthrough technologies, including for negative emissions. It will also require changed behaviour from everyone, and our economies will have to be adapted to deal with the consequences of climate change that can no longer be avoided.

The paper is structured as follows. Section 2 presents the numbers that make clear how significant the problem of decoupling is. Section 3 reviews the literature on degrowth and explains why degrowth proposals are not viable.

Section 4 summarises the literature on green growth. Section 5 discusses essential steps for the realisation of green growth. Section 6 concludes with recommendations for policymakers.

2 The challenge of decoupling: the hard numbers

Pursuing deep decarbonisation will be challenging. Annual global GHG emissions keep rising and show no sign of peaking. In 2019, they were 62 percent higher than in 1990, the year of the first Intergovernmental Panel on Climate Change report, and 4 percent higher than in 2015 when the Paris Agreement was signed (Friedlingstein **et al** 2020).

Even unprecedented circumstances such as the massive restrictions introduced to contain COVID-19 led only to a 6 percent drop in emissions in 2020, from which a quick rebound to pre-pandemic levels promptly followed (IEA, 2021a).

Historically, economic growth – by which we mean real GDP growth – has long been associated with increasing GHG emissions. Empirically, the causal chain is straightforward: higher levels of economic activity tend to go hand in hand with additional energy use and consumption of natural resources.

Fossil fuels still account for 80 percent of the global energy mix (IEA, 2020), and so energy consumption is closely related to GHG emissions and hence to climate forcing. Expansion of industrial processes, livestock rearing and other agriculture adds to emissions, while deforestation reduces carbon sinks.

A far-reaching transformation of the global economy is needed to reduce emissions. As 73 percent of global GHG emissions come from energy production (mostly as CO_2), most reductions will need to happen in that area[2]. An interesting way to look at this is by formulating the problem as a simple identity, as done by Kaya and Yokoburi (1998) on the basis of Holdren and Ehrlich (1974):

$$GHG\ emissions = population * \frac{GDP}{population} * \frac{energy\ demand}{GDP} * \frac{GHG\ emissions}{energy\ demand}$$

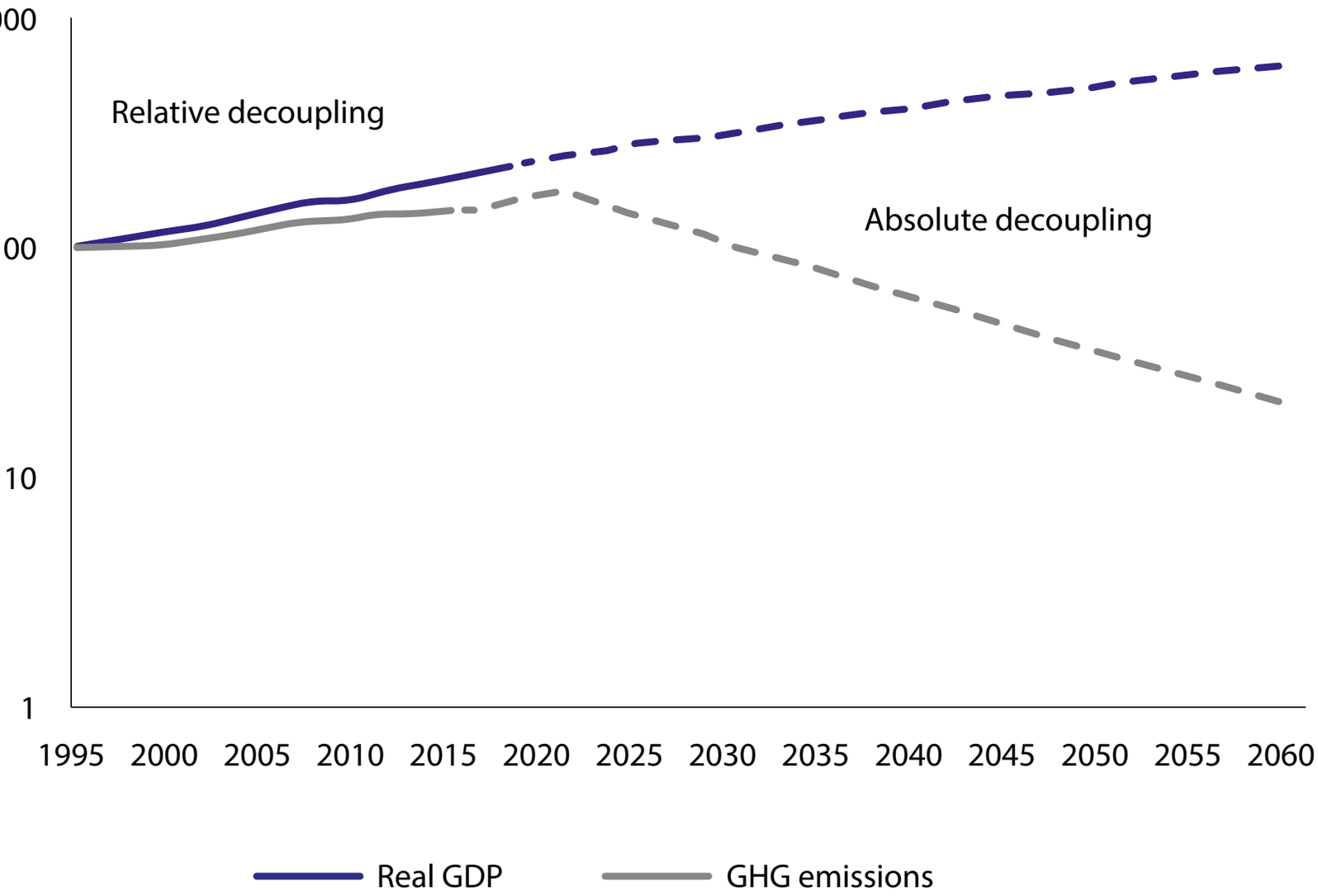
This identity permits GHG emissions (from energy production) to be decomposed into a product of the world's population size, GDP per capita, the energy intensity of GDP and the GHG emissions intensity of energy production[3].

Limiting population growth is one way to limit GHG emissions growth, but the debate on this topic goes far beyond the scope of our paper. We instead consider population growth as a given and base our analysis on OECD demographic forecasts. Cutting emissions would therefore need to happen by lowering some or all of the other factors.

Since lowering the second factor (GDP per capita) implies compromising economic and social welfare, the core question is whether the third and fourth factors (energy and emissions intensity) can decline at a sufficient speed to allow the first and the second to remain on their current paths.

This would imply an absolute decoupling of economic growth and GHG emissions (ie. a situation in which GHG emissions go down while real GDP continues to grow, see Figure 1) through a 'dematerialisation' of the economy (eg. through a shift from manufacturing to services), altered consumption behaviour, more efficient technology and the decarbonisation of the energy sector.

Figure 1. Global real GDP (2010 prices, PPP) and total GHG emissions



Note: 1995 =100. Logarithmic scale. Full lines are historical data, dots are OECD projections, dashes are a stylised representation of absolute decoupling.
Source: Bruegel, based on OECD, Economic Outlook No 103 – Long term baseline projections, accessed in July 2021 and on UNEP, World Environment Situation Room, accessed in July 2021.

Globally, there is no sign of absolute decoupling, but only of relative decoupling (ie. a situation in which total GHG emissions grow less than proportionately to real GDP).

Explained in terms of the Kaya identity, while energy related GHG emissions per unit of GDP are falling (the third and fourth factors combined), the fall is slower than the increase in real GDP (the first and second factors) so that overall emissions continue to rise.

In order to avoid global warming in excess of 1.5°C above pre-industrial levels, global GHG emissions must be rapidly reduced. Doing this without losses in economic prosperity will not be easy...

Figure 2 shows that in the last 100 years, annual CO_2 emissions from energy production have risen tenfold[4], even though emissions per unit of GDP have been slashed by almost two thirds (1.8 percent per year on average since 1990). This is simply because the global economy has grown at a much faster pace (2.8 percent per year on average since 1990).

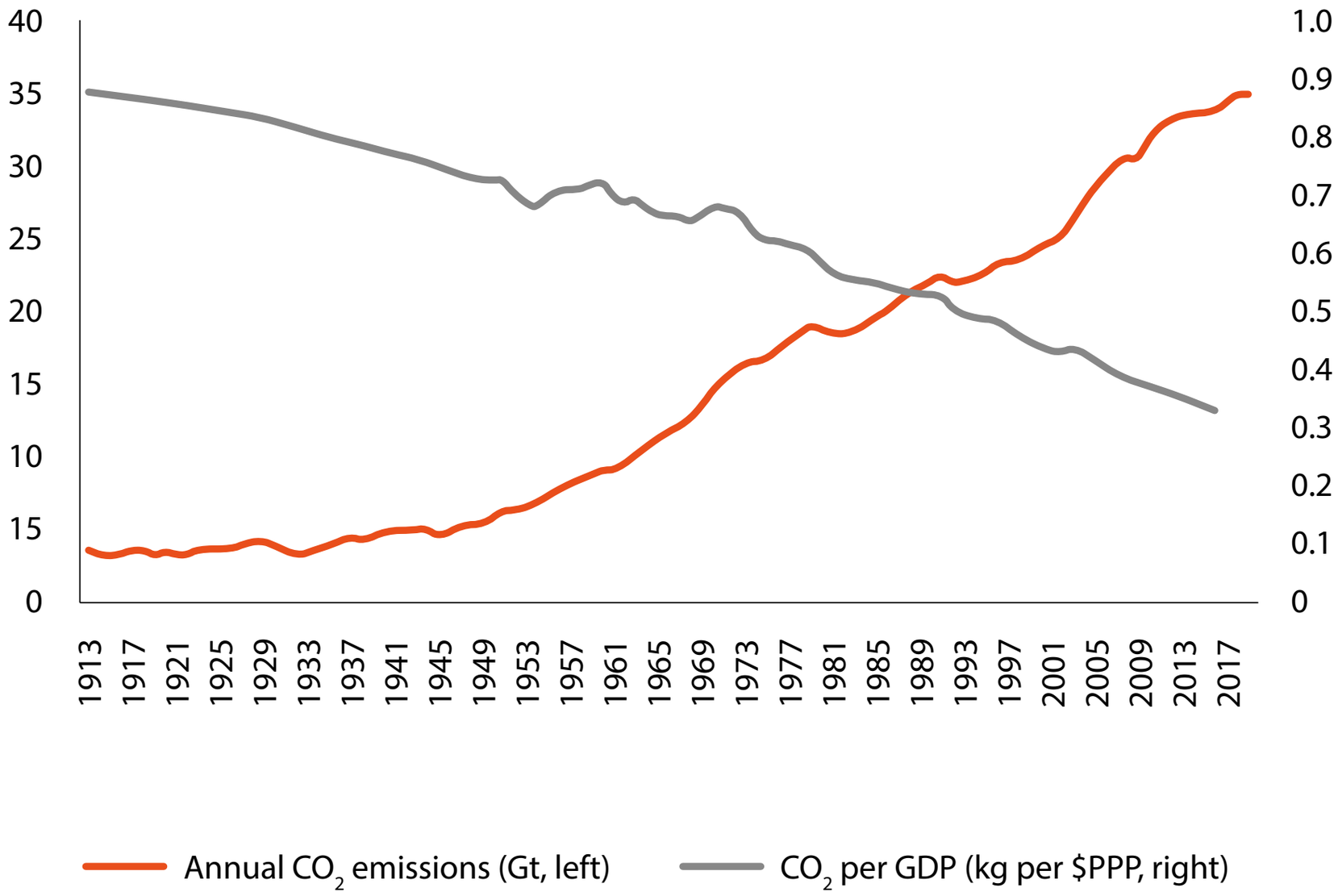
Thus, progress on decoupling GDP growth from CO_2 emissions has been achieved, but the continued expansion of the global economy has proven too fast to stop annual emissions from increasing, let alone to allow them to decrease, as is clear from Figure 2. A rough calculation (disregarding interactions between the factors of the Kaya identity) makes clear how far the world is still falling short:

- Gross emissions of CO_2 stood at around 35 billion Gt in 2018 (Our World in Data, OWID). This needs to decrease to approximately 5 Gt in 2050 according to a technologically conservative emissions pathway[5] of the IPCC (2018), or by 86 percent.

- The global population is projected to increase from 7.63 billion in 2018 to 9.77 billion people in 2050 (x1.28), and global real GDP per capita (2010 prices) is projected to increase from $19,896 to $41,099 or by 107 percent (OECD).

- CO_2 emissions per unit of GDP therefore have to decline by around 95 percent or approximately 9 percent per year on average from 2019 until 2050. Between 1990 and 2016, the world only achieved an average so-called 'decoupling rate' of 1.8 percent per year (based on OWID)[6]. Put differently, the average speed of decoupling during the next three decades will have to be almost five times greater. The later this acceleration happens, the greater it will have to be.

Figure 2. Global annual CO_2 emissions from burning of fossil fuels for energy production (in gigatonnes) and CO_2 emissions per unit of GDP (in kg per $PPP)



Source: Our World in Data (OWID) CO_2 Data Explorer (based on Global Carbon Project; BP; Maddison; UNWPP), accessed in July 2021; see https://ourworldindata.org/co2-emissions

Decoupling trends are not even fast enough in developed economies. Since 1990 the European Union's (EU) gross CO_2 emissions have decreased by 25 percent (OWID), while real GDP grew by 62 percent (European Commission, 2020a).

CO_2 emissions in the United States also started to decline more recently. This suggests that absolute decoupling is possible. But it is happening too slowly to match the globally required decoupling rate: the average EU decoupling rate was 3.4 percent per year between 1990 and 2016, while in the US it was 2.2 percent (OWID).

However, this is not the whole story. Developed economies such as the EU and the US import a lot of goods that are produced elsewhere, and thus GHG emissions attributable to consumption are somewhat higher than territorial emissions.

Fortunately, these broader emissions are also declining for the EU (Friedlingstein *et al* 2020). Once consumption-based territorial emissions are taken into account, the average decoupling rate for the EU is 2.3 percent per year since 1990 and 2.0 percent per year for the US (based on Friedlingstein *et al* 2020 and World Bank data), both lower than the rates based on territorial emissions.

3 Degrowth

Guided by past experience, the basic premise of degrowth theorists is that the world will not be able to sufficiently reduce GHG emissions while GDP grows.

In particular, they point to the fact that some of the technologies playing a relevant role in IPCC simulations, such as carbon capture and storage (CCS) applied to fossil power plants, or bioenergy with carbon capture and storage

(BECCS), do not yet exist and should not be relied on; their economic viability is unproven and they could even create new environmental problems (Keysser and Lenzen, 2021).

Such pessimistic views about our planet's capacity to sustain economic growth are not new. They have been around in some form at least since the *Essay on the Principle of Population* by Thomas Malthus (1789). He postulated that famines and economic collapse were inevitable unless birth rates decreased, based on the belief that population growth is exponential and growth of food production merely linear.

This argument was echoed throughout the twentieth century in environmentally inspired works by, for example, Osborn (1948) and Vogt (1948) and, most notably, in *The Population Bomb* by Paul Ehrlich (1968). Meadows *et al* (1972) predicted in *The Limits to Growth* (hereafter: LTG) that global population and economic activity would peak in the early twenty-first century, and advocated an economic and demographic 'equilibrium state' to avoid an uncontrolled collapse when humanity's need for resources finally exceeds the earth's capacity.

These authors all proved to be too pessimistic (at least so far) because they failed to predict the significant advances in agricultural yields, technological innovation and substitution, and declines in population growth rates.

Advances in resource efficiency have often been driven by market forces, such as for oil in the 1970s, when scarcity drove up prices, creating incentives for innovation.

However, technological progress is highly unpredictable, and since the atmosphere as a deposit for CO_2 is a rival but non-excludable good, purely market-driven innovation and substitution will not solve the problem of climate change (Eastin *et al* 2010).

Like LTG, modern degrowth theories subscribe to the idea that humanity must achieve a lower economic 'steady state' to avoid environmental catastrophe. The term 'degrowth' was probably first used in the writings of French philosopher André Gorz in 1972, and in the work of economist Georgescu-Roegen (1971, 1979), who wrote that economic activity in the long run is limited to a level supported by solar flows due to the laws of thermodynamics.

The term was popularised in the 1990s and 2000s by Serge Latouche (for example Latouche, 2009) who criticised economic development as a goal. In the early 2000s 'degrowth' was used as a slogan by social and environmental activists in France, Italy and Spain.

Finally, it emerged as an international research area in 2008 at the first Degrowth Conference in Paris (Demaria *et al* 2013; Kallis *et al* 2018), with many publications being produced, particularly in the first half of the 2010s, in the context of the global financial crisis and the sovereign debt crisis in Europe.

Authors including Giorgos Kallis (eg. Kallis, 2011), Jason Hickel (eg. Hickel, 2020), Tim Jackson (eg. Jackson, 2009) and Kate Raworth (eg. Raworth, 2017) are today at the forefront. Several variations of degrowth are advocated under different names, including 'wellbeing economics', 'steady-state economics', 'post-growth economics' and 'doughnut economics'.

There is no exact definition of what 'degrowth' stands for. Authors are not always clear on exactly what should 'degrow'. There are at least five different interpretations: degrowth of GDP, consumption, worktime, the economy's physical size, or 'radical' degrowth, referring to a wholesale transformation of the economic system (van den Bergh, 2011).

It is perhaps better to say that degrowth covers all these interpretations. Material and energy consumption and the economy's physical size need to degrow, out of a concern for resource depletion and more recently climate change.

Worktime degrowth is one tool to do so, GDP degrowth is an inevitable consequence (not an aim per se), and radical degrowth a necessary condition to make a post-growth economy socially sustainable (Kallis, 2011).

In terms of GDP and GHG emissions, degrowth scholars do not see a credible scenario in which the rate of decoupling of GDP and GHG emissions could be sufficiently high to avoid dangerous climate change (Jackson, 2009), and as such they arrive at the conclusion that global GDP must inevitably decline.

Realising the negative social consequences commonly associated with recessions, degrowth scholars set out to define a path to actively 'guide' GDP downward, rather than to passively let the world slip into a depression. Demaria *et al* (2013, p.209) therefore defined degrowth as a call for *"a democratically led redistributive downscaling of production and consumption in industrialised countries as a means to achieve environmental sustainability, social justice and well-being."*

As the definition suggests, the degrowth literature is not limited to the economy-environment nexus, but is also concerned with (international) redistribution, political participation, social fairness and 'beyond GDP' conceptions of welfare.

Antal and van den Bergh (2016) gathered a few economic arguments directed against the prospect of decoupling through green policies. The most common argument is the existence of a rebound effect from investment in efficiency and clean energy.

This means that as societies invest to reduce emissions, the increased income or savings resulting from those investments will at least partially offset the intended beneficial effects through increased consumption of non-renewable energy elsewhere. In addition, there is a risk that more stringent policies could see lower compliance because of what the authors call an 'environmental Laffer curve', with economic actors preferring to cheat rather than to respect regulations as the expected cost is lower.

A final objection is the possibility of burden-shifting: while not an issue for climate change, other environmental risks could be exacerbated indirectly by emission reduction efforts, for example soil pollution from mining for minerals.

Degrowth proponents advance a myriad of policies as part of a systemic change to make sure that the challenge of economic downscaling necessitated by ecological boundaries does not cause widespread human suffering. We will only touch on them superficially.

Perhaps the most important and common proposal is to limit the supply of production factors, most notably labour. Reductions in working hours are seen as a way to reduce consumption while increasing social welfare through more free time and achieving high levels of employment.

The latter must also be supported by shifting employment towards labour-intensive sectors and steering innovation to increase resource productivity rather than labour productivity, using green taxes and 'cap-and-share' schemes (Kallis, 2011; Kallis *et al* 2018).

Another element is to reduce aggregate investment by firms to net zero, which does not exclude that some (clean) sectors grow at the expense of other (dirty) sectors (Kallis *et al* 2018).

Other ideas found in the literature are the re-localisation of economies to shorten the distance between consumers and producers, and encouragement of the sharing economy (Paech, 2012), as well as new forms of (regional) money and limitations to property rights (Kallis *et al* 2012; van Griethuysen, 2012).

Some advocate for zero interest rates to avoid the growth imperative created by having to pay back interest (Binswanger, 2013), caps on savings to reduce wealth inequality and doing away with the logic of accumulation by firms and owners of capital. The aim is to arrive at a steady state in which the whole economy is consumed, which would end growth (Loehr, 2012).

Importantly, many of the proposed policies are considered by authors themselves to be incompatible with capitalism and unlikely to be implemented by liberal representative democracies.

Kallis *et al* (2018) therefore argued that in the absence of democratic degrowth policies a period of involuntary economic stagnation caused by climate change might usher in an authoritarian version of capitalism, unless more democratic alternatives are put forward.

Finally, it should be noted that degrowth proponents devote relatively little attention to limiting population growth, which would theoretically offer another – though contentious – way to reconcile GDP per capita growth and emission reductions.

Where it is discussed, most authors view it as undesirable, especially when non-voluntary, and point out that the large and growing populations of the Global South put relatively little stress on the environment (Cosme *et al* 2017).

On the whole the proponents of degrowth do point out the size and magnitude of the challenge confronting the world. However, we do not see any likelihood that either advanced or developing economies would accept and implement the radical propositions embedded in the degrowth literature.

We also do not think that it is in any way possible to manage degrowth without massive negative welfare effects. Overall this therefore points to green growth and the need to confront its current limitations.

4 Green growth

The calculations in section 2 illustrate the scale of the challenge. However, it is also important to note that the low decoupling rate up to now has occurred in a context in which there hasn't been a significant climate effort globally, and developed economies have put in place only modest policies. This pattern need not continue, and there are signs that it might not.

The EU has already managed to cut its territorial emissions of CO_2. This is of course partly due to lower population and GDP per capita growth than the global average. But data also shows that the decoupling rate (decline in CO_2/GDP) between 1990 and 2016 stood at -3.4 percent per year in the EU (based on OWID), more than the global average of -1.8 percent.

However, this is not at the required -9.4 percent for the EU's net-zero goal. When we break CO_2/GDP down into its two components from the Kaya identity, energy demand/real GDP and CO_2/energy demand, we see that the higher decoupling rate is mostly due to a decline in the latter: the energy sector has been decarbonised more in the EU than elsewhere.

Tables 1A and 1B show broadly similar evolutions for energy demand/real GDP globally and in the EU (the EU does slightly better), but while the carbon intensity of energy has remained largely stable worldwide, in the EU it has decreased by a yearly average of 0.7 percent since 1995.

Table 1A. Factors of the Kaya identity and CO_2/GDP, average yearly rates of change (%) at global level in historical reference periods and net-zero emission scenario

WORLD	Historical 1995-2018	Net zero scenario 2019-2050	Historical 2005-2018	Net zero scenario 2019-2050
CO_2	1.9	-5.9	1.6	-5.9
Population	1.2	0.8	1.2	0.8
Real GDP per capita	2.6	2.3	2.6	2.3
Energy demand/real GDP	-1.7	-1.7	-1.8	-1.8
CO_2/energy demand	0.0	-7.2	0.0	-7.0
CO_2/real GDP	-1.8	-8.7	-2.1	-8.7

Table 1B. Factors of the Kaya identity and CO_2/GDP, average yearly rates of change (%) at EU27 level in historical reference periods and net zero emission scenario

EU27	Historical 1995-2018	Net zero scenario 2019-2050	Historical 2005-2018	Net zero scenario 2019-2050
CO_2	-0.8	-8.1	-1.6	-8.1
Population	0.2	0.0	0.2	0.0
Real GDP per capita	1.2	1.4	0.8	1.4
Energy demand/real GDP	-1.8	-1.8	-2.1	-2.1
CO_2/energy demand	-0.7	-7.7	0.7	-7.4
CO_2/real GDP	-3.3	-9.4	-3.7	-9.4

Note: targeted gross CO_2 levels in 2050 are based on the LED/P1 pathway of the IPCC (2018) for the global estimates and on the 1.5 LIFE pathway of European Commission (2018) for EU27 estimates. Both pathways rely little on negative emission technologies. Our net zero scenario uses forecasted population and GDP per capita data by the OECD (EU GDPpc approximated by euro area data) and assumes (arbitrarily) that energy demand/real GDP will continue to decline at the same yearly rate as its average in the relevant reference period (1995-2018 or 2005-2018). Note that due to the different sources of the historical data, rates in the historical columns do not add up entirely as can be expected mathematically. We nevertheless made efforts to make the historical data as consistent as possible. Numbers should be interpreted as rough estimations.
Source: Bruegel, based on OWID for CO_2 emissions and CO_2/GDP, OECD (2018) for GDP per capita data, OECD (2021a) for population, OECD (2021b) for energy demand/real GDP, and IEA (2020b) for CO_2/energy demand.

A decline in energy demand/real GDP can be driven by improvements in energy efficiency from using better technologies for production, transport, isolation etc; by behavioural change towards less energy-intensive consumption (eg. increased use of public transport, a larger sharing economy and more re-use of durable goods); and by a changing economic structure towards a more 'immaterial' service-oriented economy.

A decline in CO_2/energy demand is mostly driven by the shift from fossil fuels to renewable energy sources. Changing behaviour also plays a role (choosing to travel by rail rather than by air for example).

So far, energy demand/real GDP has declined more since 1995 than CO_2/energy demand. Perhaps this is somewhat surprising as in the long run it seems more likely that energy would be almost completely decarbonised than that the global economy would be completely 'de-energised': goods still need to be produced somewhere and transport, heating and lighting will remain necessary.

In practice, both factors will have to decline simultaneously to sufficiently reduce gross CO_2 emissions. This is also visible in Tables 1A and 1B, which show that if energy demand/real GDP continues to decline at its current rate, a very steep drop in CO_2/energy demand will be necessary for both the world and the EU.

If energy demand/real GDP is also addressed more strongly, the 'burden' can be spread over both factors of the Kaya identity (see for example the different rates depending on which reference period is used for energy demand/real GDP).

The data presented here suggest that an absolute decoupling of CO_2 and GDP is possible, but that it is currently still too slow to reach net zero. Note that while the required decoupling rate is higher for the EU than for the world, the

EU is closer to its goal: while the overall decoupling rate must increase around five-fold for the whole world, the EU itself only needs less than a three-fold acceleration.

The historical decoupling rate against which to compare also increases if one takes a more recent reference period, as is visible in the table. Speeding-up will still take tremendous effort: if the energy intensity of GDP decreases at the same speed as in the last few decades, even the EU would need to speed up its decarbonisation of energy by a factor of around 11 to reach its required decoupling rate.

The drastic decline in prices of renewable energy technologies suggests that such an accelerated decarbonisation of energy may be feasible. Figure 3 shows that over the last decade, the cost of generating electricity with solar panels has decreased by 85 percent, while the cost of doing so with wind turbines has decreased by 68 percent.

The costs of energy from solar and wind have become lower than fossil fuel alternatives even without subsidies. Firms and governments all over the world would therefore have economic incentives to make the necessary investments to save money and at the same time reduce their emissions.

Investment decisions are of course not based solely on market prices but also on government policies and strategies. Money is still being invested in fossil fuels, but volumes are declining. Meanwhile global investments in renewable energy generation have been on the rise uninterruptedly since 2017, even during the pandemic in 2020.

Moreover, it takes time before lower costs are translated into larger investments, and other key investments must be made before renewable energy can be used at a massive scale, notably in energy storage capacity and more reliable distribution and transmission.

As investments in battery storage are surging while costs are declining and investments in grids are set to recover in 2021, we can expect that the upward trend in renewable energy investment will continue for the foreseeable future (IEA, 2021d).

Already in the earlier literature rejecting degrowth pessimism, the central role of technology was highlighted. Stiglitz (1974) and Kamien and Schwartz (1978) did not yet address GHG emissions, but rather whether continued consumption growth is possible in a world with exhaustible resources.

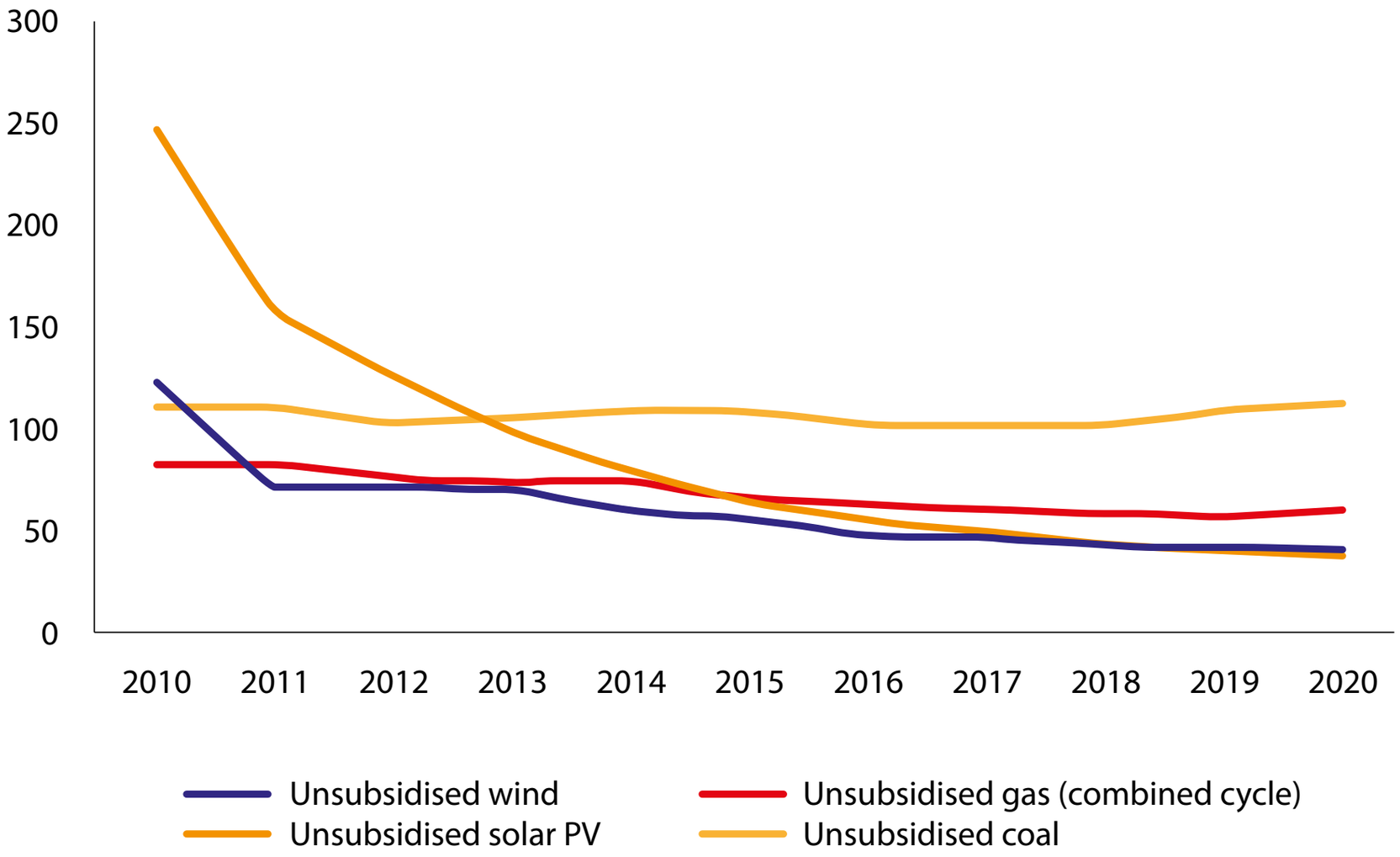
They found that technology-driven efficiency gains allow the limits set by nature to be pushed forward so that continued expansion is possible. Later papers, including Weitzman (1999), Acemoglu *et al* (2012) and Aghion *et al* (2016), discussed endogenous and directed technical change with more optimistic outlooks.

The 1987 Brundtland report *Our Common Future* is seen as a milestone for green growth with its definition[7] of 'sustainable development' (Jacob, 2012)[8]. The term 'green growth' only gained popularity in the wake of the global financial crisis of 2008 as an idea for short-term stimulus that incorporated environmental objectives (eg. OECD, 2009), and was adopted as a policy objective by international organisations in the subsequent years (Jacob, 2012).

Today it underpins the United Nations' Sustainable Development Goals[9], and to varying degrees different Green (New) Deal proposals (eg. European Commission, 2019; US House of Representatives, 2019).

No single definition has been developed of what is meant by 'green growth'. For example, the World Bank (2012), OECD (2011) and UNEP (2011) each define green objectives differently (Hickel and Kallis, 2020).

Figure 3. Levelised cost of energy (LCOE) from selected fossil fuels and renewable energy sources, in USD/MWh



Source: Lazard (2020).

Jacobs (2012) wrote that green GDP growth is understood as either: (1) higher growth than in a scenario without strong environmental or climate policies, both in the short and long run (dubbed the 'strong' version of green growth), or (2) lower in the short run and higher in the long run (the 'standard' version)[10].

Whatever the exact interpretation of green growth, publications from international organisations or governments predict both environmental benefits in the form of avoided climate damages and economic benefits resulting from increased investment and innovation[11].

This 'double dividend' forms the heart of the green-growth argument. The green-growth narrative rests on four pillars:

(1) subsidies for innovation and investments in renewable energy and energy efficiency that boost GDP;

(2) carbon pricing to further stimulate efficiency gains and renewables, and to avoid rebound effects, combined with recycling of tax revenues to cut corporate or labour taxes and boost employment;

(3) assumptions about innovation and negative emission technologies to accelerate the decoupling process; and

(4) compensation schemes for the poorest households, displaced workers or disadvantaged regions to make the transition politically feasible (see for example Table 2).

Table 2. Different green growth scenarios, showing targeted emission reductions, estimated GDP impact, key policies, and adversely affected groups (if no compensation)

	IMF (2020)	European Commission (2020b)[12]	IEA (2021b)
Emission reductions	Reduce gross global emissions by 80% by 2050	Reduce net EU emissions by 55% by 2030	Reduce global net CO_2 emissions to zero by 2050
GDP impact	Standard version: baseline GDP +0.7% first 15 years, -1% in 2050, +13% in 2100	Standard version: baseline GDP -0.27%/+0.50% by 2030	Strong version: baseline GDP +4% in 2030
Key policies	• green investment push • carbon pricing • compensatory transfers supportive macro policies	• green investment push • carbon pricing • tax recycling	• green investment push • carbon pricing
Adversely affected groups	• Low-income households, due to electricity prices and job status • Fossil fuel exporters	• Fossil fuel industry • Low-income households	• Fossil fuel exporters • Fossil fuel industry

Source: Bruegel.

Inclusion of such social elements puts current proposals a step beyond earlier incarnations of Green New Deals (Mastini *et al* 2021). In its most extreme form, green growth is believed to come as a result of free markets and does not even require public intervention other than carbon pricing (Gueret *et al* (2019) refer to this as 'green capitalism').

Overall, however, the empirical evidence for a double dividend looks mixed. In fact, some of the reports by official institutions state that a double dividend can be achieved only if very specific assumptions are made, while in many scenarios, strong climate action could at least in the short-term lower GDP growth.

5 Techno-optimism: important caveats

The numbers we have given show that the world needs to decouple gross GHG emissions and GDP growth much faster than currently. In the following, we set out the key actions necessary to achieve such a faster decoupling[13].

5.1 Need for massive investment in deployment of existing green technologies

To decouple GHG emissions and GDP growth, a huge expansion in green investment and a big shift in investment are needed. For instance, the IEA's (2021b) net-zero pathway estimates that global energy capital investments must increase from a current yearly average of about $2 trillion to $5 trillion (2019 prices) by 2030, after which they must stay at almost the same level until 2050.

As a fraction of global GDP, this would be an increase from 2.5 percent today to 4.5 percent in 2030, followed by a gradual decline back to 2.5 percent. Encouragingly, most of the technologies to be invested in up to 2030 (for 85 percent of emission reductions; see IEA, 2021b) are readily available.

Beyond 2030, that will be much less the case: only 54 percent of emission reductions will be accomplished with current technologies. Most of the investments up to 2050 (about 65 percent) would be directed to generating low-

carbon electricity, upgrading the electricity system for distribution and storage and electrifying new sectors of the economy (CO_2/energy demand), while a smaller though still significant share (about 15 percent) would be spent on efficiency improvements (energy demand/real GDP).

Governments will have to foot part of the bill, especially for large infrastructure projects or technologies still under development (IEA, 2021b). But the private sector will need to cover most of the investments.

It is therefore important that governments use policies to create incentives and facilitate investments, for example through carbon pricing, 'green' financial regulations and supervisory practises, or cooperation with the private sector through public financial institutions such as the European Investment Bank.

Clear and credible policy commitments also help by reducing the uncertainty that can keep firms from investing (Dechezlepretre *et al* 2021).

5.2 Need for breakthrough green technologies for decarbonisation

Most emission reduction scenarios that predict continued economic growth rely to varying degrees on the use of technologies that are not yet available. This is frequently used by degrowth proponents as an argument to question the feasibility of green growth.

The IEA net-zero pathway (2021b), for instance, relies to a great extent on future innovation: 15 percent of the emissions reductions by 2030 and 46 percent of the reductions between 2030 and 2050 are to be achieved with technologies that are currently in a demonstration or prototype phase, such as CCS, green hydrogen and advanced batteries.

The breakthroughs achieved in the current decade will therefore be crucial. Unfortunately, none of the technologies needed beyond 2030 are currently on track to being deployed in time (IEA, 2021c), as the road from concept to commercialisation is typically long and winding.

To accelerate the development of these innovative technologies, governments and the private sector both need to substantially increase their research and innovation funding. Fostering green innovation and bringing green technologies from the laboratory to the market requires government action, for example via pricing of emissions.

Public-private partnerships schemes, adequate risk-taking by public institutions and green industrial policy can further deliver breakthrough innovation (Tagliapietra and Veugelers, 2020). But, of course, there cannot be a guarantee that such breakthrough technologies will materialise in time.

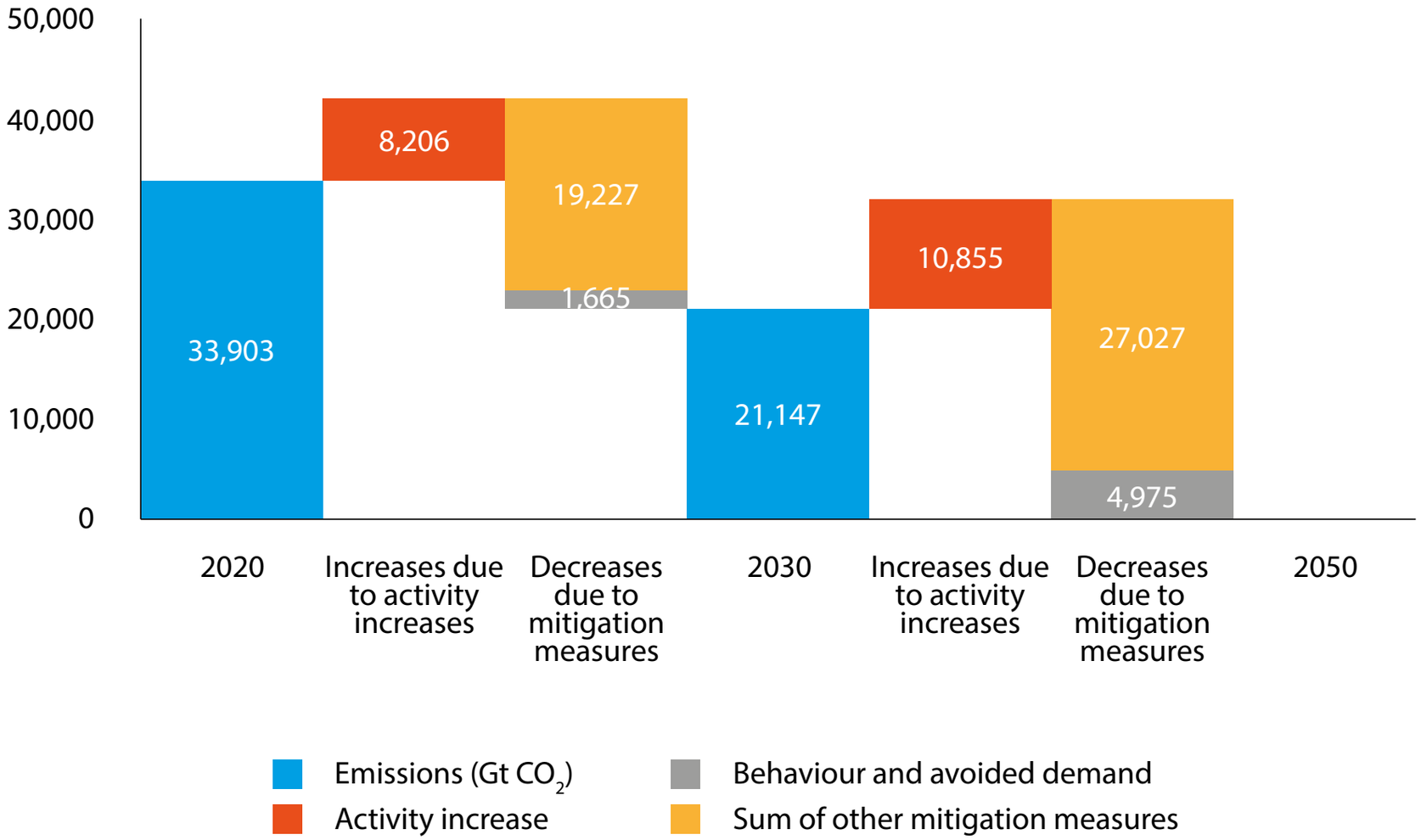
5.3 Need to foster behavioural change

In theory, emissions from energy production could be sufficiently reduced solely on the back of technology. However, we noted that both declines in energy demand/real GDP and CO_2/energy demand also depend on behavioural changes.

In practice, these will be needed to swiftly and affordably reduce emissions from sources that are more difficult to decarbonise, such as air travel. For instance, in the IEA (2021b) net-zero roadmap, behavioural change accounts for 12.5 percent of global CO_2 reductions between today and 2050 (Figure 4).

Behavioural change can also reduce the cost of the green transition. To appreciate this point, it is useful to compare the EU investment requirements to reach net zero by 2050 estimated by the European Commission under two

Figure 4. Impact of behavioural change in the IEA net-zero roadmap, emission reductions and increases from now to 2050 (megatonnes of CO_2)



Source: International Energy Agency (2021b).

different scenarios: one relying only on technology (1.5 TECH), and one relying on both technology and behavioural changes (1.5 LIFE).

Between 2031 and 2050, the 1.5 TECH scenario requires additional average annual investment of €289.5 billion compared to the baseline, while the 1.5 LIFE scenario requires only €175.7 billion (European Commission, 2018).

Furthermore, the energy sector is responsible for 73 percent of global GHG emissions[14]. This implies that even cutting energy-related emissions to zero would not be sufficient to achieve climate neutrality by mid-century, since the remaining emissions would still exceed the amounts permissible to limit global warming to 1.5°C (UNEP, 2020a).

Other sectors that primarily emit gasses including methane (CH_4) and nitrous oxide (N_2O) for other reasons than energy therefore also have an indispensable role to play in emission reductions. For much of these emissions however, particularly from agriculture and land use, which account for 18.4 percent of the total, technology is not likely to have much impact.

We have not made much progress in decoupling GHG emission from food production (1.0 percent per year since 1990, according to FAO data). As Turner (2020) put it, the technology 'cow' has indeed barely changed over the last millennia.

GHG emissions per kilo of meat from cattle have declined by a mere 0.4 percent per year on average since 1990. They account for 37 percent for all emissions from food production documented by the FAO[15] (FAOSTAT, 2021). A change in diet and the way we use land for producing other goods might thus become necessary.

Bearing this in mind, it is important to consider degrowthers' warnings of rebound effects. If policies to reduce emissions through investments in renewables and efficiency gains achieve positive income effects or too optimistic perceptions, a narrow focus on certain sectors could leave room for harmful effects from increased emissions elsewhere. This could offset at least part of the progress made in emission reductions from energy[16].

5.4 Need to develop and scale-up negative emission technologies

All IPCC emission pathways, including the one on which we based our calculations in sections 2 and 3, consider net CO_2 emissions, with reductions from agriculture, forests and other land use.

Reforestation, afforestation, habitat and soil management can be used to remove CO_2 from the atmosphere, provided that increased efforts are made in these areas. This is why gross emissions can remain small but positive in a net-zero situation.

Unlike the conservative pathway we used, most of the IPCC pathways (IPCC, 2018) also rely significantly on human-made negative emission technologies. They allow for greater remaining CO_2 emissions from activities that are hard to decarbonise when reaching climate neutrality by mid-century and beyond, as these are offset by more carbon removal.

This in turn means that the high required decoupling rate of around 9 percent becomes somewhat lower, which would make a difference in the feasibility of net-zero by mid-century.

This is controversial among climate scientists, however. Negative emission technologies are currently under development or in early small-scale implementation and are not on track to being ready in time (IEA, 2021c).

Furthermore, many scientists are sceptical about the feasibility and viability of certain technologies and are even worried that they may create numerous other serious environmental problems because of potentially high input requirements.

Governments should encourage the development of both natural and technological solutions but should be keenly aware that negative emission technologies cannot be a substitute for actual, immediate emission abatement.

5.5 Need to adapt our economies to unavoidable climate change

Global efforts to reduce GHG emissions are aimed at limiting global warming to 1.5°C, thus minimising dangerous climate change.

Unfortunately, with average temperatures already more than 1.0°C above pre-industrial levels (IPCC, 2018) climate change is already upon us. Natural disasters, most of which could be linked to climate change, reportedly caused $210 billion of damages worldwide in 2020[17] (Munich Re, 2021).

Structural change such as desertification and shifting seasonal patterns are already visible. Occasional and structural damages are bound to get worse and more frequent as temperatures rise to 1.5°C or 2°C in a mitigated scenario, let alone if we do nothing. For regions closer to the equator, climate change may become a matter of life and death, and political and other spillovers are to be expected.

It is therefore imperative that in parallel to mitigation efforts, investment in climate adaptation should accelerate. Coastal areas, often densely populated, will have to improve their flood defences, while many regions, in particular urban areas, simultaneously will have to save potable water for dry spells.

Buildings and cities need to be adapted to cope with sometimes much higher temperatures, while forests must be managed to minimise fire hazard. Rural areas will need to change their sources of income if certain crops become difficult to cultivate and tourist destinations lose their appeal.

Like mitigation, climate adaptation measures are good investments. For instance, in a scenario with 3°C of global warming or more, the PESETA IV study by the European Commission (2020c) estimated that installing reservoirs to reduce flood risks in Europe will save €40 billion per year by 2100, for a yearly investment of only €3.3 billion up to then.

Annual damages of up to €220 billion by 2100 can be avoided if we start investing less than €2 billion in the protection of our coastlines. The analysis suggests that such investments will still be worthwhile in a scenario with only 2°C of global warming.

It is important to realise the sizable returns to adaptation, as annual adaptation costs in the developing world alone are estimated to be between $140 billion and $300 billion in 2030, while those of developed countries are even higher (UNEP, 2020b).

6 Conclusions

In order to avoid global warming in excess of 1.5°C above pre-industrial levels, global GHG emissions must be rapidly reduced. Doing this without losses in economic prosperity will not be easy: so far, decoupling GHG emissions from GDP growth has been slow or absent.

This is seen as justification for degrowth scholars to propose a radical overhaul of our economic system. Yet this approach seems unrealistic. Asking for lower growth, let alone negative growth, would mean that large parts of the world could not develop, or only at the expense of even harsher degrowth in developed countries.

Low-income countries will obviously not follow this advice and the notion of redistributing income from rich to poor countries is also unrealistic.

The real question therefore becomes whether decarbonisation efforts can be accelerated. While global emissions have not declined, GHG emissions from developed economies such as the EU have, despite continued economic growth.

The data also shows that the speed of decoupling of emissions and growth has accelerated in the world. The efforts to reduce the carbon intensity of energy in many economies have contributed to a steep decline in the prices of renewable energy technology, which has improved the economic case for rapid decarbonisation worldwide.

Belief that further innovation and investment will enable the world to successfully reach climate neutrality by 2050 without reducing welfare underlies the green-growth narrative advocated by most governments and international organisations.

The direction and pace of technological progress are impossible to predict. Neither the degrowth hypothesis as the only approach to achieve climate neutrality by 2050, nor the green-growth hypothesis can therefore be credibly excluded ex ante. However, as we argued in the previous section, there are important actions governments can take to enhance the likelihood that green growth is achieved.

Ultimately, if stringent emission targets are taken as a given, the choice to pursue green growth, degrowth or something in between is a choice about how much one is willing to trust in technology and how much one wants to hedge against the adverse effects of declining GDP.

Both rely on untested ideas. The only certainty is that we should firmly commit to sticking to stringent targets no matter which path is chosen, and policy should evolve accordingly.

As the *Stern Review* (2007) put it, in the long run the benefits of strong climate action will outweigh the costs of climate action. ■

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Endnotes

1. See for example https://www.theguardian.com/environment/video/2019/sep/23/greta-thunberg-to-world-leaders-how-dare-you-you-have-stolen-my-dreams-and-my-childhood-video, accessed 15 July 2021.

2. The remaining emissions arise from agriculture (11.2 percent), land use (7.2 percent), industrial processes (5.2 percent) and waste (3.2 percent) (see https://www.climatewatchdata.org/ghg-emissions). While this paper focusses mostly on GHG emissions from energy, the more difficult part of emissions reduction and sustainability in general may in fact be making the necessary changes in how we use natural resources to feed and dress ourselves. More on this in section 5.

3. Energy production is what causes emissions, but the variable that must be impacted by policy is energy demand. We assume production is equal to demand and use IEA data on total primary energy supply to represent both. For IEA definitions see https://www.iea.org/commentaries/understanding-and-using-the-energy-balance

4. From here on we switch from showing data on total GHG emissions to data on CO_2 emissions for reasons of data availability and comparability to theoretical emission pathways. Since we focus on emissions mitigation in the energy sector, this is not an oversimplification: CO_2 represented 91 percent of global GHG emissions from energy in 2018 (CH4: 8.6

percent and N_2O: 0.8 percent), and the energy sector accounts for 93 percent of global CO_2 emissions (industry: 4.1 percent and LULUCF: 3.3 percent) (see https://www.climatewatchdata.org/ghg-emissions). LULUCF = land use, land-use change and forestry.

5. Loosely based on the LED/P1 pathway of the IPCC (2018), which uses neither carbon capture and storage technology (CCS) nor bioenergy with CCS (BECCS), technologies that are currently under development and that degrowth scholars deem unfit for climate change mitigation.

6. Decoupling is slowest in developing and emerging countries, where the carbon intensity of GDP is mostly higher than in Europe today. Between 1990 and 2016 the average yearly decoupling rate in India was -2.4 percent, in Africa -2.1 percent, in China -1.8 percent and in South America -1.1 (based on OWID data). It is important to note here that most of these countries had vastly lower levels of carbon intensity of GDP than developed countries throughout most of the previous century and have contributed much less to the current stock of CO_2 in the atmosphere. Nevertheless, as these economies increase their shares of world GDP, faster decoupling will become increasingly important. It is not for this paper to review the vast discussion on international climate justice and the degree to which different parts of the world, because they have increased the global stock of CO_2 in the atmosphere, should decouple more quickly.

7. "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development 1987, p. 41).

8. It lay at the basis of global ecological policy thinking of the next few years, such as at the Earth Summit and in the Rio Declaration in 1992, which explicitly called for economic growth to address environmental problems.

9. The SDGs indeed also include 'Decent Work and Economic Growth' as SDG8.

10. Adding to the confusion is lack of clarity about the baseline against which growth is usually compared: is it a trajectory based on historical average growth rates or a no-action scenario that includes serious damage from climate change in the long run? This is not trivial, as in comparison to an economy wrecked by runaway climate change, an economy that avoids global warming by growing more slowly or even by shrinking could be on a higher growth path, but this is generally not a scenario considered as 'green growth'.

11. The environmental benefits are sometimes augmented by more short-term co-benefits, mostly through improved health; see Karlsson et al (2020) for an overview.
12. Includes JRC-GEM-E3, E3ME and E-QUEST model estimates.
13. Because of the nature of renewable energy, global supply chains, and the consequences of climate change, as well as the benefits to be had from cooperation in R&D, each of these points should be addressed with international cooperation in mind (see for example Leonard et al 2021).
14. See Climate Watch for historical GHG emissions.
15. See FAOSTAT, Agri-Environmental Indicators, accessed on 20 July 2021.
16. In the absence of a limit or prices on emissions, there can also be rebound effects within the energy sector, for example when people start using more energy because it is becoming cheaper or greener. This means increases in energy demand/real GDP offset decreases in CO_2/energy demand.
17. See 'Record hurricane season and major wildfires – The natural disaster figures for 2020', Munich RE, accessed 24 February 2021.

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A new asset class

Alexander Lehmann says the proposed EU green bond standard will be less prone to 'greenwashing', and the widest possible set of issuers and jurisdictions should be encouraged to use the standard

The European Commission's proposal for a European Union green bond standard, published 6 July, comes at a time when issuance of green bonds is booming, with the bulk being issued and traded within the EU. Demand for such assets by investors is similarly strong, though increasingly there are concerns about 'greenwashing' – exaggerated claims by issuers about the environmental quality of the underlying projects financed by the bonds. Dubious practices by some issuers could undermine the entire market.

The EU green bond standard may not become effective for some time but nevertheless the Commission's proposal could do much to direct investors into higher-quality bonds and projects. If used widely, a new asset class in global capital markets could emerge.

Containing greenwashing

A green bond is a traditional bond where the proceeds from issuance are used for a project that meets certain pre-established environmental criteria.

In the case of default, the investor typically has recourse to the issuer's entire balance sheet, as structures based only on the underlying green project or its revenues are rare.

To the end investor, the additional value from holding the green asset derives from this enhanced transparency and association with the green project financed by the bond (even though refinancing is common).

However, definitions of what activities are sustainable are often fuzzy or conflict across jurisdictions. Reporting on the use of proceeds, let alone a project's impact, is often lax. The problems with issuer disclosure and communicating information on the use of proceeds to investors are more pronounced in emerging markets, exactly where the bulk of low-carbon investment will be needed over the coming years.

The EU green bond standard would address these inherent problems with a rigorous regime of transparency and supervision. Only projects that are in line with the EU taxonomy of sustainable activities would be eligible for funding, and issuers would need to provide additional information at the time of issuance, and subsequently through regular reporting on the use of proceeds and its impact.

The new EU standard will put green bond markets on a sounder footing, though implementation should mobilise additional issuers and facilitate cross-border funding in capital markets

Crucially, only external reviewers supervised by the European Securities and Markets Authority (ESMA) will be allowed to sign off on an EU green bond.

Green bonds will be a crucial part of financing the low-carbon transition, given their typical long durations and end-loaded repayment structures, which fit well with large infrastructure projects. Use of the EU green bond label will be voluntary, so the extent to which investors use it and mobilise capital for the low-carbon transition should be one measure of its success.

But the standard will also define a framework for green assets in the capital markets. As such, it should foster scale and liquidity of the asset class, so that investors can discern a yield curve specific to green debt instruments.

Green bond funds and the securitisation of green bank loans could mobilise additional funds, but will depend on there being a uniform standard across different issuers and jurisdictions.

A global blueprint?

Given these wider objectives, there are two possible fates for the EU green bond standard. It may come to define a widely recognised quality benchmark that is replicated in other markets. This kind of 'Brussels effect' in global capital markets has, for instance, been observed for the EU format for retail investment funds (UCITS), which are now widely used outside the EU, including in emerging markets.

Alternatively, the EU's 'gold standard' ambition may remain out of reach for most issuers. Compliance with the technical standards in the EU taxonomy in particular could become a problem. Issuers will weigh the costs and complications of additional disclosure and of going through an ESMA-approved and supervised external reviewers against the benefits of accessing a wider investor base.

Alternative private green bond standards and certification processes may well continue to proliferate. Several EU capital market products have already been shunned by market participants in this way, as for instance has been the case with European long-term investment funds, first designed in 2015, but barely used since then.

Implementing the standard

To simultaneously define a high-quality bond standard while creating scale and liquidity in capital markets, pragmatic implementation by the EU supervisor, and full support from public sector issuers in the EU, will be crucial. Three measures in particular could define success.

First, the EU itself and other EU supranational and sovereign issuers will likely be the largest single class of green bond issuers over the coming years. Green bond issuance by the European Commission under the Next Generation EU (NGEU) programme may amount to €250 billion over the next three years, roughly equal to total global issuance of green bonds in 2020.

To date, issuance by ten EU sovereigns amounted to over €80 billion, and is set to increase rapidly given strong investor demand and the presumed benefits to funding costs in sovereign debt markets. To ensure credibility, the EU and other public sector issuers now need to adopt the EU green bond standard in their own capital market activities.

At the national level, we have already shown that the problems in classifying public expenditures under the EU taxonomy can be overcome (France has already done so). Some EU states have shown how a clear green bond framework can define credible forward-looking commitments on the use of bond proceeds in the national budgetary process.

But under the proposed, regulation green bond issuance by EU countries would be subject to a weaker standard than issuance by the private sector, as reviews by government auditors will not be subject to ESMA supervision. Government agencies would in effect determine what could become a key non-financial attribute of sovereign debt.

Issuance by the Commission under the NGEU programme began in June. Ultimately, the EU as the largest issuer of green bonds will need to account to bond investors for spending of the proceeds in EU countries.

It is in the interest of both the EU and member states that their own green bond issuance complies with the same high standards as corporate issuers. There should not be a separate green bond type for public sector issuers.

Second, EU regulators should define straightforward ways through which taxonomies in other jurisdictions can be mapped into alignment under the EU taxonomy. Many of such classification systems are in use globally, and EU coordination with the key jurisdictions should make different systems compatible (as suggested by Fabio Panetta).

The United Kingdom and the United States are likely to develop taxonomies which are more principles-based. Discussions between the EU and the Chinese authorities within the International Platform on Sustainable Finance suggests the two classification systems are not fundamentally at odds. Ultimately, issuers from non-EU markets should be able to access EU capital markets. EU bond investors may want to document a coherent standard aligned with the EU taxonomy in their global portfolios.

Finally, ESMA, as the EU's capital market supervisor, will need quickly to build up the skills and capacity for its new role as supervisor of green-bond reviewers. The criteria proposed by the European Commission are sensible, as they will put in place a minimum standard for qualifications, transparency and limitation of conflicts of interest.

ESMA should as much as possible enable entities outside the EU to issue on the basis of the EU standard. This should especially reflect the requirements in emerging markets, where corporate disclosure and reporting standards are still weak.

The financing requirements of the EU Green deal are substantial and will primarily rest with the private sector. The new EU standard will put green bond markets on a sounder footing, though implementation should mobilise additional issuers and facilitate cross-border funding in capital markets, which are quickly embracing sustainability. ■

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SPACs in the gap

Rebecca Christie considers special-purpose acquisition vehicles, and believes they could fill a gap in European equity markets and lure risk-averse investors off the sidelines

European equity markets lag behind their American counterparts and draw relatively limited interest from insurance companies and pension funds. Getting this capital off the sidelines and into growing companies is one of the main goals of the European Union's capital markets union project. To move forward, the EU will need to consider innovating, not just expanding, its equity offerings.

Special purpose acquisition companies, or SPACs, might be part of the solution. These companies are publicly traded pools of cash that seek to merge with a promising non-public company within a set timeframe.

The system works like this: a sponsor or group of sponsors, often a brand-name fund manager, takes this 'cash box' public with a promise to find a company to merge with, within two years. The sponsor keeps a 20% stake. Investors buy shares in this cash box that come with warrants for future shares. Then the pool of money merges with an existing company, likely as a minority shareholder, and that merged company takes over the SPAC's spot on the stock exchange and continues to trade.

Often the enterprise gets at least one more round of funding known as a private infusion of public equity (PIPE) around the time the merger takes place.

For growing, non-public companies these vehicles offer an alternative to pursuing an initial public offering (IPO), which can be complicated and costly, or working with private-equity investors who may demand substantial control in exchange for a cash infusion.

Because the SPACs have to find a company to merge with or refund all of the initial investments, the target firms may find they can get a more attractive deal than via other routes. Founders also may be more comfortable with the size of the stake they have to give up in the merger.

This potential to help companies find funding that will help them scale up is a big reason to consider a growing role for SPACs in EU market offerings.

New in Europe

SPACs are fairly new to European markets, in contrast to their recent rise in the surging US equity environment. In the US, they are viewed as expensive, lightly regulated, and currently deeply trendy – the focus of extensive international media coverage and renewed scrutiny from the US Securities and Exchange Commission.

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Critics have painted them as poor bets. However, the same lottery-ticket characteristics that justify those criticisms also show the potential for SPACs to draw new money into the markets and to provide a new path for growing companies seeking funding. In Europe, where bank loans make up the lion's share of corporate financing, that makes these vehicles worth a look.

European policymakers therefore should look for ways to support the industry and channel its energies constructively. By adding investor protections and focusing on ways to align longer-term incentives of founders, investors and start-up firms, the EU may be able to channel SPACs' strengths while limiting their weaknesses.

Not cheap

The SPAC process is not cheap. The SPAC process tends to leech value out of the company, while enriching sponsors and some of the early shareholders. In a November 2020 study of 47 US SPACs that completed mergers between January 2019 and June 2020, SPAC shares worth $10 at initial sale held only $6.67 of value at the median by the time the merger took place.

In an April update, the median value fell to $6.40. The mean was $5.10, meaning that almost half the value of the initial share was diluted because of distributions to the sponsor, the warrant holders and underwriting costs. Share prices also usually fell after the merger. Shareholders thus bear the brunt of the costs and the dilutive effects.

There does seem to be a difference between 'high-quality' sponsors, who are former senior executives at Fortune 500 companies or are themselves a fund with $1 billion under management, and other sponsors, according to the research.

Yet the better performance of the quality sponsors is driven primarily by extreme winners, so the median performance is still bad. To get a sense of how uneven the returns are, consider the case of billionaire SPAC investor Chamath Palihapitiya.

According to the *New Yorker*, *"…if an everyday investor had bought one share of stock in each of his SPACs on the first day the stock traded, three of those investments would have lost money. The entire bundle would today be worth thirty-one per cent more than the investor had initially paid. A comparable investment in the S&P 500 over the same period would have returned similar profits, but would have involved much less volatility and risk."*

SPAC sponsors – and importantly, SPAC target companies – do not face the same risks. The sponsors themselves tend to do well regardless. Meanwhile the target companies often can negotiate for more cash and to remain in majority control of the post-merger company.

The study of 47 US SPACs found that on average, 70% of the merged company stayed with the target, leaving the combined SPAC holders with about 30% of the new entity. Because the SPAC usually has to liquidate if it cannot find a merger partner on time, the target companies may able to ask a higher price in a crowded market.

At a crossroads

Post-Brexit, the EU is at a crossroads in terms of what it wants its markets to look like. Historically, investors on the continent have been loath to take risks in their investments, and regulations shield them further.

But the global financial crisis and subsequent pandemic recession have changed the scene. Bank deposits and sovereign bond investments yield little or nothing, or sometimes lose money because of negative interest rates.

Meanwhile long-term capital is sitting on the sidelines. EIOPA, the EU insurance regulator, in December recommended loosening the framework for allowing insurers to invest in equity and long-term illiquid assets, and similar efforts are underway in the EU's next round of capital markets union planning. Now the challenge will be to convince investors that because they can invest in equity, they might actually want to.

Why would investors want to invest in a company when they don't know what it is going to do? First, these vehicles might represent a bet or a diversification from investors looking for a new asset class or to increase their general equity market exposure.

Second, the pre-merger investors get warrants that have often proved a way to lock in returns, although that is getting harder now that markets have learned how better to price them.

Third, well-heeled investors may relish the chance to invest alongside high-profile money managers, regional or sectoral specialists, and even non-financial celebrities. That last may seem far-fetched, but in an era when investors also are flocking to volatile crypto-assets and non-fungible token digital art, SPACs would seem to offer at least as logical a proposition for return.

When considering the potential role of SPACs in European markets, it's worth noting the differences with US markets. For one thing, SPACs in the EU are much less established: in the US, there were 248 SPAC IPOs in 2020, and 298 in the first quarter of 2021, according to market data presented at the ECGI event.

In Europe, the comparable numbers were 4 and 7, and the vehicles themselves tend to be smaller. In the US, SPACs can reach up to $1 billion in size. In the EU, funds are generally in the $300 million to $500 million range, and there can be restrictions on selling and redeeming.

For example, in some jurisdictions investors cannot redeem their shares unless they reject the proposed business combination. The UK, a popular locale for SPAC listings, has additional barriers such as a requirement that share trading be suspended when mergers are announced, which limits how investors can sell or redeem their holdings.

A review of the SPAC rules was included in the March 2021 *UK Listings Review* chaired by former EU financial services commissioner Jonathan Hill.

Fragmented rules

There is no EU regime for SPACs, which instead are subject to a melange of national rules, tax considerations and listing rules. SPAC IPO listings in Europe have primarily been in the UK, the Netherlands, Italy and Sweden.

Factors in deciding where to list include regulation, company law flexibility, taxes, governance, the likely country of the SPAC's target and the degree of investor familiarity with the process. The companies are more likely to be incorporated in tax-friendly jurisdictions like the British Virgin Islands, Luxembourg or the Netherlands, as well as in the UK and Italy.

Requirements for specifying a target industry sector vary, as do prospectus rules, although the general feeling is that SPACs are not subject to the Alternative Investment Fund Managers Directive (2011/61/EU).

The law firm found that it is possible to get pretty close to the US structures, although the presence of negative yields on cash holdings means that either investors or sponsors need to provide extra capital to keep the funding pool stable.

Another transatlantic difference is the prevalence and desirability of going public, either through an IPO or a direct listing. Where US commentators sometimes worry that the market for public offerings is becoming overheated, in Europe policy makers have emphasised the lack of market options for smaller companies, who also have a harder time getting bank loans than bigger firms.

In 2020, the High Level Forum on Capital Markets Union found that small and medium-sized enterprises (SMEs) are particular wary of equity markets, noting in its top findings that *"public listing is too burdensome and costly, especially for SMEs and the funding ecosystem for IPOs in the EU is underdeveloped."*

Overall, EU listed companies have been getting larger and older, as the public corporation has declined in prominence. A 2020 study for the European Commission by the Oxera consulting firm found the number of listings in the pre-Brexit EU 28 had declined substantially over the previous decade.

Meanwhile investors cite difficulty navigating prudential requirements and the maze of specialised investment vehicles meant to help smaller companies find funding.

Sponsors' responsibilities

One way to make SPACs a sturdier part of the EU market would be to require SPAC sponsors to take on more skin in the game, over a longer-term horizon. For example, in April, the SPAC Pegasus Europe raised €500 million in its April IPO and is looking to merge with a growth-oriented company in the financial services industry, according to its public profile.

A pre-listing announcement for Pegasus said the four co-sponsors would invest in a minimum of 10% of the initial offering and commit to enter into a substantial forward purchase agreement. This could be one model for aligning

incentives of sponsors, investors and the target firm over time. Because of the fragmented nature of European markets, the extra costs of joining forces with a fund sponsor might not seem so daunting, especially given the fees and hassle of other investment options.

To be sure, there will be ongoing questions of corporate control, particularly if institutional investors want to take a more active oversight role, and the market will continue to favour professional investors with better information.

However, expanding equity markets promises to boost the economy for governments, firms and households. The European Central Bank has further found that economies that have a funding structure more focused on equity than bank credit or other forms of debt have reduced their carbon footprints more than other countries in recent decades. SPACS can be one element of expanding EU options.

As regulators consider what to do with this format, the question should not be whether SPACs are the ideal way forward for European equity markets but rather whether the costs and risks of this vehicle are worth it if they can attract investment and growing companies that might otherwise not be in the markets at all. ■

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