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# Annual Economic Report

June 2021

*Promoting global monetary  
and financial stability*



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# Contents

A bumpy pandexit .....	ix
Introduction .....	ix
A surprisingly strong but very uneven recovery .....	ix
Near-term prospects .....	x
Policy challenges .....	xii
Near-term challenges .....	xii
Longer-term challenges .....	xiii
The distributional footprint of monetary policy .....	xiv
Central bank digital currencies .....	xvi
I. Covid and beyond .....	1
The year in retrospect .....	2
An incomplete recovery .....	2
Exceptionally accommodative financial conditions .....	7
Box I.A: House prices soar during the Covid-19 pandemic .....	10
The next stage of the pandemic .....	11
The central scenario .....	12
Box I.B: What can we learn from market-based inflation expectations? .....	13
Box I.C: Charting a path to “pandexit” .....	15
Alternative scenario 1: higher inflation and tighter financial conditions .....	16
Alternative scenario 2: the recovery stalls, business insolvencies rise .....	19
Box I.D: Aggregate implications of an uneven sectoral recovery .....	21
Box I.E: Covid-19 and the corporate credit loss outlook .....	23
General considerations .....	25
Macroeconomic policy challenges .....	25
Near-term challenges .....	25
Box I.F: Tighter global financial conditions and EMEs .....	27
Longer-term challenges .....	30
Box I.G: Fiscal inflation? .....	32
Securing a durable recovery .....	35
II. The distributional footprint of monetary policy .....	39
Poverty and inequality: trends and determinants .....	40
Box II.A: A taxonomy of inequality .....	42
Inequality and monetary policy mandates .....	44
Inequality and inflation .....	44
Inequality and recessions .....	46
Inequality and the conduct of monetary policy .....	49
The impact of inequality on the transmission of monetary policy .....	49
Monetary policy stance and inequality .....	50
Box II.B: Heterogeneity and distribution in macroeconomic models .....	51
Box II.C: The impact of interest rates on wealth inequality .....	52
Box II.D: Labour markets and the reviews of monetary policy frameworks .....	55

Beyond monetary policy .....	56
Macroeconomic stability .....	56
Structural inequality .....	57
Central banks' non-monetary hats .....	58
Box II.E: Fiscal policy and inequality .....	59
Conclusion .....	60
III. CBDCs: an opportunity for the monetary system .....	65
Introduction .....	65
Money in the digital era .....	66
Digital money as a central bank public good .....	70
Box III.A: Project Helvetia – exploring the use of wholesale CBDCs .....	71
Box III.B: APIs and the industrial organisation of payments .....	74
CBDC architectures and the financial system .....	77
Identification and privacy in CBDC design .....	82
The international dimension of CBDC issuance .....	85
Conclusion .....	90
Glossary .....	91



## Graphs

I.1	A large recession, but macroeconomic policy support limited the fallout	2
I.2	Household income held up and firms kept access to credit	3
I.3	Scarring was not as large as initially feared	4
I.4	Banks' profitability declined, but capital ratios rose	5
I.5	Economic conditions remain weaker than before the pandemic	6
I.6	An uneven recovery	7
I.7	After falling early in the pandemic, inflation picked up as cost pressures mounted	8
I.8	Credit markets recovered quickly and equity valuations were rich	9
I.9	Equities rose and the US dollar gained as the reflation trade gathered momentum	12
I.10	The central scenario	14
I.11	Stronger growth, higher inflation and financial tightening	18
I.12	Slow and uneven vaccination poses a risk to the recovery	19
I.13	The outlook for corporate credit losses	20
I.14	Higher debt will weigh on investment and reallocation	22
I.15	Rising debt but debt service cost at historical trough: no reason to worry?	31
I.16	How have countries successfully lowered public debt?	34
II.1	Inequality features prominently in central banks' communication since the GFC	40
II.2	Inequality on the rise amid declining poverty rates	41
II.3	Structural forces have pushed up inequality	43
II.4	Inflation erodes income and wealth of the poorest	45
II.5	The benefits of keeping inflation under control	46
II.6	The pandemic hit low-income workers harder	47
II.7	Higher income inequality leads to steeper declines in consumption	48
II.8	The long-term effects of recessions	49
II.9	High inequality mutes the impact of monetary policy on activity	50
II.10	The changing nature of the business cycle	54
II.11	Fiscal policy redistributes income	58
III.1	As cash use falls and digital payments rise, CBDC projects are moving ahead	67
III.2	Current forms of digital payments remain expensive	68
III.3	Consumers do not trust all counterparties equally to handle their data safely	69
III.4	The monetary system with a retail CBDC	72
III.5	Forms of digital central bank money	73
III.6	Deferred wholesale settlement results in credit for payee's bank	77
III.7	Retail CBDC architectures and central bank-private sector cooperation	78
III.8	CBDCs can be designed to have a limited financial system footprint – like cash today	81
III.9	A broad range of public and private solutions for a digital ID	83
III.10	Addressing cyber risks and data breaches is key for CBDC design	84
III.11	Cross-border retail activity is rising, but dollarisation is primarily a trust issue	86
III.12	Multi-CBDC arrangements can facilitate cross-border payments	88
III.13	mCBDC models offer an opportunity to improve cross-border payments	89

## Tables

I.1	US fiscal stimulus could have large effects	17
III.1	Comparison of cash, retail FPS and retail CBDCs as payment methods	76
III.2	Store-of-value properties of cash, CBDCs and bank deposits	82

This Report went to press on 18 June 2021 using data available up to 31 May 2021.

### Conventions used in the Annual Economic Report

std dev	standard deviation
\$	US dollar unless specified otherwise
mn	million
bn	billion (thousand million)
trn	trillion (thousand billion)
% pts	percentage points
bp	basis points
lhs, rhs	left-hand scale, right-hand scale
sa	seasonally adjusted
saar	seasonally adjusted annual rate
mom	month on month
yoy	year on year
qoq	quarter on quarter
...	not available
.	not applicable
–	nil or negligible

Components may not sum to totals because of rounding.

The term “country” as used in this publication also covers territorial entities that are not states as understood by international law and practice but for which data are separately and independently maintained.



## Country codes

AE	United Arab Emirates	GB	United Kingdom	NZ	New Zealand
AR	Argentina	GR	Greece	PA	Panama
AT	Austria	HK	Hong Kong SAR	PE	Peru
AU	Australia	HR	Croatia	PH	Philippines
BA	Bosnia and Herzegovina	HU	Hungary	PK	Pakistan
BE	Belgium	ID	Indonesia	PL	Poland
BG	Bulgaria	IE	Ireland	PT	Portugal
BR	Brazil	IL	Israel	QA	Qatar
CA	Canada	IN	India	RO	Romania
CH	Switzerland	IS	Iceland	RU	Russia
CL	Chile	IT	Italy	RS	Republic of Serbia
CN	China	JP	Japan	SA	Saudi Arabia
CO	Colombia	KR	Korea	SE	Sweden
CY	Republic of Cyprus	KW	Kuwait	SG	Singapore
CZ	Czech Republic	KZ	Kazakhstan	SI	Slovenia
DE	Germany	LT	Lithuania	SK	Slovakia
DK	Denmark	LU	Luxembourg	TH	Thailand
DO	Dominican Republic	LV	Latvia	TR	Turkey
DZ	Algeria	LY	Libya	TW	Chinese Taipei
EA	euro area	MK	North Macedonia	US	United States
EE	Estonia	MT	Malta	UY	Uruguay
ES	Spain	MX	Mexico	VE	Venezuela
EU	European Union	MY	Malaysia	VN	Vietnam
FI	Finland	NG	Nigeria	ZA	South Africa
FR	France	NL	Netherlands		
		NO	Norway		

## Currency codes

AUD	Australian dollar	KRW	Korean won
BRL	Brazilian real	MXN	Mexican peso
CAD	Canadian dollar	NOK	Norwegian krone
CHF	Swiss franc	NZD	New Zealand dollar
CLP	Chilean peso	PEN	Peruvian sol
CNY (RMB)	Chinese yuan (renminbi)	PHP	Philippine peso
COP	Colombian peso	PLN	Polish zloty
CZK	Czech koruna	RUB	Russian rouble
EUR	euro	SEK	Swedish krona
GBP	pound sterling	THB	Thai baht
HUF	Hungarian forint	TRY	Turkish lira
IDR	Indonesian rupiah	USD	US dollar
INR	Indian rupee	ZAR	South African rand
JPY	Japanese yen		

*Advanced economies (AEs):* Australia, Canada, Denmark, the euro area, Japan, New Zealand, Norway, Sweden, Switzerland, the United Kingdom and the United States.

*Major AEs (G3):* The euro area, Japan and the United States.

*Other AEs:* Australia, Canada, Denmark, New Zealand, Norway, Sweden, Switzerland and the United Kingdom.

*Emerging market economies (EMEs):* Argentina, Brazil, Chile, China, Chinese Taipei, Colombia, the Czech Republic, Hong Kong SAR, Hungary, India, Indonesia, Korea, Malaysia, Mexico, Peru, the Philippines, Poland, Russia, Saudi Arabia, Singapore, South Africa, Thailand and Turkey.

*Emerging market and developing economies (EMDEs):* 135 economies classified either as emerging markets or developing economies.

*Global:* All AEs and EMEs, as listed.

Country aggregates used in graphs and tables may not cover all the countries listed, depending on data availability.

# A bumpy pandexit

## Introduction

It is now over a year since the Covid-19 pandemic struck out of the blue, plunging the global economy into a historically deep recession. An acute health crisis turned into an overwhelming economic crisis, as policymakers adopted stringent containment measures to save lives. This was a recession in response to an insidious invisible enemy.

A timely, forceful and concerted policy drive prevented the worst. Working together, monetary, fiscal and prudential authorities managed to stabilise the financial system and cushion the blow. They put the patient in a state of suspended animation.

But as last year's Annual Economic Report (AER) went to press, uncertainty still reigned: what would happen next? There was hardly any precedent to serve as a benchmark. No recent pandemic was remotely as damaging as the current one. And the Spanish flu outbreak was too distant and too different. Many central banks suspended publishing forecasts, turning to tentative scenarios instead.

Where do we stand today? We know much more about the enemy and we are better equipped to fight it. We know much more about how the economy responds and how far it can adjust. The patient is in much better health but has not yet fully recovered. Some parts of the body are in better shape than others. What is clear is that the recovery will be uneven and the long-term consequences material. "Pandexit" will be bumpy and leave a costly and long-lasting legacy.

How has the global economy fared during the past year? What are the prospects and risks? What are the policy challenges?

While central banks were tackling the consequences of the pandemic, other important issues continued to draw attention. Questions pertaining to the relationship between monetary policy and inequality moved to the centre of public discourse. In addition, discussion and analysis of central bank digital currencies (CBDCs) became livelier than ever.

What follows elaborates on these issues.

## A surprisingly strong but very uneven recovery

Starting in the second half of 2020, the global economy rebounded more strongly than anticipated. Private consumption was the main engine of growth. As Covid-19 broke out, there had been widespread concerns about "scarring effects" on consumers' spending. It had been feared that lingering risk aversion and contagion worries would hold it back. In the event, these fears proved unfounded. The craving for normality prevailed. Whenever containment measures were relaxed in contact-intensive services, demand returned swiftly. In addition, as consumers adapted, a further shift to e-commerce limited the restrictions' fallout.

At the same time, rates of change should not be confused with levels. For the year as a whole, GDP still declined by some 3.4%. To be sure, at the time of writing world GDP has more or less returned to its pre-crisis level. But this masks a clear divide between China, where GDP is now well above its pre-crisis level, and the rest of the world, where it is still generally some way below. This is even true for the

United States, which has experienced some of the strongest growth rates. If anything, the overall picture for the labour market is somewhat weaker.

Moreover, the recovery has been very uneven across countries and sectors, mainly reflecting the evolution of the pandemic and hence the stringency of containment measures. The euro area has lagged behind the other large jurisdictions. And, as a group, emerging market economies (EMEs) – China aside – have fared worst. In particular, EMEs relying heavily on international tourism were badly hit. Manufacturing has rebounded strongly; and so has trade in goods, confounding previous expectations. Residential construction has followed suit, in part on the back of solid housing demand. By contrast, services have done considerably worse, given lingering mobility restrictions.

In no small measure, the recovery owes its strength to policy.

Fiscal support has been critical. Transfers, loans and guarantees have shielded firms and households, giving them precious oxygen to recover. Indeed, in many countries, personal disposable income actually rose – in some countries, such as the United States, at the strongest pace in decades. Saving rates increased substantially – the “excess savings” phenomenon. Widespread furlough schemes bolstered firms’ bottom lines and shored up employment. Government loans and guarantees kept funding flowing.

Monetary policy has also played an important part. An extraordinarily accommodative stance underpinned exceptionally easy financial conditions. These were supported later in the period by positive news about vaccines and, initially at least, anticipations of the boost to the economy from fiscal stimulus in the United States.

Indeed, the period saw further signs of frothiness and aggressive risk-taking. Credit spreads narrowed to the lower part of historical ranges. Equity valuations reached new heights. Activity in corporate funding markets was frenetic. Various forms of equity financing surged, and the credit spigots remained wide open for low credit-quality firms. A strong appetite for risk underpinned buoyancy across all asset classes, including real estate, commodities and cryptocurrencies. Retail investors played a disproportionate role – a typical sign of overstretched valuations.

At the same time, as the year wore on bond yields started to creep up and then rose more strongly in early 2021, afterwards pulling back only slightly. This reflected a combination of strong US fiscal expansion and accommodative monetary policy, which boosted term premia in anticipation of a flood of government paper and raised expectations that inflation would return.

At the time of writing, the outlook for inflation is one of the big questions keeping financial markets on tenterhooks. Inflation has already increased in a number of EMEs: higher commodity and food prices alongside currency depreciations have given it a push. Moreover, the supply of many intermediate goods is failing to keep up with demand, generating bottlenecks. But the real question is whether the significant rise in inflation already seen in the United States – where it has recently substantially exceeded the target – will be temporary or longer-lasting. This could have major implications not just for financial markets, but for the global economy more broadly.

## Near-term prospects

How could the global economy evolve from here? What could “pandexit” look like?

The degree of uncertainty about the future may not be as high as a year ago, but the fog has not fully lifted. The pandemic is not yet over, the global vaccination campaign is uneven and new contagion waves may still come. Nor has the pandemic’s economic legacy fully come to light.

In addition, three other factors hold the key to the future: the path and impact of fiscal policy, notably that of the huge US stimulus; the path of consumption, which has rebounded surprisingly strongly so far; and the size of firms' potential credit losses, as the much feared wave of insolvencies has not yet materialised.

Given the uncertainties involved, and before turning to policy, it is worth considering three plausible scenarios: the central one embodied in current consensus forecasts, one in which inflation proves stronger than expected and financial market conditions tighten, and one in which the global recovery falters and the economy fails to recover. Of course, various combinations are also possible. The future will not be so tidy, and individual countries will experience different permutations. Even so, together the scenarios provide a useful range of plausible outcomes that helps clarify the challenges policymakers face.

The **central scenario** sees a comparatively smooth recovery. The pandemic is steadily brought under control. Consumption sustains the expansion. Corporate sector losses remain limited, and sectoral reallocation proceeds smoothly. In the main jurisdictions, inflation rises towards targets and any increase beyond them is temporary. Financial conditions do not tighten significantly. Even in this scenario, however, significant cross-country differences remain. The world entered the crisis suddenly and as one; countries will "pandexit" at their own speed and in their own way. In particular, growth in many EMEs lags behind, even as some see more persistent inflation.

The **second scenario** is one where, on the back of stronger growth, inflation exceeds expectations and financial conditions tighten. Markets anticipate a quicker and possibly more intense monetary policy tightening. This is consistent with a larger impact of fiscal policy on demand and a bigger reversal in saving rates than assumed in the central scenario, possibly supported by better news on the pandemic front.

How plausible is this scenario? To be sure, the longer-term forces holding inflation down are still with us, notably globalisation and technological advances: these have weakened the pricing power of both labour and firms. Moreover, the responsiveness of inflation to pressures on productive capacity has been extremely low for well over a decade now. That said, non-linearities cannot be ruled out. And even if any increase in inflation ultimately proves temporary, financial market participants could overreact, anticipating more sustained inflation. Either way, the tightening could be substantial, as participants could be caught wrong-footed and be forced to unwind their positions. The prolonged aggressive risk-taking that has prevailed in markets for so long increases the probability of such an outcome. Recent localised stress, such as the Archegos failure and the losses it has inflicted on banks, could turn out to be the proverbial canary in the coalmine. A key question concerns the resilience of non-bank financial intermediation, especially in the context of hidden leverage and liquidity mismatches.

The **third scenario**, in which the recovery stalls, is more plausible if the pandemic proves harder to control. Successive waves of more virulent Covid strains could be impervious to vaccines, leading to tighter containment measures. Fiscal multipliers and the deployment of excess savings could fall short of expectations.

In particular, the feared wave of firms' insolvencies could materialise – another big question mark clouding the outlook. Estimates of likely credit losses embodied in the central scenario suggest that they would be manageable. Importantly, the debt in the most affected sectors accounts for a relatively small fraction of the total. But this conclusion hinges on policy support being there for as long as necessary. In this alternative scenario, firms' losses could be larger, possibly on a par with those during the Great Financial Crisis (GFC). In turn, banks could feel the strain. In fact, some of them have taken back part of the provisions made earlier in 2020, indicating that they could be caught by surprise.

## Policy challenges

This range of possible outcomes raises near-term challenges for the calibration of policy. But sooner or later the pandemic will end, leaving in its wake issues that may well be more daunting and enduring. Consider each set of challenges in turn.

### Near-term challenges

The near-term scenarios and corresponding uncertainty call for policy adjustments.

If inflation surprised on the upside and financial conditions tightened, central banks would be severely tested. Especially in the United States, which would be critical in this scenario, a tug of war between financial markets and the central bank would probably ensue. Depending on views concerning the path of inflation and inflation expectations, the central bank would have to choose between being extremely patient, on the one hand, and adjusting the stance sooner than anticipated, on the other. It would be difficult to avoid bouts of high volatility and tension in markets.

In this case, the tightening of financial conditions would have broader repercussions. Here, EMEs would be most vulnerable. While benefiting from stronger economic growth and hence buoyant trade, they would face tighter global financial conditions. Depending on economic and financial structures, the weaker among them could run out of room for policy manoeuvre: financial markets could force an abrupt policy tightening. Should the US dollar also appreciate, the pressure would mount further. Other advanced economies in which inflation has been hovering persistently below target could actually welcome higher inflation. This would be so unless financial conditions tightened in an unwarranted fashion or inflation rose excessively, in part responding also to domestic demand pressures.

Should the recovery stall, the policy challenge would be similar to the one faced so far. Countries' room for policy manoeuvre would be tested further. Those where monetary policy and, in particular, fiscal policy have been stretched most would face the more serious difficulties. A number of EMEs would be on the front line. Granted, global financial conditions would probably remain supportive since monetary policy in AEs would remain accommodative. Even so, some economies might still exhaust policy headroom. Again, financial markets could force a premature tightening, in some cases possibly requiring external assistance.

This range of outcomes suggests that policy needs to be calibrated in a sufficiently flexible and prudent way in order to accommodate the resulting uncertainty. Caution is especially important where the policy room for manoeuvre is more limited.

Fiscal policymakers will continue to face the question of when and how far to withdraw stimulus. That said, it is critical that their measures become more targeted. This would help retain precious policy space. It would also facilitate the required reallocation of resources to address the pandemic-induced changes in demand patterns, with some sectors or delivery channels (e-commerce) gaining at the expense of others.

Flexibility will also be at a premium for monetary policy. As inflation concerns persist, communication will be tested to the fullest. Central banks face a delicate balancing act. On the one hand, they need to reassure markets of their continued willingness to support the economy as necessary. On the other, they also need to reassure them of their anti-inflation credentials and prepare the ground for normalisation. Given the uncertainties involved, it would be important to make sure that financial markets focus on the conditional elements of forward guidance rather than giving weight to the calendar signals that reflect central bank expectations.

This is not straightforward: by their very nature, financial market participants' attention gravitates towards the less ambiguous fixed points in time.

Prudential policy will face a twofold task. Supervisors will need to encourage banks to support the economy, but not at the expense of weakening their resilience. Accurate pricing of credit risks is essential, without taking public support of firms for granted. At the same time, absent adjustments in monetary policy, the deployment of macroprudential tools could help address the build-up of vulnerabilities, which are in part linked to the persistence of exceptionally easy monetary conditions. Such tools could be especially useful when aimed at the housing market – a market that has been unusually buoyant for recessionary conditions and whose downturns have been a catalyst for major economic weakness on many occasions in the past.

One limitation prudential policy will face is that the current toolkit is not well suited to addressing the build-up of vulnerabilities among non-bank financial intermediaries, such as asset managers and leveraged funds. It is these players that were at the epicentre of the tremors in March 2020 and among which the most recent signs of stress have emerged. Work is under way in the international community to tackle some of the structural vulnerabilities in this area, such as hidden leverage and maturity mismatches. In the near term, the challenge will be to monitor developments closely and to make sure that the core of the financial system, notably banks and central counterparties, remains resilient against possible shocks.

## Longer-term challenges

Policy support is still essential to nurse economies back to health. But once the Covid pandemic is left behind and the economy has fully recovered, policymakers will face a key long-term challenge: how to rebuild safety margins for both fiscal and monetary policy. An economy that operates with thin safety margins is vulnerable to both unexpected events and future recessions, which will inevitably come. Those margins have been narrowing over time. Rebuilding them means gradually re-normalising policy.

Unprecedented initial conditions globally set the stage. On the one hand, government debt-to-GDP ratios are already on a par with or even higher than their World War II peaks. On the other hand, nominal interest rates have never been so low since records began. In real terms, they have been negative for even longer than during the exceptional Great Inflation era. Likewise, central bank balance sheets have only rarely reached similar heights relative to GDP, and then only during wars. With interest rates so exceptionally low, debt service costs are at post-war troughs – no doubt historical ones, too. The debt burden has never felt so light.

Thus, normalising policy will not be easy.

This is true if one considers each policy in isolation. The post-GFC experience has highlighted the difficulties in normalising monetary policy when structural factors keep inflation low and act as headwinds. Admittedly, for fiscal policy the task is facilitated by the fact that the growth rate of the economy has exceeded the extraordinarily low interest rates for quite some time now: all else equal, this reduces the debt-to-GDP ratio over time. Even so, it would not be prudent to rely on such a configuration going forward. "All else" is not equal. The reassurance of low rates, given political imperatives, could encourage governments to increase debt further. And in some cases it could raise concerns about sustainability, which would lift risk premia and possibly cause broader stress. Indeed, successful reductions in debt-to-GDP ratios have generally required running fiscal surpluses.



The fact that normalising policy is a joint task complicates matters. It means that at times along this long path, fiscal and monetary policies would be working at cross-purposes. Fiscal policy would act as a drag on the economy, putting pressure on monetary policy to remain easy. Raising interest rates would increase the government's borrowing costs, magnifying the required fiscal consolidation. For instance, should interest rates return to the levels prevailing in the mid-1990s, when inflation had already been conquered, median service costs would exceed the previous wartime peaks.

In fact, large-scale central bank government bond purchases increase the sensitivity of government net servicing costs. From the perspective of the consolidated public sector balance sheet, they amount to a debt management operation. It is as if the government had retired long-term debt and replaced it with overnight debt – banks' excess reserves with the central bank. In the large advanced economy jurisdictions, this means that some 15–45% of all the sovereign debt is de facto overnight.

This suggests that, along the normalisation path, tensions may well arise between the two policies. As a result, the risk of fiscal dominance is material. Hence the importance of institutional arrangements that safeguard the central bank's ability to deliver on its mandate. Preserving central bank independence will be critical, otherwise the central bank's credibility and, with it, the ability to achieve its objectives could be undermined. It was precisely this credibility that allowed central banks to take forceful action during the GFC and the Covid-19 crisis.

Above all, this analysis indicates that raising sustainable long-term growth is essential. It is the only way of improving the trade-offs along the normalisation path, by facilitating fiscal consolidation at positive real interest rates. No well functioning economy should operate with real interest rates that remain negative for too long: capital is misallocated and growth impaired. As described in more detail in previous AERs, raising long-term growth requires structural policies designed to deliver a vibrant, flexible and competitive economy. Growth-friendly fiscal policy could also play a useful role. This calls for a shift in the composition of expenditures towards carefully chosen and well executed investments, ultimately financed through efficient taxation.

## The distributional footprint of monetary policy

The pandemic and the preceding prolonged phase of exceptionally low interest rates and large-scale asset purchases have not only complicated the normalisation task. They have also given rise to the perception that monetary policy has been exacerbating income and wealth inequality.

It is well known that monetary policy decisions inevitably have some distributional consequences. The reason is that changes in interest rates influence economic activity through changes in incomes, balance sheets and asset prices. For instance, lower interest rates redistribute income and wealth from creditors to debtors, from tenants to homeowners – often from the young to the old – and from depositors to equity investors. But any such effects are short-run and need to be put into perspective.

There is a broad consensus that trends in inequality are fundamentally driven by structural factors. Over the past couple of decades, in particular, the impact of globalisation and technology has been amply documented. Hence the critical role of structural policies, ranging from education, health and competition to, more generally, policies fostering equal opportunities – so that the relatively poor of today can be the well-off of tomorrow. Hence also the role of fiscal policy, notably

through redistribution policies: post-tax measures of inequality are uniformly lower than pre-tax ones. On top of the fact that the shape of the income distribution is not a monetary phenomenon, monetary policy simply does not have adequate tools. Nevertheless, wearing their non-monetary hats, central banks can make a significant contribution. Depending on their statutory responsibilities, they can do so by fostering financial development, broadening financial inclusion, protecting against unfair financial practices and promoting low-cost payment services.

What monetary policy can do to contribute to a more equitable society is seek to deliver macroeconomic stability. The two major macroeconomic forces that generate inequality over business fluctuations are inflation, rightly regarded as an insidious regressive tax, and recessions, which disproportionately hurt the poor through unemployment. Delivering price and macroeconomic stability – which, in turn, also requires financial stability – is precisely what monetary policy mandates are all about.

Fulfilling these mandates may at times require measures that, in the short run, have unwelcome consequences for inequality in order to secure precious long-run gains. Bringing inflation down can cause recessions. Recovering from deep recessions may require interest rates to be kept low for long periods. This is essential to bolster employment and hence avoid a much larger cost in terms of income inequality. But, by the same token, it may also increase wealth inequality by boosting the prices of assets held disproportionately by the better off, notably equities – although this outcome is not a given, as it depends in particular on who owns housing. This short-run cost is highly visible; the larger gains in terms of lower unemployment and lower income inequality are far less so.

At the same time, changes in the nature of the business cycle since the early 1980s have complicated monetary policy's task. Until then, recessions tended to follow a tightening of monetary policy to bring inflation under control. Since then – Covid aside – they have reflected the reversal of a preceding financial boom. Such “financial recessions” tend to be deeper and longer, especially if a financial crisis breaks out, and the recovery is much more drawn out: their costs in terms of inequality are much higher. Key reasons for the change include the smaller responsiveness of inflation to economic slack, better anchored inflation expectations and financial liberalisation.

The change in the nature of the business cycle has given rise to tougher intertemporal trade-offs. On the one hand, central banks have been able to raise employment further during expansions without generating inflation: this reduces inequality during that phase. On the other hand, accommodative policy of this kind can contribute to the build-up of financial imbalances, which can sow the seeds of subsequent costly financial recessions. Not only do these widen income inequality by more than other recessions, they also require lower interest rates for longer to nurse the economy back to health. As a result, the possible short-run negative impact of lower rates on wealth inequality can become more prominent.

This suggests that a more balanced policy mix is necessary to improve the trade-offs. This means macroprudential policies, to strengthen the financial system's resilience and restrain the financial booms; microprudential policies, to strengthen banks so that they can withstand the bust and support credit; and fiscal policies, to act as a backstop in case a financial crisis breaks out and to support the recovery. These are the key ingredients of a holistic macro-financial stability framework, better suited to address the nature of today's business fluctuations and, as a consequence, their impact on inequality.

But the bottom line is clear: if we want a better, longer-lasting income distribution, continued structural reforms are unavoidable.

## Central bank digital currencies

Trust in the currency underpins the monetary system. As the central bank provides the ultimate unit of account, that trust is grounded in confidence in the central bank itself. This principle has been the fixed point of the monetary system even as it has undergone rapid transformation with changes in the digital landscape.

Last year's AER set out the principled case for how CBDCs can be a means towards fulfilling the central bank's core mission in the payment system. This year's report takes a significant step towards putting this big idea into practice by laying out the design choices for CBDCs and assessing their economic implications for users, financial institutions and the central bank itself.

The overriding criterion when evaluating a change to something as central as the monetary system should be whether it serves the public interest. CBDCs enhance the central bank's traditional roles in the payment system: ensuring the finality of payments; providing liquidity and acting as the lender of last resort; and ensuring that central bank money is "neutral", ie provided with a commitment to competitive fairness on an equal basis to all commercial parties.

Several conclusions follow from these considerations.

First, CBDCs are best designed as part of a two-tier system where the central bank and the private sector focus on what they do best: the central bank on operating the core of the system by ensuring sound money, liquidity and overall security; the private sector by innovating and using its creativity and ingenuity to serve customers better. CBDCs should therefore be designed to delegate most operational tasks and consumer-facing activities to commercial banks and non-bank payment service providers. By preserving the two-tier system, the central bank keeps its financial system footprint small, just as cash does today. Central bank money can then retain its core attribute of neutrality.

Second, the most promising design is an account-based CBDC, rooted in an efficient digital identity scheme for users. In this way, CBDCs can meet the challenges raised by the huge volume of personal data collected as an input into business activity. They can be designed to balance the need for data privacy on the one hand and safeguards for the payment system against illicit activities on the other. Secure identification is also required to promote equal access for everybody. Striking the right balance is key to protecting users against data hoarding and abuses of personal data while preserving the system's integrity against money laundering and financial crime.

Third, CBDCs address another imperative arising from the centrality of data in the digital economy – that of preserving an innovation-friendly level playing field. Network effects make the payment system prone to concentration as well as to the emergence of data silos and the accumulation of market power arising from the exclusive use of data. The same technology that encourages a virtuous circle of greater access, lower costs and better services could equally induce a vicious circle of data silos, market power and anti-competitive practices.

For this reason, it is important that CBDCs be part of an open platform. Open platforms build on technical standards such as application programming interfaces (APIs) and on data governance frameworks that grant control of data to users. They are most conducive to a virtuous circle of greater access, lower costs and innovation.

To be sure, these characteristics are not unique to CBDCs. They also feature in the latest generation of retail fast payment systems – systems that provide near real-time settlement for users. But CBDCs have the additional feature of extending the unique attributes of central bank money to the general public. CBDCs allow direct settlement on the central bank's balance sheet, without the need for intermediary credit. And they maintain a tangible link with the central bank in the same way that

cash does – a salient marker of the trust in sound money itself – even as the use of cash dwindles owing to the increasing adoption of digital payment technologies.

Last but not least, the judicious simplification of the monetary architecture afforded by CBDCs holds the promise of improving cross-border payments. While improvements might also be made by adjusting current systems, starting with a clean slate, unburdened by legacy systems, could yield considerable benefits. So-called multi-CBDC (mCBDC) arrangements, which join up CBDCs across borders, are a case in point. The greatest potential for improvement is offered by an mCBDC system that features a jointly operated payment system hosting multiple CBDCs.

A possible concern is that a foreign jurisdiction's CBDC could magnify the risk of currency substitution. This is the threat that a foreign CBDC might make inroads into domestic payments as domestic prices and contracts become increasingly denominated in it. However, an account-based CBDC builds in safeguards against such an encroachment. The comparison between a CBDC and foreign bank notes circulating in the black market is not a good one in that the issuing central bank would need to recognise any non-domestic CBDC user as a member of the user network. Robust legal tender provisions that promote the use of the national currency in domestic payments would also help. Above all, no payment system exists separately from the underlying economic transactions. International currencies have developed as a result of the transactional needs of their users. A currency is unlikely to achieve international status merely because it is in digital form.

CBDCs are an idea whose time has come. They present an opportunity to design a technologically advanced representation of central bank money, one which preserves the core features of finality, liquidity and integrity that only the central bank can provide. If properly designed, CBDCs could form the backbone of a highly efficient new digital payment system by enabling broad access and providing strong data governance and privacy standards.



## I. Covid and beyond

### **Key takeaways**

- The global recession was deep, but ended sooner than expected, aided by considerable policy support. The recovery has been uneven; some countries and sectors returned to pre-pandemic growth paths, while others lagged. Meanwhile, financial conditions have remained exceptionally accommodative.
- The next stage of the pandemic will involve different, but no less formidable, challenges. As the rollout of vaccines and improved treatments help countries manage the pandemic, its enduring consequences for economic reallocation and work practices will become increasingly apparent.
- Upside and downside risks to growth loom large. Enormous fiscal stimulus and the drawdown of accumulated household savings could deliver stronger growth and higher inflation; but growth could disappoint and business credit losses mount if the virus is not controlled.
- In the near term, diverging economic conditions could pose policy challenges for emerging market economies. Further out, a key task will be to lay a solid foundation for the recovery to allow for policy normalisation and to manage any tensions that might arise between fiscal and monetary policy.

The battle against the Covid-19 pandemic shaped economic and financial developments over the past 12 months. In most countries, the recovery from the first wave of the virus was stronger, and the financial consequences less persistent, than initially feared. But with the virus continuing to spread, the recovery has been markedly uneven across countries and sectors. Ample policy support has shielded firms from the worst consequences of the downturn, helping to ease financial conditions but also supporting buoyant asset prices, which in some cases have been hard to justify given economic conditions.

In the coming year, it seems likely that many countries will gradually bring the virus under control. This will usher in a new phase of the pandemic involving different, but no less formidable, challenges. While the ebb and flow of infections will continue to influence economic conditions, the frequency and severity of lockdowns should ease. Instead, issues such as potential corporate credit losses and capital and labour reallocation will come to the fore. In advanced economies (AEs), fiscal stimulus should facilitate the financial and economic transition and hasten the recovery. But less policy support is likely in most emerging market economies (EMEs). While EMEs will benefit from increased export demand as the recovery in AEs consolidates, they could also face additional headwinds should global financial conditions tighten. The whole world entered the crisis suddenly and as one; the exit is proving slower and staggered.

In the near term, the need to assist firms and households affected by the pandemic will remain a key policy objective. The nature of policy assistance needs to evolve, however, as broad-based support measures give way to more targeted programmes. Differences across countries in the strength and timing of the recovery could lead to a divergence in policy settings and pose a challenge for policymakers in countries where growth is lagging. Meanwhile, it will be important for

policymakers to keep long-term objectives in mind. Key among these is ensuring a solid foundation for sustainable growth to allow policy to be normalised, and reaffirming clear boundaries between monetary and fiscal policies.

This chapter reviews economic and financial conditions over the past year. It then discusses the key economic and financial challenges that are likely to arise in the next stage of the pandemic and lays out scenarios for how they might evolve. Finally, it elaborates on the near- and long-term policy challenges.

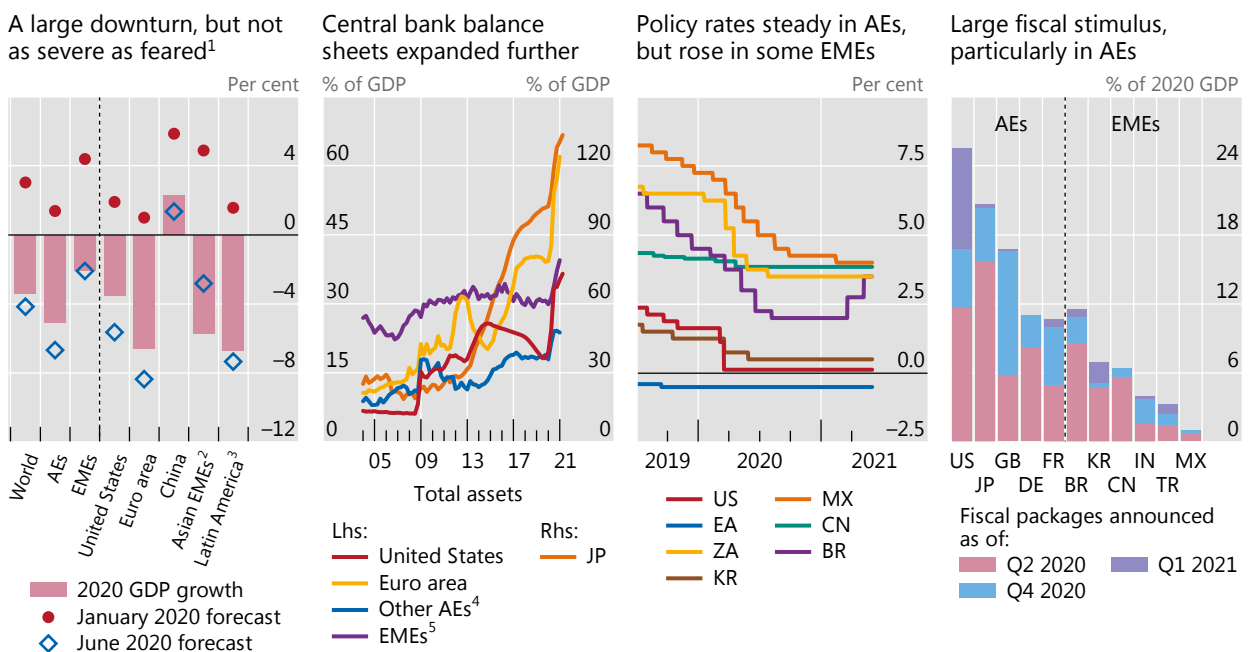
## The year in retrospect

### An incomplete recovery

Many of the key forces that shaped economic developments over the past 12 months were already apparent a year ago.<sup>1</sup> At the time of last year's Annual Economic Report, the world was in the midst of a historically large and synchronised recession. Unprecedented joint monetary and fiscal policy support had been deployed, although it was unclear how effective it would be or how long it could be sustained.<sup>2</sup> There was widespread anticipation of scarring to broad swathes of the economy including firms, households and global trade. There were concerns about the lingering impact of insolvencies, persistent shifts in consumption patterns and shrinking global value chains. Some vaccines were already being developed, but their effectiveness was unproven. The duration of the pandemic was also highly uncertain; early estimates ranged from a single wave lasting a few months to a much more prolonged process.

A large recession, but macroeconomic policy support limited the fallout

Graph I.1



<sup>1</sup> Country groups calculated as weighted averages based on GDP and PPP exchange rates. <sup>2</sup> ID, IN, KR, MY, PH, SG and TH. <sup>3</sup> AR, BR, CL, CO, MX and PE. <sup>4</sup> Simple median of AU, CA, CH, DK, GB, NO, NZ and SE. <sup>5</sup> Simple median of AR, BR, CL, CN, CO, CZ, HK, HU, ID, IN, KR, MX, MY, PE, PH, PL, RU, SA, SG, TH, TR and ZA.

Sources: IMF, *Fiscal Monitor Database of Country Fiscal Measures in Response to the COVID-19 Pandemic*, April 2021; OECD; Bloomberg; Consensus Economics; national data; BIS calculations.



The recession was certainly deep, but the rebound was stronger than forecasters had predicted. The second quarter of 2020 saw the biggest quarterly contraction in global economic activity since the Second World War. However, for the year as a whole, the GDP drop amounted to only 3.4% – a dire outcome in any normal year, but considerably better than projected at the height of the crisis (Graph I.1, first panel).

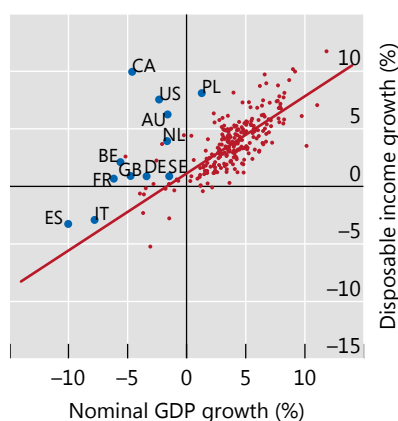
Macroeconomic policy support, which was even more extensive than anticipated, limited the fallout. After acting decisively to pre-empt severe disruptions to credit intermediation and preserve market functioning at the onset of the pandemic, in the period under review central banks provided further stimulus to aid the recovery.<sup>3</sup> In AEs they maintained, and in some cases expanded, asset purchase programmes (Graph I.1, second panel). Some also made greater use of forward guidance, in the case of the Federal Reserve as part of a revised monetary policy framework. In EMEs, central bank actions reflected varying economic forces. Some EME central banks lowered policy rates further; others, such as those of Brazil and Turkey, tightened in early 2021 in response to rising inflation (third panel). Several EME central banks also launched asset purchase programmes for the first time, generally to stabilise markets. In time, most EME central banks were able to weather the furious storm of March and April 2020.

Unprecedented and timely global fiscal stimulus further supported demand, breaking patterns that had become well established in previous recessions. Particularly in AEs, fiscal expansion continued after the initial pandemic shock (Graph I.1, fourth panel). In a number of countries, the packages amounted to more than 10% of GDP. In AEs, household income greatly benefited from fiscal transfers, expanded unemployment benefits and furlough schemes. In a number of cases, household disposable income actually rose in 2020 – sometimes exceptionally fast (Graph I.2, left-hand panel). For firms, government debt guarantees, debt moratoriums and

## Household income held up and firms kept access to credit

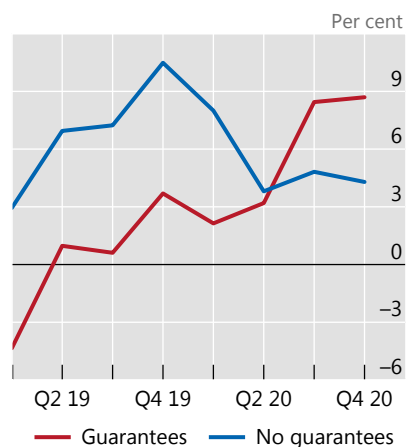
Graph I.2

Household income grew more than expected, given GDP growth



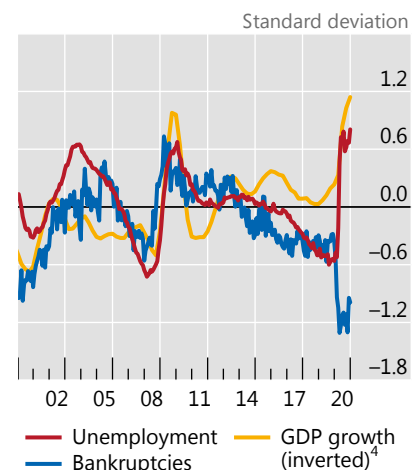
• Historical trend and data<sup>1</sup> • 2020

Credit grew faster in countries with government guarantees<sup>2</sup>



— Guarantees — No guarantees

Corporate bankruptcies decoupled from economic activity<sup>3</sup>



— Unemployment — Bankruptcies — GDP growth (inverted)<sup>4</sup>

<sup>1</sup> Calculated over the period 2000–19 for AU, BE, CA, DE, ES, FR, GB, IT, NL, PL, SE and US. <sup>2</sup> Average year-on-year change in total loans for a sample of 112 large banks in 29 jurisdictions. “Guarantees” refers to loan growth in countries where governments provided credit guarantees. “No guarantees” refers to loan growth in other countries. <sup>3</sup> The mean and standard deviations are calculated over the period 2000–19 on an individual country basis for 11 AEs and 12 EMEs. The graph shows the average of the standard deviations from the mean across countries, where data are available. <sup>4</sup> GDP growth line is inverted, ie values are multiplied by -1.

Sources: IMF, *Fiscal Monitor Database of Country Fiscal Measures in Response to the COVID-19 Pandemic*, April 2021; OECD; national statistical agencies; Datastream; FitchConnect; S&P Capital IQ; BIS; BIS calculations.

other direct support measures helped ensure ample credit supply, counterbalancing a dramatic fall in revenue (centre panel).

Partly as a result, the anticipated wave of corporate insolvencies did not materialise. In fact, business bankruptcies fell in many countries. This coincided with a significant break in the previously close relationship between bankruptcies and economic activity (Graph I.2, right-hand panel).<sup>4</sup>

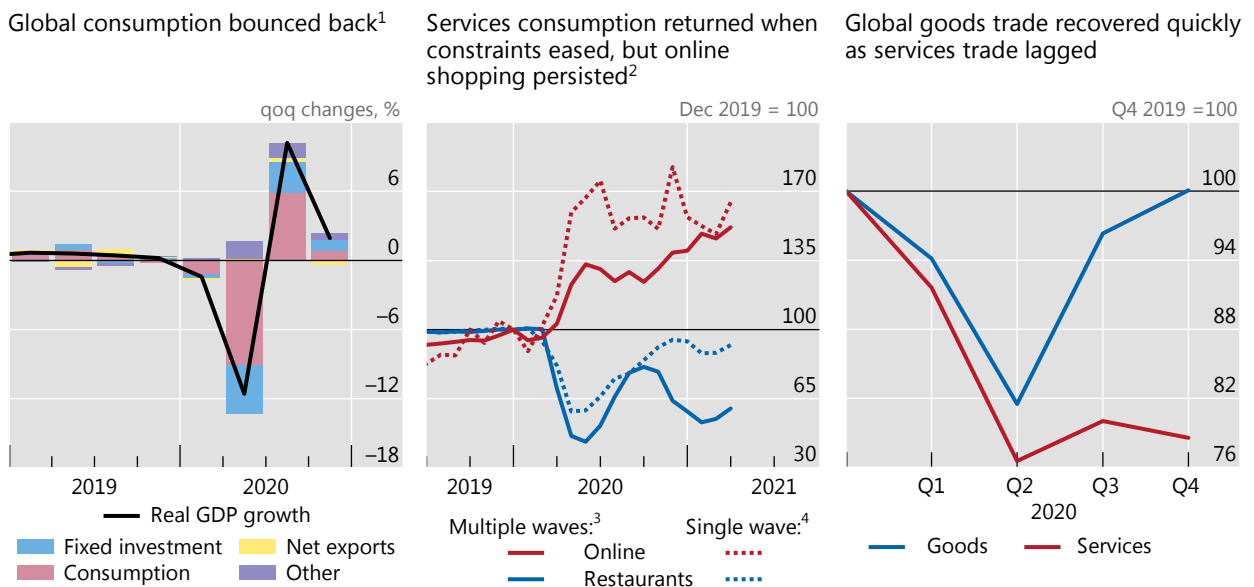
The impact of the crisis on households was less persistent than initially feared. When lockdowns eased in many countries in the third quarter of 2020, spending made up much of its lost ground (Graph I.3, left-hand panel). The lingering weakness in some forms of consumption, notably recreation services, probably reflected constraints rather than enduring shifts in consumer preferences. Indeed, in countries that saw only a single large infection wave, spending on services such as restaurants returned close to pre-pandemic levels (centre panel). At the same time, the pandemic reinforced previous trends in consumption patterns. In particular, the shift to online retailing gathered pace, regardless of whether countries experienced multiple waves of infection. These changes in consumer behaviour also helped insulate economic activity from containment measures. As a result, lockdowns led to much smaller declines in economic activity in early 2021 than they had earlier in the pandemic.<sup>5</sup>

Concerns that the pandemic would deal a lasting blow to global economic integration also proved overly pessimistic. Goods trade rebounded strongly after contracting by nearly 20% early in the first half of 2020 when supply disruptions had wreaked havoc on production networks (Graph I.3, right-hand panel). When supply pressures reappeared in early 2021, they reflected robust demand for goods such as electronic equipment and motor vehicles rather than disruptions to global value chains (GVCs). Services trade, however, did not recover. Cross-border tourism was hard hit, with international air travel declining by 74% in 2020.<sup>6</sup>

Banks weathered the recession surprisingly well. Most had entered the pandemic with relatively strong balance sheets, in large part owing to post-Great

Scarring was not as large as initially feared

Graph I.3



<sup>1</sup> Weighted average based on GDP and PPP exchange rates of 46 countries representing 71% of world GDP. <sup>2</sup> Data up to March 2021. <sup>3</sup> Countries with multiple waves: CA, DE, ES, FR, GB, NL, SE and US. <sup>4</sup> Countries with a single wave: AU, NZ and SG.

Sources: OECD; Consensus Economics; national data; BIS calculations.

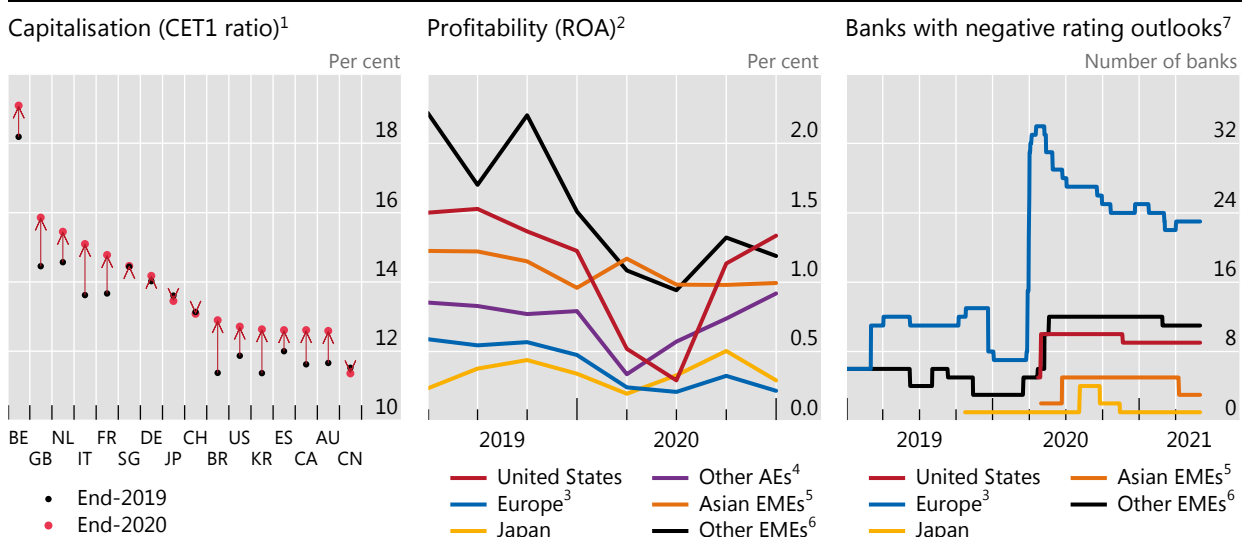
Financial Crisis (GFC) regulatory reforms. Low insolvency rates meant that the hit to asset quality was contained relative to the sharp drop in GDP. Indeed, bank capitalisation increased in many countries in 2020, in part due to restrictions on shareholder payouts and greater flexibility in classifying loans and applying regulations (Graph I.4, left-hand panel). After declining early in the pandemic because of increased provisions against expected losses, bank profitability recovered in the United States and some smaller AEs, although it remained low in Europe and Japan (centre panel). The number of banks with negative rating outlooks also remained elevated, particularly in Europe and EMEs outside Asia. This reflected the uncertain outlook for corporate insolvencies as well as the persistent challenges to bank profitability from low interest rates and competition from technology firms (right-hand panel).

Although the recession turned out to be less severe than initially feared, the recovery has been incomplete. GDP has remained well below pre-pandemic expectations, which admittedly were unusually strong given the length of the previous economic expansion (Graph I.5, left-hand panel). Labour market conditions have deteriorated markedly since the start of the pandemic. And higher unemployment rates tell only part of the story (centre panel). Labour force participation rates have declined substantially in some countries. In Europe, where furlough and part-time work schemes averted large rises in unemployment, the deterioration is visible in shorter working hours. In some countries, enrolment in these schemes – intended initially as a temporary measure – has remained well above pre-pandemic levels (right-hand panel).

The pace and extent of the recovery differed markedly across countries. China, the first economy to enter recession, rebounded quickly. It grew by 2.3% in 2020, on the back of strong business fixed investment and export demand. In turn, China's economic recovery lifted growth in some East Asian EMEs through GVCs. Meanwhile, in the United States a consumption-led bounceback in the second half of the year,

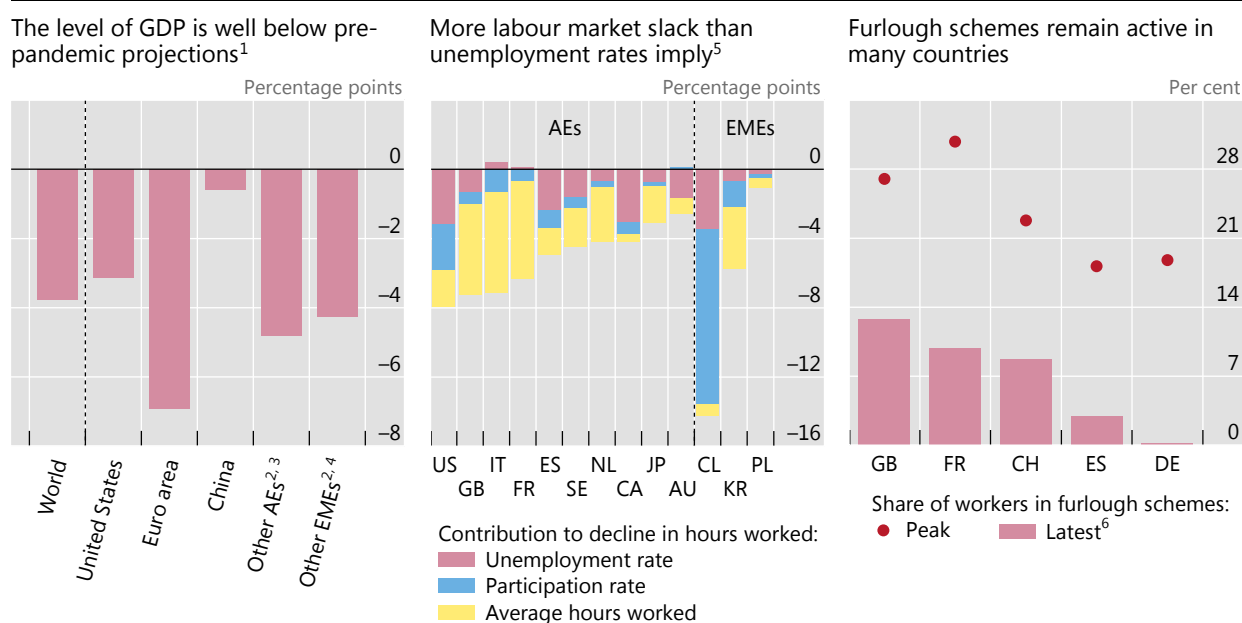
## Banks' profitability declined, but capital ratios rose

Graph I.4



<sup>1</sup> Asset-weighted average of banks in each country, based on risk-weighted assets. <sup>2</sup> ROA = return on assets, calculated as operating income as a share of total assets; asset-weighted average of banks in each region. <sup>3</sup> BE, CH, DE, ES, FR, GB, IT, NL and SE. <sup>4</sup> AU and CA. <sup>5</sup> CN, ID, IN, KR and SG. <sup>6</sup> AR, BR, MX, RU, SA, TR and ZA. <sup>7</sup> Outlooks from Fitch on foreign currency long-term issuer default ratings, including negative watches. For banks in other AEs, there were no negative outlooks during the period shown.

Sources: FitchConnect; BIS calculations.



<sup>1</sup> Difference between the level of GDP at end-Q1 2021 and the December 2019 Consensus Economics forecast for Q1 2021 GDP. For countries that have not yet reported Q1 2021 GDP, the most recent Consensus Economics forecast is used. <sup>2</sup> GDP and PPP exchange rates weighted average. <sup>3</sup> AU, CA, CH, GB, JP, NO, NZ and SE. <sup>4</sup> AR, BG, BR, CL, CO, CZ, HU, ID, IN, KR, MX, PL, RO, RU and TR. <sup>5</sup> Deviation of total hours worked per capita at end-2020 from pre-pandemic level. <sup>6</sup> Latest data as of 31 May 2021.

Sources: International Labour Organization; IMF; OECD; Bloomberg; Consensus Economics; Datastream; BIS calculations.

supported by a residential construction boom and strong growth in information technology investment, limited the contraction in 2020 to 3.5%. In both China and the United States, the vigorous growth momentum extended into 2021.

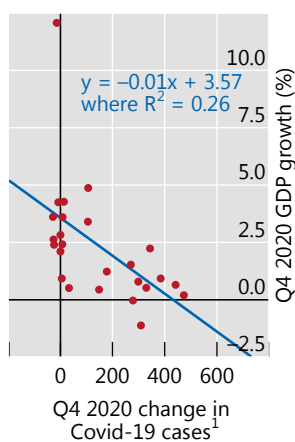
In other countries, however, the initial recovery lost steam. In the euro area, in particular, economic activity declined by 6.6% in 2020 and contracted further in the first quarter of 2021, as new waves of infection led to renewed lockdowns. Growth also slowed in other AEs that experienced multiple infection waves (Graph I.6, first panel).

EMEs in Latin America, Africa and parts of Asia faced particularly challenging conditions. In many of these countries, the structure of economic activity is less suited to remote working and social distancing, constraining their ability to contain the virus, which at times overwhelmed local health services. Early in the crisis, expansionary policy, in some countries alongside remittances, cushioned the initial drop in activity. However, there was little additional fiscal stimulus from mid-2020, in most cases reflecting diminished policy space.

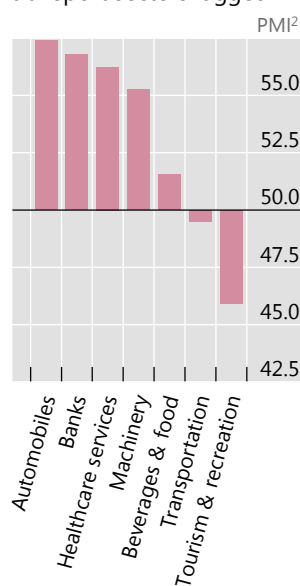
The recovery was also uneven at a sectoral level due to the pattern of containment measures. In most countries, sectors such as manufacturing and construction bounced back rapidly after lockdowns were relaxed (Graph I.6, second panel). By contrast, customer-facing service industries lagged badly. Unsurprisingly, these typically labour-intensive low-wage sectors saw by far the largest job losses (third panel).<sup>7</sup> In EMEs, the informal sector suffered most (fourth panel).

The disinflationary effects of the pandemic continued through 2020 (Graph I.7, first panel). Lower aggregate demand, weaker labour markets and firms' cost-cutting more than offset supply constraints. Slower price increases early in the pandemic in service industries, such as transport and recreation, were only partly offset by stronger ones in the durable goods sector, which actually saw higher

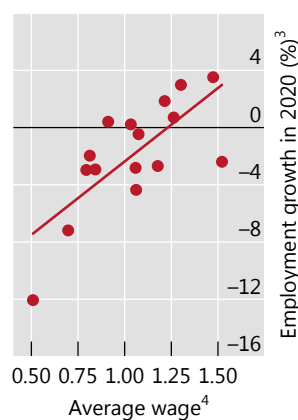
Rising infections weighed on growth



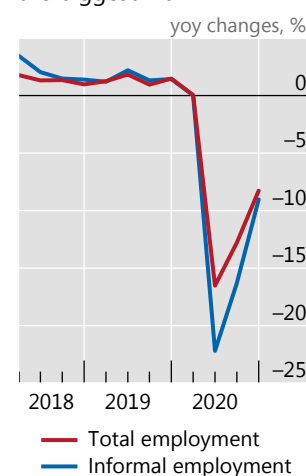
The recreation and transport sectors lagged



Employment fell most in low-wage industries



Informal employment took the biggest hit<sup>5</sup>



<sup>1</sup> Q4–Q3 2020 difference in the average number of new Covid-19 cases per million inhabitants. <sup>2</sup> Global purchasing managers' indices: a value of 50 indicates that the number of firms reporting improvement in activity is the same as the number reporting deterioration. Average from July 2020 to present. <sup>3</sup> Average growth across AU, CA, BE, CH, DE, ES, FR, GB, IT, NL, SE and US. <sup>4</sup> Mean industry wage relative to economy-wide mean in 2019, average across AU, CA, CH, GB and US. <sup>5</sup> Working age population-weighted average of AR, BR, CL, CO, PE and ZA.

Sources: International Labour Organization; IHS Markit; Opportunity Insights, Economic Tracker; Our World in Data; BIS calculations.

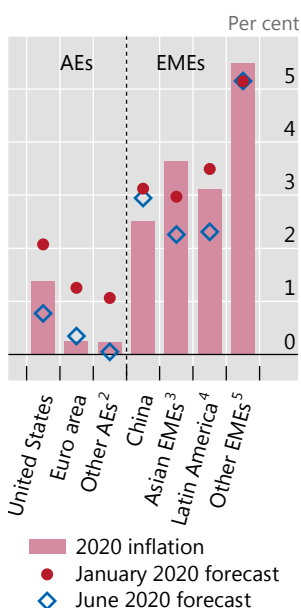
demand during lockdowns (second panel). Low inflation in China also reverberated through other economies due to the country's large role in global trade.

As the period under review progressed, however, supply pressures strengthened substantially and inflation picked up. After declining early in the pandemic, PPI inflation trended firmly upwards in several economies, most notably China, paralleling a steady recovery in commodity prices (Graph I.7, third and fourth panels). In conjunction with exchange rate depreciations, this led to higher inflation in a number of large EMEs. Inflation also rose in most AEs and in some cases exceeded central bank targets. As well as higher commodity prices, a rebound in the prices of items such as airfares and hotels, which had fallen sharply early in the pandemic, contributed to increased inflation in these countries.

### Exceptionally accommodative financial conditions

The economic recovery went hand in hand with exceptionally accommodative financial conditions. Expectations that very easy monetary policy settings would be sustained, together with unprecedented fiscal expansions that improved economic prospects and supported corporate solvency, were instrumental in reducing business funding costs and compressing risk premia. While public interventions sustained asset valuations, risky assets appeared expensive even after accounting for the level of interest rates. Starting in early 2021, rapidly improving economic forecasts led to a sharp rise in sovereign yields in AEs that then spilled over to EME yields. On balance, however, financial conditions remained very supportive from a historical perspective, including in most EMEs.

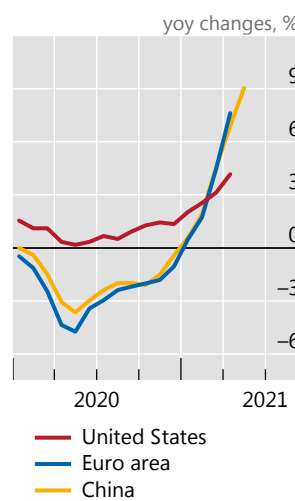
In 2020 inflation stayed low in AEs, but rose in some EMEs<sup>1</sup>



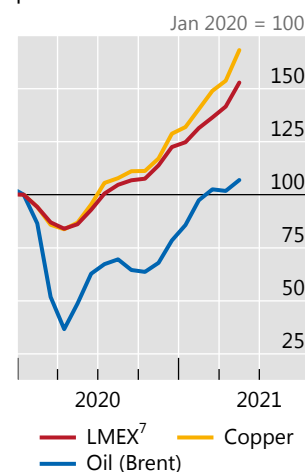
Prices grew more slowly in pandemic-affected sectors than in others<sup>6</sup>



Producer prices increased as the period progressed



After declining early in the pandemic, commodity prices soared



<sup>1</sup> Country groups calculated as weighted averages based on GDP and PPP exchange rates. <sup>2</sup> AU, CA, CH, JP and SE. <sup>3</sup> HK, ID, IN, KR, MY, TH and SG. <sup>4</sup> BR, CO, CL, MX and PE. <sup>5</sup> PL, RU, SA, TR and ZA. <sup>6</sup> Simple average across 36 countries. <sup>7</sup> London Metal Exchange index, consisting of the prices of the six primary metals: copper, aluminium, lead, tin, zinc and nickel.

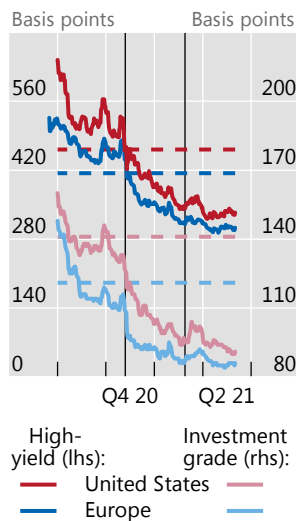
Sources: OECD; Consensus Economics; Datastream; BIS calculations.

With accommodative policies in place, businesses were able to access finance on very favourable terms. Credit spreads were compressed through mid-2021, even for low-rated firms, falling well below historical averages (Graph I.8, first panel). Following a sharp increase in mid-2020, not least thanks to central banks' asset purchases and liquidity facilities, corporate bond issuance remained exceptionally buoyant into the first quarter of 2021, even reaching record highs in the US high-yield segment (second panel). The prices of funds investing in loans to small risky firms also soared in late 2020, exceeding pre-pandemic levels in early 2021.

Strong risk appetite sustained valuations in equity and real estate markets. Even after accounting for the very low level of interest rates, stocks appeared expensive in the United States and China, although less so in other markets (Graph I.8, third panel). Positive sentiment was also apparent in the steep increase in capital raised through initial public offerings and special purpose acquisition companies, which echoed the rush to public markets seen in the late 1990s tech boom. While commercial real estate (CRE) prices had fallen markedly early in the pandemic, proxies for risk premia remained low. In the United States, the difference between CRE rental yields (also known as capitalisation rates) and Treasury yields – often interpreted as a valuation measure – was at the same level in the first quarter of 2021 as it had been in late 2019, even for the pandemic-hit retail sector (fourth panel). Moreover, although office building valuations fell, they remained well above post-GFC lows. In the meantime, and unusually for a recession, house prices rose sharply in many countries (Box I.A).

Positive vaccine news and an unprecedented fiscal expansion underpinned buoyant sentiment in equity markets. Global stock prices started rising in November 2020 on favourable vaccine trial results, even though they remained

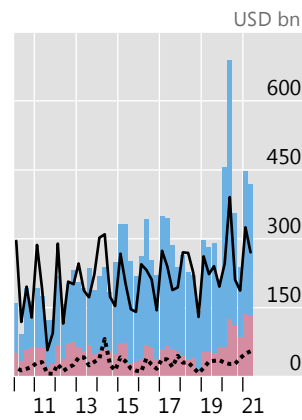
Corporate bond spreads compressed



High-yield (lhs):  
 — United States  
 — Europe

Investment grade (rhs):  
 — United States  
 — Europe

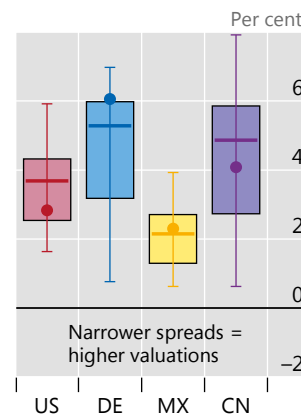
Corporate bond issuance was unusually strong



Corporate bond issuance<sup>1</sup>  
 United States:  
 ■ High-yield  
 ■ Investment grade

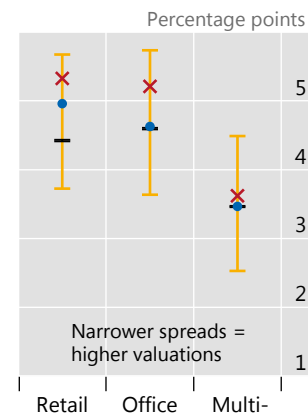
Euro area:  
 — High-yield plus investment grade  
 ..... High-yield

Valuations were buoyant for selected equity benchmarks...



CAPE spread box plots<sup>2</sup>  
 May 2021:<sup>3</sup> ● United States  
 ● Germany  
 ● Mexico  
 ● China

...and were stable for hard-hit commercial real estate



Capitalisation spreads:<sup>4</sup>  
 ● Q4 2019    × Q1 2021

Historical distribution:<sup>5</sup>  
 — 5th–95th percentile range  
 — Median

The vertical lines in the first panel indicate 6 November 2020 (last trading day before Pfizer released details on vaccine efficacy) and 25 February 2021 (US bond market turmoil). The horizontal lines in the first panel indicate 2005–current medians.

<sup>1</sup> For 2021, issuance data up to 31 May 2021, extrapolated to full quarter. <sup>2</sup> Box plots show medians, interquartile ranges, and fifth and 95th percentiles; data starting in 2005. CAPE yields are calculated by subtracting the inflation-adjusted yield on the 10-year government bond from the inverse of the cyclically adjusted price/earnings (CAPE) ratio. <sup>3</sup> May 2021 values calculated using April 2021 CPI, with the exception of DE. <sup>4</sup> Based on US capitalisation rates minus monthly average of 10-year US Treasury yield. <sup>5</sup> Based on monthly data since January 2010.

Sources: IMF; OECD; Bloomberg; BoAML ICE indices; Dealogic; BIS calculations.

sensitive to the evolution of infection rates and delays in vaccine availability. In conjunction with very accommodative monetary policy, an extraordinary increase in government expenditure, especially in the United States, provided crucial support to risky assets in 2021 (Graph I.9, first panel). As US fiscal legislation neared its approval, volatility rose alongside higher sovereign yields in late February. The rise in EME equities also lost steam at this time on concerns of negative spillovers from higher AE yields. Chinese stocks experienced particularly large losses, which they had yet to recoup by June, partly due to policy efforts aimed at curbing credit growth.

As the period unfolded, sovereign yields started to rise. The brightening economic outlook, sustained by positive vaccine news, fiscal expansion and continued monetary accommodation, bolstered a “reflation trade”. At first, the steady increase in US bond yields reflected higher market-based inflation expectations (Box I.B). Subsequently, forecasts of buoyant US economic growth, supported by exceptional US fiscal stimulus and a tilt towards longer-dated sovereign issuance, lifted long-term yields (Graph I.9, second panel). The reflation trade appeared to ease somewhat in April, even as macroeconomic forecasts improved. Reportedly, increased demand from international investors was partly responsible. Indeed, by the end of March 2021 US Treasury yields hedged into euro and yen had risen to the highest levels in years, becoming particularly attractive to investors from those jurisdictions.



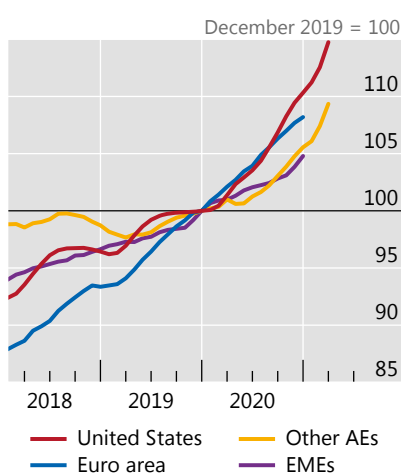
## House prices soar during the Covid-19 pandemic

House prices soared in many countries over the past year (Graph I.A, left-hand panel). Although a rise in house prices during a recession is not unprecedented, partly because accommodative monetary policy meant to stimulate the economy also supports asset prices, recent increases have been unusually large. In AEs, house prices rose by 8% on average in 2020, with growth accelerating further in the first few months of 2021. In EMEs, prices rose by around 5% on average in 2020. Rising house prices can contribute to a build-up of household vulnerabilities. As such, understanding why house prices rise is important when evaluating possible risks ahead.

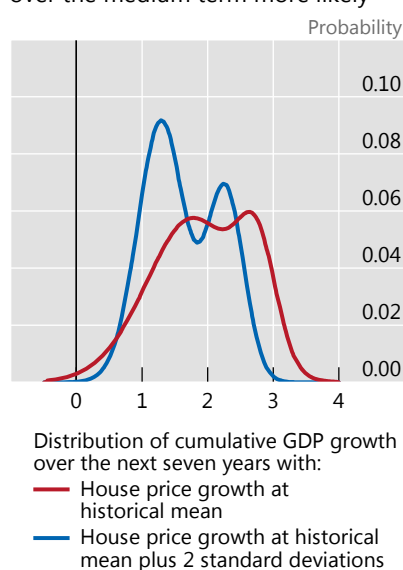
### Drivers and risks of rising house prices

Graph I.A

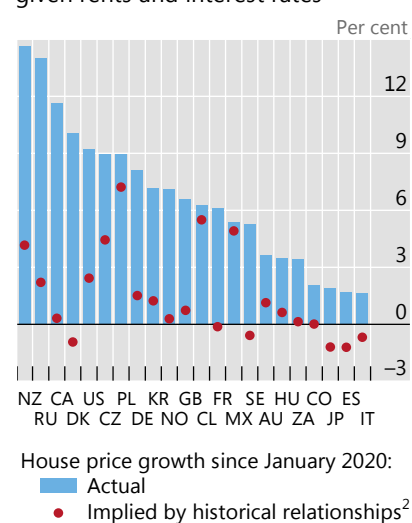
#### House prices rose sharply<sup>1</sup>



#### Rising house prices make low growth over the medium term more likely



#### Prices grew more than expected given rents and interest rates



<sup>1</sup> GDP and PPP exchange rates weighted averages: euro area = DE, FI, FR, IE, NL and PT; other AEs = AU, CA, GB, IS and SE; EMEs = AE, BR, HK, IL, KR, MX and TH. <sup>2</sup> Based on the regression  $\Delta \left( \frac{price_{i,t}}{rent_{i,t}} \right) = \alpha_i + \gamma_t + \beta_1 \left( \frac{price_{i,t-1}}{rent_{i,t-1}} \right) + \beta_2 yield_{i,t-1} + \beta_3 \Delta \left( \frac{price_{i,t-1}}{rent_{i,t-1}} \right) + \beta_4 \Delta yield_{i,t-1} + \varepsilon_{i,t}$  estimated on an unbalanced panel of 13 AEs over the sample Q1 1980–Q4 2019, where  $price_{i,t}$  is the log of the real housing price in country  $i$  at time  $t$ ,  $rent_{i,t}$  is the log of the real CPI rent index,  $yield_{i,t}$  is the value of the real 10-year bond yield and  $\alpha_i$  and  $\gamma_t$  are country and time fixed effects.

Sources: D Aikman, M Drehmann, M Juselius and X Xing, "The Bactrian camel: macro risk in the medium term", forthcoming; OECD; Bloomberg; Datastream; IFRS Foundation; national data; BIS calculations.

Two factors seem to be behind the rise in house prices. The first is the pandemic itself. After contracting significantly as economies locked down in early 2020, the number of housing transactions surged towards the end of the year and into 2021. As well as pent-up demand, the increase in housing turnover seems to reflect changes in housing preferences as lockdowns and working from home caused households to reassess commuting costs.<sup>①</sup> Because housing supply is relatively inelastic in the short run, demand-induced increases in housing turnover typically go hand in hand with rising house prices.<sup>②</sup> The second factor is interest rates, which declined early in the pandemic. Not only do lower interest rates make it cheaper to service a home loan, they also raise the present value of future housing services, which increases the value of home ownership relative to renting.

Soaring house prices give rise to intertemporal trade-offs. They can bolster consumption in the near term and are an important part of the monetary policy transmission mechanism, but they also raise downside risks in the medium term, particularly if accompanied by a pickup in credit growth.<sup>③</sup> In addition, rising house prices tend to go hand in hand with increased residential construction, which is associated with lower aggregate productivity growth.<sup>④</sup> Graph I.A, centre panel, illustrates the medium-term consequences of higher house prices. The red line shows the distribution of expected annual GDP growth over a seven-year window when house price growth is at its long-run mean for a panel of AEs. The blue line shows the same distribution

when house price growth is two standard deviations above its long-run mean. The bulk of the blue line lies to the left of the red line, indicating that faster house price growth is associated with an increased probability of below-trend GDP growth in the medium term.

Moreover, there is evidence that, since the start of the pandemic, house prices have risen by more than fundamental drivers, such as borrowing costs and rents, would imply. Based on their historical relationship to rents and interest rates, house prices would have been expected to rise in many countries since the start of 2020, but in most cases by less than the actual increase observed (Graph I.A, right-hand panel). Growth in rents – a key component in the cost of housing services – slowed in most countries over the past year. But mortgage interest rates and long-term bond yields – the relevant interest rates for discounting housing services – declined, at least until early 2021. This apparent divergence between house prices and their fundamental determinants could make them more vulnerable to larger corrections in the future, especially if financial conditions become less accommodative.

① Indeed, US house prices have grown fastest outside major metropolitan areas since the start of the Covid-19 pandemic, reversing long-run trends over preceding decades. See A Gupta, V Mittal, J Peeters and S Van Nieuwerburgh, “Flattening the curve: pandemic-induced revaluation of urban real estate”, *NBER Working Papers*, no 28675, April 2021. ② See K Hort, “Prices and turnover in the market for owner-occupied homes”, *Regional Science and Urban Economics*, vol 30, no 1, January 2000. ③ For a summary of the empirical estimates of housing wealth effects, see Figure 5 in D May, G Nodari and D Rees, “Wealth and consumption in Australia”, *The Australian Economic Review*, vol 53, no 1, February 2020. ④ See C Borio, E Kharroubi, C Upper and F Zampolli, “Labour reallocation and productivity dynamics: financial causes, real consequences”, *BIS Working Papers*, no 534, December 2015.

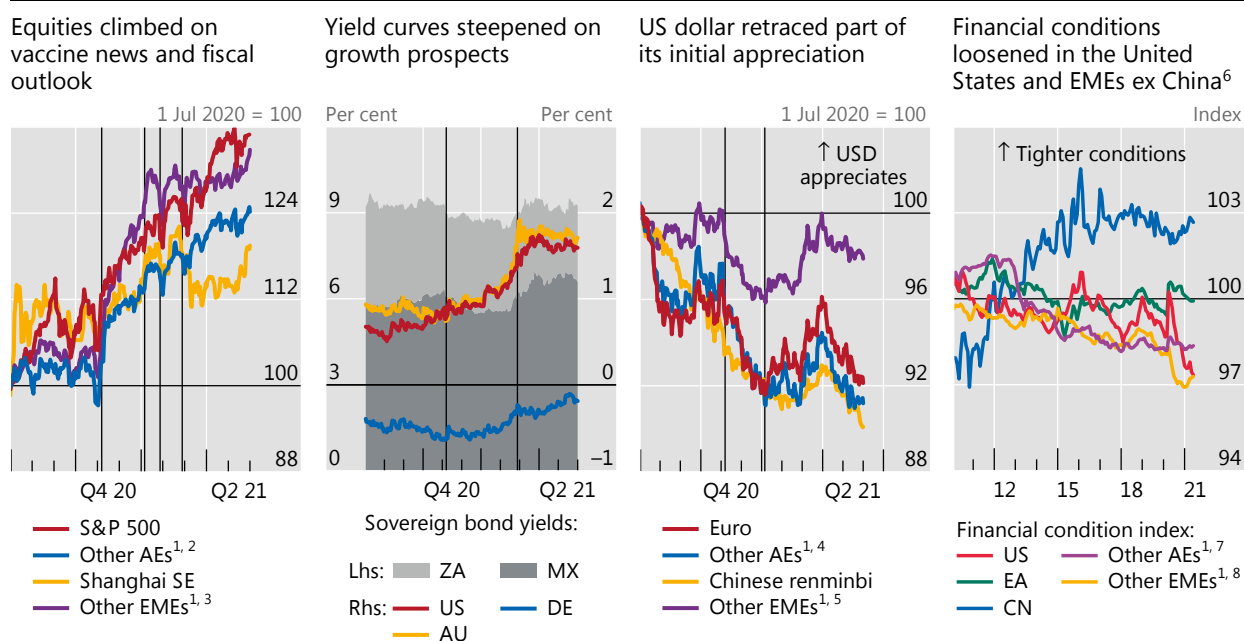
The reflation trade in AEs spilled over to EMEs. Starting in February 2021, local currency EME yields jumped (Graph I.9, second panel). Improving growth expectations in AEs had positive effects on EMEs thanks to rising exports and commodity prices. In many EMEs, however, higher AE yields exacerbated vulnerabilities stemming from a combination of slow vaccination rates, rising contagion rates, surging public debt levels and structural economic weakness that preceded the pandemic. The difficult predicament EMEs faced was visible in the depreciation of their currencies relative to the US dollar in the first quarter of 2021, which was unusual given soaring commodity prices (third panel).

That said, financial conditions in EMEs generally tightened only moderately and remained accommodative on balance (Graph I.9, fourth panel). The tightening effect of higher long-term yields was partly offset by advancing equities. China was an exception and saw financial conditions tighten noticeably, not least due to its domestic policy stance that aimed at containing credit growth. The tightening took place despite buoyant bond fund flows driven by a search for yield and portfolio rebalancing after Chinese bonds were included in international indices.

## The next stage of the pandemic

A key goal of policy in the past year was to hold the fabric of the economy together until a path out of the pandemic came into view. While policymakers could do little about the lockdowns’ direct impact, wide-ranging policy support limited the fallout. In many countries, support measures were so extensive that the lasting consequences of the pandemic, including shifts in the composition of economic activity, have scarcely begun to be addressed. In this respect, the experience of the past year illustrates the limits as well as the power of stabilisation policy.

The pandemic is now entering a new stage. While the spread of the virus will still constrain economic activity, a wider set of forces will start to shape outcomes. Among the most significant are US fiscal policy, which could have global consequences through trade and financial spillovers, and the behaviour of households, whose



The vertical lines in the first panel indicate 6 November 2020 (last trading day before Pfizer released details on vaccine efficacy), 5 January 2021 (Georgia Senate runoff elections), 27 January 2021 (US House majority leader starts the process for possible non-bipartisan approval of fiscal expansion) and 25 February 2021 (US bond market turmoil). The vertical lines in the second panel indicate 6 November 2020 and 25 February 2021. The vertical lines in the third panel indicate 6 November 2020 and 5 January 2021.

<sup>1</sup> GDP weighted average. <sup>2</sup> AU, CA, CH, DK, GB, NO, NZ and SE. <sup>3</sup> BR, CL, CO, CZ, HK, HU, ID, IN, KR, MY, MX, PE, PH, PL, RU, SG, TH, TR and ZA. <sup>4</sup> AU, CA, CH, DK, GB, JP, NO, NZ and SE. <sup>5</sup> AR, BR, CL, CO, CZ, HK, HU, ID, IL, IN, KR, MY, MX, PE, PH, PL, RU, SA, SG, TH, TR, TW and ZA. <sup>6</sup> Individual financial condition indices are z-scores, hence average levels are not directly comparable across regions. A value of 100 represents average conditions. <sup>7</sup> AU, CA, GB, JP, NO and NZ. <sup>8</sup> CL, HU, ID, IN, KR, MX, MY, PH, PL, RU, TH and ZA.

Sources: IMF; Barclays; Bloomberg; BIS calculations.

“excess savings”, if released, could provide a significant impetus to the recovery. The strength of these forces will help determine whether the wave of business insolvencies that failed to materialise last year eventually occurs. Corporate credit losses would, in turn, feed back into broader economic conditions through business investment and the health of the financial sector. Meanwhile, the pandemic’s effects on corporate reallocation will become clearer.

How will the global economy evolve as these forces play out over the next year or so? A natural starting point is the central scenario embedded in current economic forecasts and financial market prices, and the corresponding assumptions and policy expectations. However, given the exceptional combination and scale of the forces at work as well as surrounding uncertainty, it is worth exploring how economic conditions could differ if the assumptions behind the central forecast are not realised. Accordingly, what follows contrasts the relatively benign central scenario with two plausible and more challenging alternatives. The range of outcomes provides insights into the considerations that could inform policy.

### The central scenario

The central scenario, as embodied in Consensus Forecasts, is for the economic recovery to continue, albeit at varying speeds across countries (Graph I.10, left-hand and centre panels). The pickup in growth should go hand in hand with better labour market conditions. As slack diminishes, inflation is projected to move closer

## What can we learn from market-based inflation expectations?

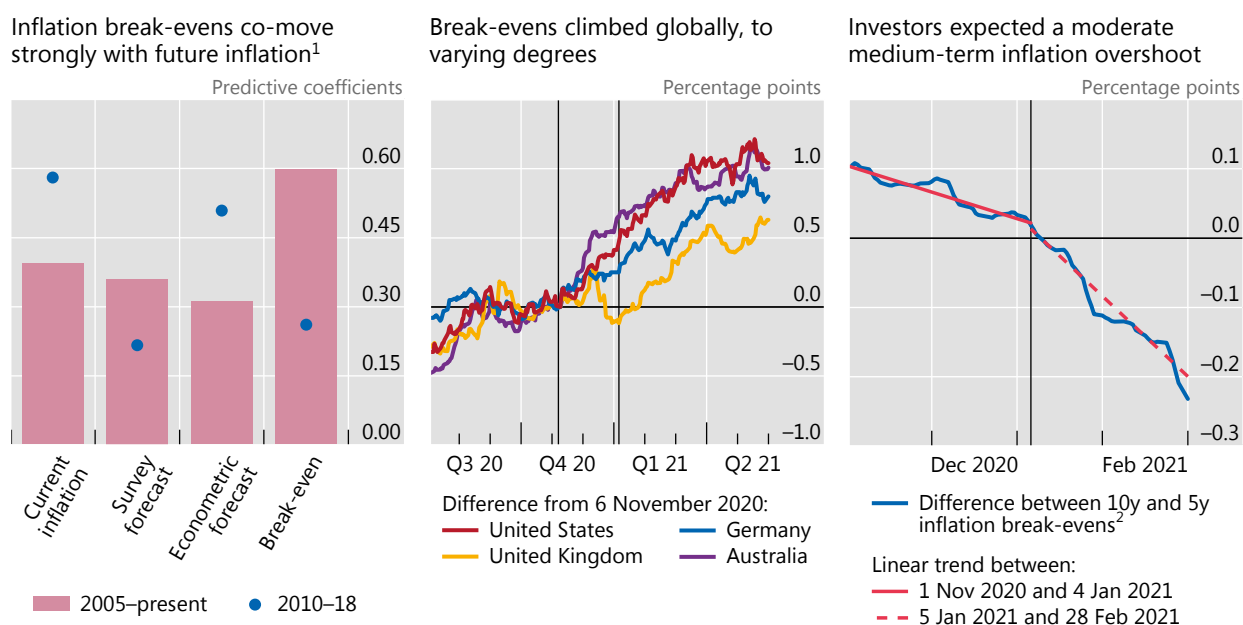
Inflation break-even rates are often used as timely measures of market-based expectations of future inflation. Break-evens are defined as the spread between the yields on nominal and inflation-indexed government bonds. These measures reflect three elements: first, the inflation rate that investors expect will be realised over the maturity of the bonds; second, the compensation for the inflation risk that investors require when holding nominal bonds; and third, the effect of demand/supply imbalances, such as those due to dealer balance sheet capacity.

This box addresses two questions. First, given that expected inflation is only one of their drivers, how informative are break-evens about future realised inflation? Second, what can short-term movements in break-evens tell us about the factors behind rising inflation expectations in late 2020 and early 2021? The first main finding is that break-evens predict near-term inflation well. The second is that, in the context of the Federal Reserve's new monetary policy framework adopted in August 2020, break-evens in several countries appear to have been significantly and durably influenced by positive vaccine news as well as by US fiscal expansion.

Break-evens compare favourably with other predictors of inflation. This takeaway is based on data from the United States over the sample period 2005–20 and on the link between monthly averages of daily five-year break-even rates and future realised inflation. In order to maximise available data, the analysis uses inflation measured during the following year rather than over the subsequent five years. The evidence indicates that break-evens co-move more strongly with future inflation than other common predictors, as reflected in the larger coefficient from regressions of realised inflation on lagged break-evens (Graph I.B, first panel, red bars). During tranquil times, ie excluding the GFC and the Covid-19 pandemic from the sample, the co-movement is weaker (fourth bar vs fourth dot), but even then break-evens have a larger predictive coefficient than survey forecasts of market economists (second dot vs fourth dot). This pattern implies that break-evens can be especially informative during volatile periods, when conditions evolve quickly and market prices respond rapidly to new information.

### Break-evens rose globally as medium-term pressures built in the United States

Graph I.B



The vertical lines in the centre panel indicate 6 November 2020 (last trading day before Pfizer released details on vaccine efficacy) and 5 January 2021 (Georgia Senate runoff elections). The vertical line in the right-hand panel indicates 5 January 2021.

<sup>1</sup> Coefficients from predictive regressions of average monthly US CPI change 12 months ahead on each of the indicated variables separately. Inflation 12 months ahead is used instead of inflation 60 months ahead to minimise sample loss. Survey inflation five years ahead is from the Survey of Professional Forecasters. The econometric forecast is average inflation 12 months ahead from an ARMA(1,1) model on realised inflation since 2005. The break-even rates have a five-year horizon. <sup>2</sup> Difference calculated on the five-day moving average of the two series.

Sources: Federal Reserve Bank of Philadelphia; Bloomberg; BIS calculations.

Starting in the third quarter of 2020, market-based inflation expectations reacted strongly to news about vaccines and fiscal expansion in the United States. In the wake of higher and sustained volatility earlier in the year following the initial pandemic shock, break-evens remained relatively stable in mid-2020 in a number of AEs and EMEs. As early trial results indicated substantial vaccine efficacy, break-evens started to climb rapidly across jurisdictions, with the exception of those for the United Kingdom (Graph I.B, second panel). Underscoring the expected global spillovers from US fiscal deficits, break-evens for Germany and the United Kingdom rose more rapidly after political changes raised prospects of a large fiscal package in early January 2021.

The spread between 10-year and five-year break-evens points to expectations of a short-run bout of inflation from the US fiscal impulse. This spread is typically positive, possibly because longer investment horizons carry more uncertainty and higher inflation risk premia (Graph I.B, right-hand panel). Market participants interpreted the results of US Senate runoff elections in Georgia in early 2021 as raising the likelihood of a very large fiscal expansion under the new US administration, which indeed took place a few weeks later. Immediately after the election results, the break-even spread fell more quickly and turned negative, indicating that investors expected fiscal policy to boost medium-run inflation above long-term levels.

to central bank targets, and in some cases exceed them (right-hand panel). However, with the exception of a few EMEs, inflation overshoots are seen as temporary.

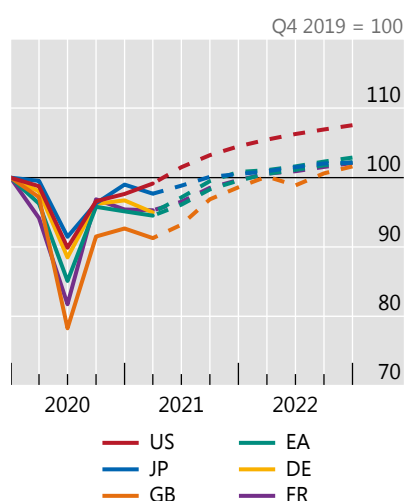
Accommodative fiscal and monetary policy are envisaged to underpin the recovery. Considerable fiscal stimulus remains to be deployed, on top of measures introduced last year, particularly in the United States. Monetary policy is also expected to remain highly expansionary in AEs, where a number of central banks have committed to maintaining their current stance until inflation reaches, or in some cases exceeds, its target. As a result, any tightening in global financial conditions is seen as moderate. However, policy rates could rise in some EMEs to dampen inflation.

Progress in controlling the virus is expected to vary across countries, contributing to the highly uneven recovery. In some AEs, the rollout of vaccines has

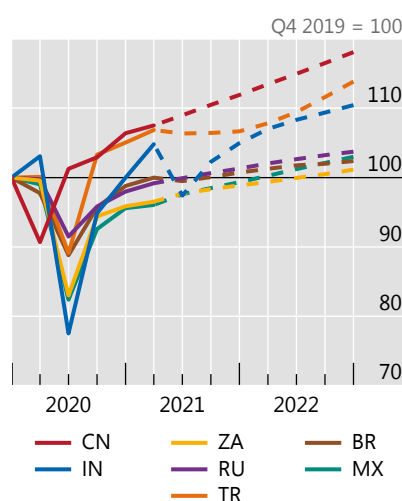
## The central scenario

Graph I.10

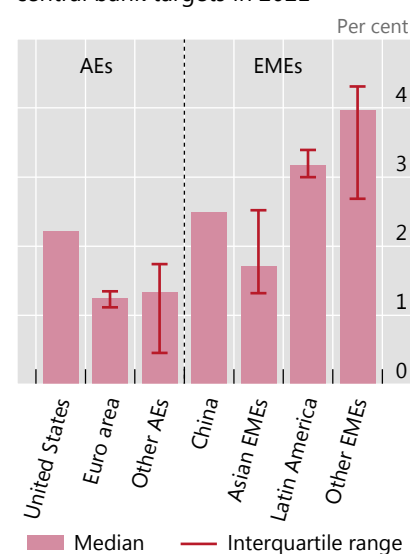
### A steady recovery in AEs<sup>1,2</sup>



### More dispersion in EMEs<sup>1,3</sup>



### Inflation expected to move closer to central bank targets in 2021<sup>4</sup>



<sup>1</sup> Levels based on quarter-on-quarter percentage change. Dashed lines indicate forecasts. <sup>2</sup> From Consensus Economics, *Continuous Consensus Forecasts*, May 2021. <sup>3</sup> JPMorgan forecast as of 31 May 2021. <sup>4</sup> Consensus Economics March 2021 forecasts for CPI inflation in 2021. Euro area = BE, DE, FR, ES, IT and NL. Other AEs = AU, CA, CH, JP and SE. Asian EMEs = HK, ID, IN, KR, MY, SG and TH. Latin America = BR, CO, CL, MX and PE. Other EMEs = PL, RU, SA, TR and ZA.

Sources: Consensus Economics; JPMorgan; BIS calculations.

## Charting a path to “pandexit”

Vaccine rollouts could pave the way for the removal of most remaining constraints on economic activity. Yet vaccination rates remain low in many parts of the world. Until substantial progress is made, many countries, particularly EMEs, remain vulnerable to further waves of infection. Although vaccine production is accelerating, supply looks set to be constrained for some time. This highlights the value of alternative “pandexit” strategies, such as improved treatments and more targeted prevention methods. This box evaluates these strategies and quantifies their possible effects on economic activity.

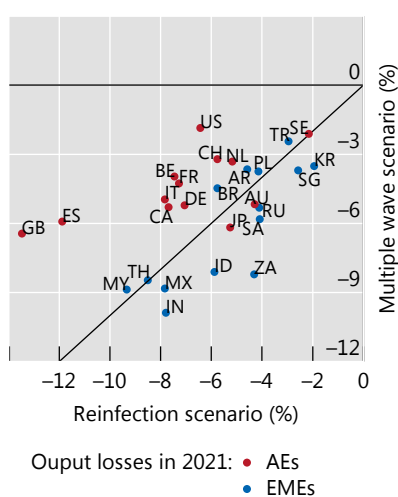
To assess the economic implications of different health strategies, a framework is needed that captures the interactions between epidemiology and economics. One such analysis employs a two-bloc framework that can flexibly accommodate a variety of epidemiological scenarios across many countries.<sup>①</sup> The first bloc describes how mobility affects the evolution of the pandemic, based on the susceptible-exposed-infectious-removed (SEIR) model of infectious disease transmission. The second bloc captures how society adjusts mobility to balance health and economic considerations.<sup>②</sup> Changes in mobility can in turn be mapped into GDP based on the historical relationship between the two variables. The model produces real-time estimates of infection and fatality rates, reflecting changes in the characteristics of the virus (eg the emergence of new variants) and improved treatments, which can be used to project the economic and health implications of current trends. In addition, the model can quantify how advances in vaccination or the emergence of virus variants alter the achievable combination of health and economic outcomes.

The analysis points to significant gains from vaccine rollouts. If the pace of vaccination slows to a third of its currently forecasted rate, the implied drag of the virus on output during 2021 could be one and a half times as large for the median country as is currently assumed. Slower progress with vaccinations also leaves countries more exposed to a resurgence in infections. Indeed, for many EMEs further waves of infections pose a greater risk than the emergence of vaccine-resistant virus variants because they are less protected by vaccination (Graph I.C, left-hand panel). In contrast, for countries with high vaccination rates, the emergence of vaccine-resistant variants poses the greater risk.

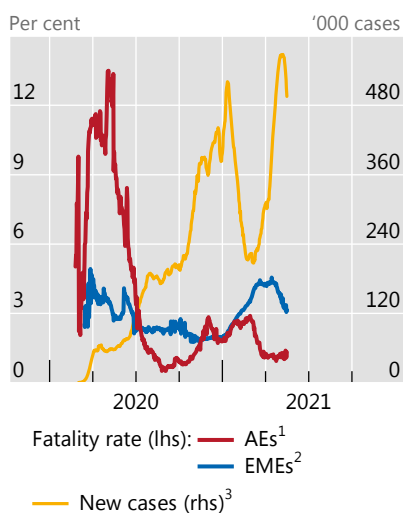
### Pandexit strategies: roles of vaccination and treatment

Graph I.C

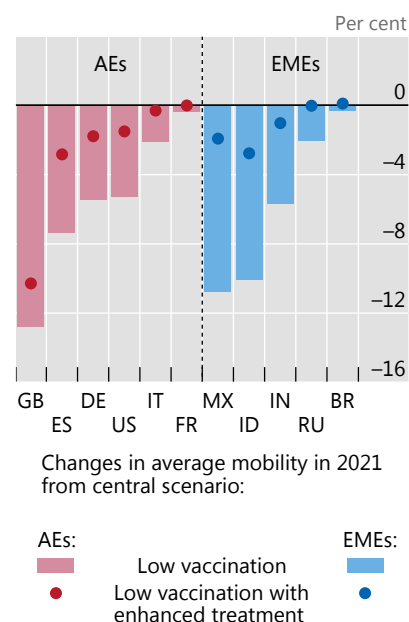
Lower vaccination rates make EMEs vulnerable to infection surges



Improved treatments limit fatality rates even as infections rise



Enhanced treatment could make up for vaccine shortfalls



<sup>1</sup> Simple median of CA, DE, ES, FR, GB, IT and the US. <sup>2</sup> Simple median of AR, BR, IN, KR, MX, RU and ZA. <sup>3</sup> Seven-day moving average.

Sources: P Rungcharoenkitkul, “Macroeconomic consequences of pandexit”, *BIS Working Papers*, no 932, March 2021; Our World in Data; BIS calculations.



With vaccines in short supply in the near term and potentially less effective against future virus strains, a complementary pandemic strategy may be to develop better therapeutic practices. The substantial decline in fatality rates since the start of the outbreak (Graph I.C, centre panel) points to the valuable role of improved treatment.<sup>③</sup> At the same time, significant gaps in fatality rates remain between AEs and EMEs, suggesting potential gains for the latter group. In principle, if the virus were less harmful it would be possible to ease constraints even if much of the population was unvaccinated.

Model simulations lend some support to improved treatment as a useful complement to vaccination. But for treatment to make a material difference, it would need to deliver a large and rapid reduction in fatality rates. The right-hand panel of Graph I.C illustrates the implications for mobility restrictions in selected countries of two alternatives to the central scenario. In the first, only a third of vaccinations planned for 2021 actually occur, and current treatment practices remain in place. This results in a decline in mobility of over 10% in some countries to contain the spread of the virus to a socially acceptable level. In the second, the slower vaccine rollout proceeds alongside improvements in treatment that halve the virus fatality rate. This reduces, and in some cases entirely offsets, the impact of lower vaccination rates on mobility.<sup>④</sup> Achieving such large improvements in treatment would require significant resources to mobilise and scale proven technologies and develop new ones. But, if effective, the cost of doing so would probably be much smaller than that of repeated lockdowns.<sup>⑤</sup>

From a global perspective, increased vaccination and improved treatment should clearly go hand in hand. International spillovers, not considered in the analysis, provide a compelling case for global vaccination and an equitable distribution of vaccines across countries. The presence of infections in any part of the world weighs on global economic activity via trade and supply chains, leaving open the possibility that new variants will undo the progress achieved in vaccination. Widespread vaccination reduces this risk. At the same time, improved treatments would reduce the appeal of “vaccine nationalism”, increasing the political feasibility of a more equal distribution of vaccines focused on the most at-risk groups. Improved treatments would also reduce the economic and health consequences of the emergence of vaccine-resistant variants. As a global challenge, ending the pandemic will require a coordinated effort, including a coherent global vaccination strategy.

<sup>①</sup> See P Rungcharoenkitkul, “Macroeconomic consequences of pandemic”, *BIS Working Papers*, no 932, March 2021 and <https://github.com/phurichai/covid19macro> for an open source code to replicate the results. <sup>②</sup> These responses include government-mandated containment measures as well as individual actions to reduce the risk of infection. <sup>③</sup> The current guideline recommends different combinations of anti-viral medicines tailored to the severity and stages of illnesses, a protocol that is still evolving. See [www.covid19treatmentguidelines.nih.gov](http://www.covid19treatmentguidelines.nih.gov). <sup>④</sup> The final scenario assumes that the fatality rate will converge to the steady state value of 0.5%, about five times larger than that of the regular flu. The central scenario assumes a constant fatality rate at the latest available value. <sup>⑤</sup> For example, the REGN-COV2 treatment contract costs the United States government \$450 million, about \$1.40 per capita.

already drastically reduced infections and mortality rates, raising hopes of a relatively smooth and early “pandexit”. Achieving similar gains in countries with lower vaccination rates would require further improvements in treatment methods and more targeted prevention strategies (Box I.C). Thus, the short-term prospects for containing the virus are less bright for many EMEs, particularly outside East Asia.

### Alternative scenario 1: higher inflation and tighter financial conditions

In this alternative scenario, inflation in a number of countries exceeds current expectations by enough to bring forward the expected start of monetary policy normalisation and prompt an unexpected and substantial tightening of global financial conditions. Naturally, this scenario involves stronger growth than currently projected. And it is more plausible if the pandemic is tamed more quickly than envisaged.

One reason why growth might surprise on the upside is that fiscal policy could turn out to be more stimulatory than expected. From a global perspective, the impact of the large US stimulus package passed in March 2021 is key, given its size and the United States’ influence on economic and financial conditions globally. Additional fiscal stimulus, should it occur, would reinforce these effects.

For the United States, the fiscal boost to GDP depends largely on how households respond. Estimates of fiscal multipliers – ie the overall increase in GDP from a \$1 increase in stimulus – are imprecise. That said, they are generally thought to be lower for broad-based transfer payments – a large share of the most recent US fiscal package – than for spending targeted at financially constrained households, and to be larger when monetary policy is accommodative.<sup>8</sup> To fix ideas, the middle-of-the-road multiplier estimates that inform the central scenario (eg 0.3 for transfers and 1.5 for direct expenditures) imply a boost to the level of US GDP of between 1 and 2% in each of the next two years (Table I.1). But if the multipliers turn out to be closer to the upper end of the range of the estimates, the fiscal impulse could be more than twice as large. Faster growth in the United States will, in turn, boost export demand elsewhere.

A second possible reason for surprisingly strong growth is that household saving rates in AEs, which increased sharply in 2020, could fall back more quickly than expected. The resulting push to consumption would reinforce the more stimulatory fiscal policy. A trigger for a faster reduction in saving rates could be early control of the pandemic, which would lower uncertainty and cut precautionary saving. Improved labour market conditions and rising house prices could also boost confidence and encourage households to draw down their savings more quickly. Additional saving in 2020 in some AEs was equivalent to over 5% of pre-crisis GDP. Thus, even a small drawdown could materially lift global economic activity (Graph I.11, left-hand panel).

The impact on inflation is harder to assess. There are grounds to believe that any further increase would be limited and temporary. The relationship between inflation and slack has weakened in recent decades: empirical estimates suggest that even very tight economic conditions would prompt only a modest rise (Graph I.11, right-hand panel). Inflation expectations are also better anchored, so that the “second-round” effects of an initial rise in inflation are typically small.<sup>9</sup> Moreover, many of the structural factors that have been exerting downward pressure on inflation for a long time and have further dampened second-round effects are still at play. Foremost among these are the globalisation of product and labour markets and technological change, which have reduced the pricing power of labour and many firms.<sup>10</sup> The pandemic-induced growth of e-commerce has worked in the same direction.

That said, given the strength of the forces at play in the scenario, one cannot rule out a larger and more sustained increase in inflation. The relationship between

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## US fiscal stimulus could have large effects

Estimated impact of March 2021 US fiscal package on the level of US GDP (%)<sup>1</sup>

Table I.1

	2021	2022	Total <sup>2</sup>
Low multiplier = 0.2 <sup>3</sup>	1.1	0.5	1.7
Medium multiplier = 0.4 <sup>4</sup>	2.1	1.0	3.5
High multiplier = 0.8 <sup>5</sup>	4.8	2.2	8.0

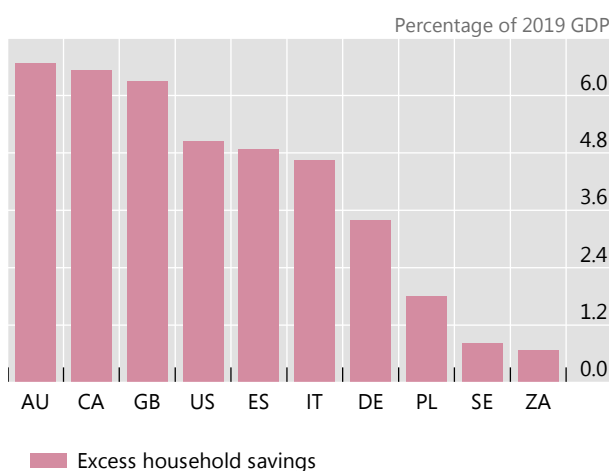
<sup>1</sup> Estimates of timing of impact on GDP based on Congressional Budget Office estimates of the timing of fiscal transfer and expenditure package and simulations of the FRB/US model of the US economy. <sup>2</sup> Cumulative increase in GDP over the period 2021–25. <sup>3</sup> Estimated multiplier for the entire package assuming a multiplier from transfers of 0.1 and a multiplier from direct spending of 0.7. <sup>4</sup> Estimated multiplier for the entire package assuming a multiplier from transfers of 0.3 and a multiplier from direct spending of 1.5. <sup>5</sup> Estimated multiplier for the entire package assuming a multiplier from unemployment benefits of 0.7, a multiplier from other transfers of 0.3 and a multiplier from direct spending of 1.5. For the high multiplier case, it is assumed that 50% of transfers to state and local governments constitute direct spending.

Sources: US Congressional Budget Office; BIS calculations.

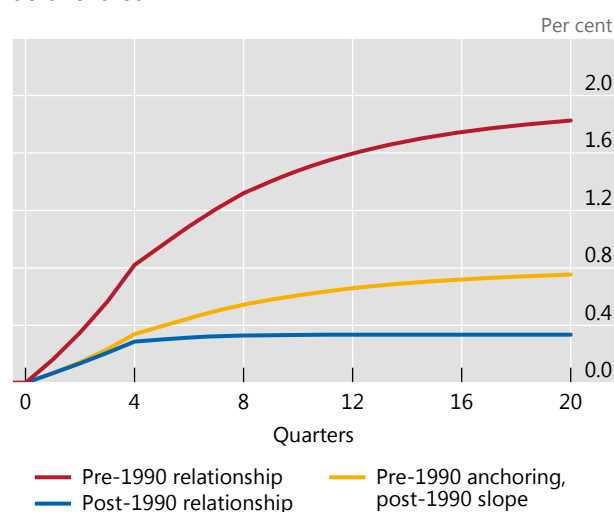
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Savings build-up could fuel consumption boom<sup>1</sup>



Inflation will increase more if expectations are de-anchored<sup>2</sup>



<sup>1</sup> Excess savings calculated as the increase in gross savings in 2020 compared with 2019 divided by 2019 nominal GDP. <sup>2</sup> Impulse response of inflation to a permanent 1 percentage point increase in the output gap. Estimates based on the model  $\pi_{it} = \alpha_i + \beta_1 \pi_{i,t-1}^{ye} + \beta_2 gap_{i,t-1} + \varepsilon_{i,t}$ , where  $\pi_{i,t}$  is quarterly CPI inflation in country  $i$  in quarter  $t$ ,  $\pi_{i,t}^{ye}$  is year-on-year inflation and  $gap_{i,t}$  is the output gap, measured using an HP filter with  $\lambda = 1600$ . The model is estimated on an unbalanced panel of 14 AEs over two samples: (i) Q1 1970–Q4 1989; and (ii) Q1 1990–Q4 2019.

Sources: National data; BIS calculations.

inflation and economic slack – the Phillips curve – could turn out to be non-linear, meaning that inflationary pressures rise substantially when spare capacity is sufficiently small.<sup>11</sup> Such an outcome would be more likely in this scenario, as the pickup in growth would be synchronous across many countries, so that capacity would come under stronger pressure at the global level. Inflation expectations could also become less well anchored. Already this year, financial market measures of inflation expectations rose quickly in a number of countries as prospects for the US fiscal stimulus firmed (Box I.B).<sup>12</sup> Should this foreshadow a more general unmooring, eg so that inflation became as “backward-looking” as prior to 1990, a given reduction in economic slack would deliver twice as much inflation as more recent estimates imply. This would be true even if the response of inflation to economic slack remained low (Graph I.11, right-hand panel).

Even a temporary rise in inflation could deliver a sizeable financial tightening, especially given stretched financial markets. This would be more likely if uncertainty about central banks’ response caused financial markets to bring forward the anticipated start of policy normalisation. Such a scenario could lead to a rapid and disorderly unwinding of positions taken on the assumption of persistently easy monetary conditions.

This scenario would play out differently across the world. Jurisdictions where inflation has persistently been below target would welcome its rise as long as financial conditions there did not tighten excessively. By contrast, a tightening could be particularly challenging for EMEs, which are seeing a slower recovery than most AEs. The financial tightening in those economies would be all the more severe should the US dollar appreciate – a likely outcome given that the US economy would be the main source of the growth surprise.

## Alternative scenario 2: the recovery stalls, business insolvencies rise

In this scenario, the recovery stalls. As growth slows, business insolvencies, which were remarkably low in 2020 given the state of the global economy, start to rise substantially. The resulting corporate loan losses weaken the financial position of banks, sapping their lending capacity.

An adverse turn in the pandemic is an obvious trigger for this scenario. A particular risk comes from the emergence and spread of new vaccine-resistant virus strains from countries with high infection rates and slow progress in vaccination (Graph I.12, left-hand panel). Modifying vaccines to cope with these strains would take time, and renewed lockdowns could be required. Based on the historical relationship between infection rates, lockdowns and GDP, the emergence of a vaccine-resistant virus strain could lower GDP by between 1.5% and 3.5% in the second half of 2021, with regions where vaccination has progressed most experiencing the biggest hit to growth (right-hand panel).

Consumption would naturally be lower in this scenario. Renewed lockdowns, weaker labour market conditions and possibly a rise in precautionary saving because of heightened uncertainty would all take their toll.

The boost to growth from fiscal policy could be smaller as well. Subdued consumption would translate into less spending out of fiscal transfers. In the United States, for example, the fiscal impulse would be only half as large as in the central scenario if fiscal multipliers turned out to be near the bottom of the range of estimates. In some countries, investors could start to question fiscal sustainability, which would lower growth further.

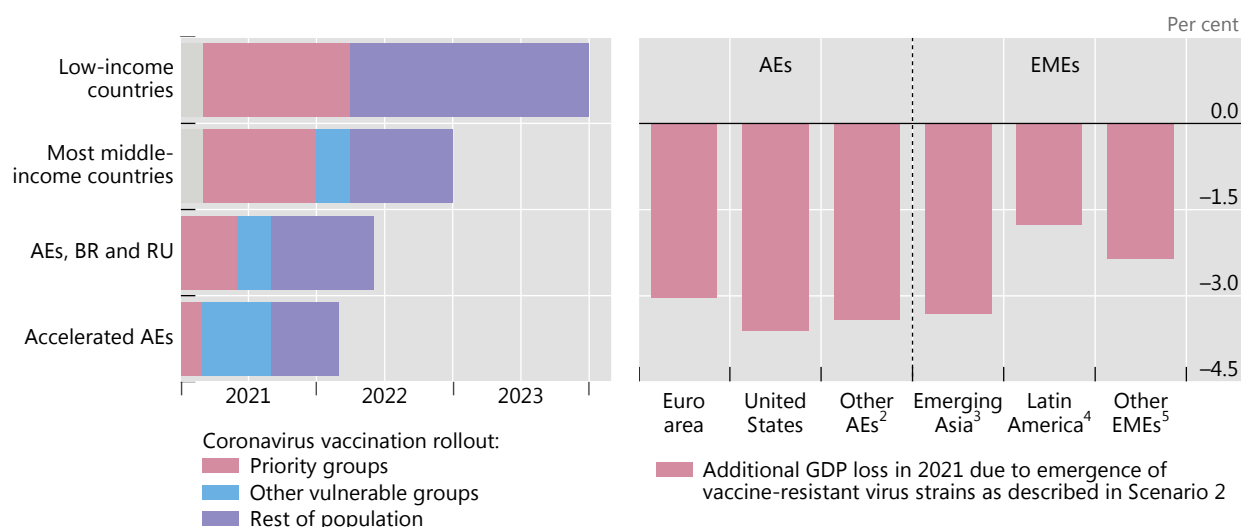
But it is the business sector that would feel the brunt of the damage. Even in the central scenario, credit losses would probably pick up in pandemic-affected sectors from the extremely low 2020 levels (Graph I.13, left-hand panel). In some industries, such as bricks-and-mortar retailing and commercial property, persistent shifts in customer behaviour and work practices could exacerbate losses (Box I.D).

### Slow and uneven vaccination poses a risk to the recovery

Graph I.12

The pace of vaccine rollouts is highly uneven<sup>1</sup>

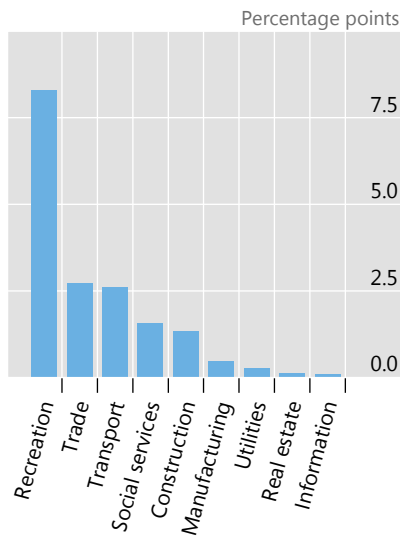
Vaccine-resistant virus strains could curtail the recovery



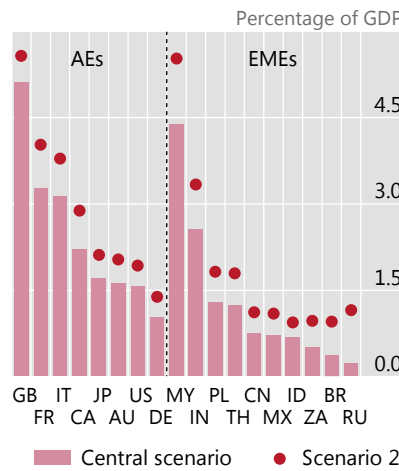
<sup>1</sup> Accurate as at 22 January 2021. <sup>2</sup> AU, CA, CH, GB and SE. <sup>3</sup> ID, IN, KR, MY, SG and TH. <sup>4</sup> AR, BR and MX. <sup>5</sup> PL, RU, SA and ZA.

Sources: P Rungcharoenkitkul, "Macroeconomic consequences of pandexit", *BIS Working Papers*, no 932, March 2021; The Economist Intelligence Unit; BIS calculations.

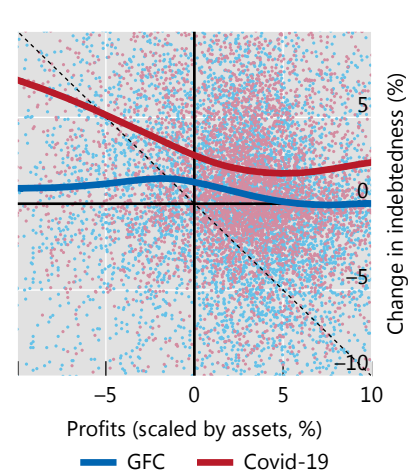
Higher credit loss rates likely to be concentrated in a few sectors<sup>1</sup>



Increases in credit losses reflect GDP growth and outstanding debt<sup>2</sup>



Credit supply to loss-making firms significantly above GFC<sup>3</sup>



<sup>1</sup> Increase of projected credit losses as a share of GDP during the crisis (average during 2020–22) from pre-crisis level (average during 2018–19) based on projected sectoral growth rates. <sup>2</sup> Sum of excess credit losses from 2020 to 2022 above the levels that prevailed in 2019. Sectoral credit losses weighted by the total indebtedness of the non-financial corporate sector as a percentage of GDP. <sup>3</sup> The smooth line is estimated using a generalised additive model, which fits penalised basis splines through the individual firm-level observations. Based on public and large private companies in the non-financial sector in AU, CA, DE, ES, FR, GB, IT, JP and US. GFC (Great Financial Crisis) refers to Q3 2008–Q2 2009, where change in indebtedness is the change between Q3 2008 and Q2 2009 divided by total assets in Q3 2008, and “profits” is the sum of profits from Q4 2008 to Q2 2009 divided by total assets in Q3 2008. Covid-19 refers to Q4 2019–Q3 2020, where change in indebtedness is the change between Q4 2019 and Q3 2020 divided by total assets in Q4 2019, and profits are the sum of profits from Q1 2020 to Q3 2020 divided by total assets in Q4 2019.

Sources: R Banerjee, J Noss and J Vidal Pastor, “Liquidity to solvency: transition cancelled or postponed?”, *BIS Bulletin*, no 40, March 2021; B Mojon, D Rees and C Schmieder, “How much stress could Covid put on corporate credit? Evidence using sectoral data”, *BIS Quarterly Review*, March 2021, pp 55–70; S&P Capital IQ; BIS calculations.

That said, so long as the recovery retains some momentum, credit losses seem to be manageable (Box I.E). A renewed downturn, however, would put further pressure on business finances (Graph I.13, centre panel). Corporate balance sheets are more exposed than at the start of the pandemic because of a substantial increase in borrowing, particularly by the least profitable firms (right-hand panel). While ample credit supply helped compensate for rising losses in the early stages of the pandemic and some firms have built sizeable cash reserves, it is unclear whether additional credit would be forthcoming should economic conditions worsen once again.

The adverse effects of rising corporate insolvencies would be magnified through their impact on banks and other financial institutions. Recent stress tests suggest that most banks hold sufficient capital to meet their regulatory requirements even in the face of a severe downturn, at least in AEs.<sup>13</sup> However, they also point to a significant hit to capital buffers, which could constrain the supply of credit to healthy firms and dampen business investment. Low bank profitability in an environment of low-for-long interest rates heightens the challenges and could hinder banks’ ability to build buffers and raise new capital.<sup>14</sup>

Even if an upsurge in insolvencies does not materialise, firms will have to contend with increased repayment obligations due to the large rise in borrowing early in the pandemic. The value of debt repayments due in the next two years has increased significantly since the start of the pandemic in many AEs and some large EMEs. In some countries it exceeds 50% of firms’ net income (Graph I.14, left-hand

## Aggregate implications of an uneven sectoral recovery

Like the recession that preceded it, the recovery from the Covid pandemic has been uneven across sectors. Some, such as manufacturing and construction, rebounded quickly after lockdowns eased. But many customer-facing service industries still face constraints. International tourism and business travel, for example, may take years to recover completely.

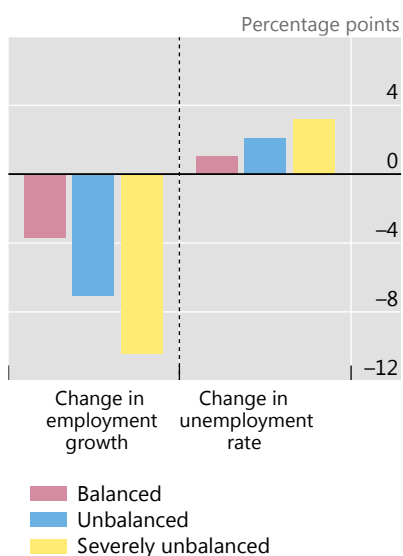
Uneven recoveries can pose challenges for macroeconomic policy. This is especially true when the unevenness reflects constraints that place a cap on activity in some sectors – such as the need to restrict personal interactions to limit the spread of a virus. Traditional stimulus policies, which aim to boost *aggregate* activity, are less effective.<sup>①</sup> Public support measures aimed at maintaining productive capacity in constrained sectors are costly, hard to target and difficult to sustain for long. Moreover, these policies cannot support activity forever and may delay necessary adjustments when sectors facing permanent reductions in demand need to downsize. Conversely, policies fostering reallocation from constrained sectors to expanding ones need time to bear fruit, making interim support critical.

As a result, recoveries from uneven recessions are often particularly slow. Estimates in a sample of advanced economies indicate that, in the three years after the start of a “balanced” recession, ie one that hits all sectors equally, employment typically falls by about 3.5 percentage points (Graph I.D, left-hand panel).<sup>②</sup> The employment drop is almost three times larger (about 10 percentage points) after a severely unbalanced recession.

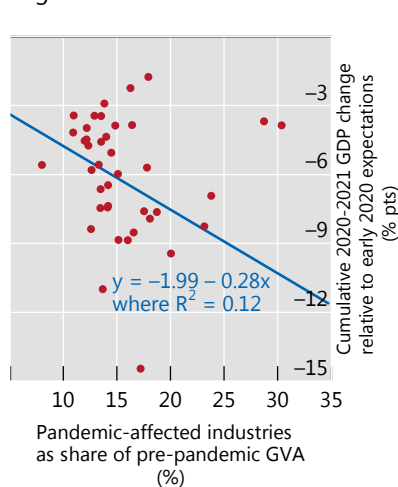
### Aggregate implications of an uneven recovery

Graph I.D

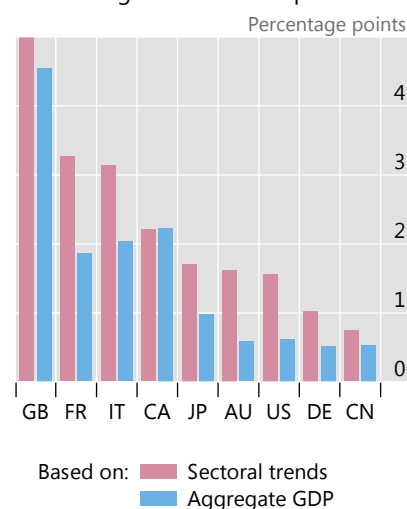
Unbalanced recessions weigh on labour markets<sup>1</sup>



GDP drops more in countries with larger customer service industries<sup>2</sup>



Projected credit losses higher after accounting for sectoral dispersion<sup>3</sup>



<sup>1</sup> 2006–17 data for AT, BE, CH, CZ, DE, ES, FI, FR, GB, IE, IT, NL, PL, PT, SE and TR. The red bars show the relative change in employment and the percentage change in the unemployment rate three years after a one standard deviation drop in growth and a one standard deviation increase in the employment share of exiting firms; the blue bars add to this a two standard deviation increase in the dispersion of sectoral employment shares of exiting firms; the yellow bars add another two standard deviation increase of the same dispersion. Estimations include country and time dummies. <sup>2</sup> Line of best fit calculated excluding SG and HK. <sup>3</sup> Cumulated increase of credit losses during 2020–22 compared with pre-crisis level based on sectoral credit losses and country-level aggregates.

Sources: IMF, *World Economic Outlook*; OECD; Consensus Economics; Moody's CreditEdge; Moody's Investor Service; S&P Capital IQ; BIS calculations.

There are signs that the recovery from the Covid-19 pandemic could confirm this pattern, at least in countries where progress with vaccinations is slow, delaying the relaxation of containment measures. Estimates from a multi-sector macroeconomic model indicate that current constraints on customer service industries could lower potential output in large AEs by up to 2% of GDP.<sup>③</sup> The effects should loom even larger in small open economies more reliant on industries such as tourism. Indeed, countries where customer service industries

account for a larger share of economic activity are projected to face bigger GDP shortfalls than the rest at the end of 2021 (Graph I.D, centre panel).

Uneven recessions may also have far-reaching financial consequences. Because insolvencies tend to rise more than proportionally with falling revenues, a downturn that reflects large contractions in a few sectors should be expected to lead to larger credit losses than a more evenly spread one. According to one study, estimates of pandemic-induced business credit losses that account for differences in economic conditions across sectors can be up to 50% larger than those based on aggregate economic conditions alone (Graph I.D, right-hand panel).<sup>④</sup>

① See V Guerrieri, G Lorenzoni, L Straub and I Werning, "Macroeconomic implications of COVID-19: can negative supply shocks cause demand shortages?", *NBER Working Papers*, no 26918, April 2020. ② See R Banerjee, E Kharroubi and U Lewrick, "Bankruptcies, unemployment and reallocation from Covid-19", *BIS Bulletin*, no 31, October 2020. ③ See D Rees, "What comes next?", *BIS Working Papers*, no 898, November 2020. ④ See B Mojon, D Rees and C Schmieder, "How much stress could Covid put on corporate credit? Evidence using sectoral data", *BIS Quarterly Review*, March 2021, pp 55–70.

panel). If debts cannot be rolled over, meeting these repayments will require firms to find ways to lower their costs or cut back on capital investment.<sup>15</sup>

Constrained financial institutions and highly indebted firms could also delay the required reallocation of resources. Such a reallocation would be more pressing in this scenario, given the persistent changes in consumer behaviour and increased risk of "zombie" firms linked to the sustained downturn. Another factor potentially holding back resource reallocation is blanket business support programmes. Over

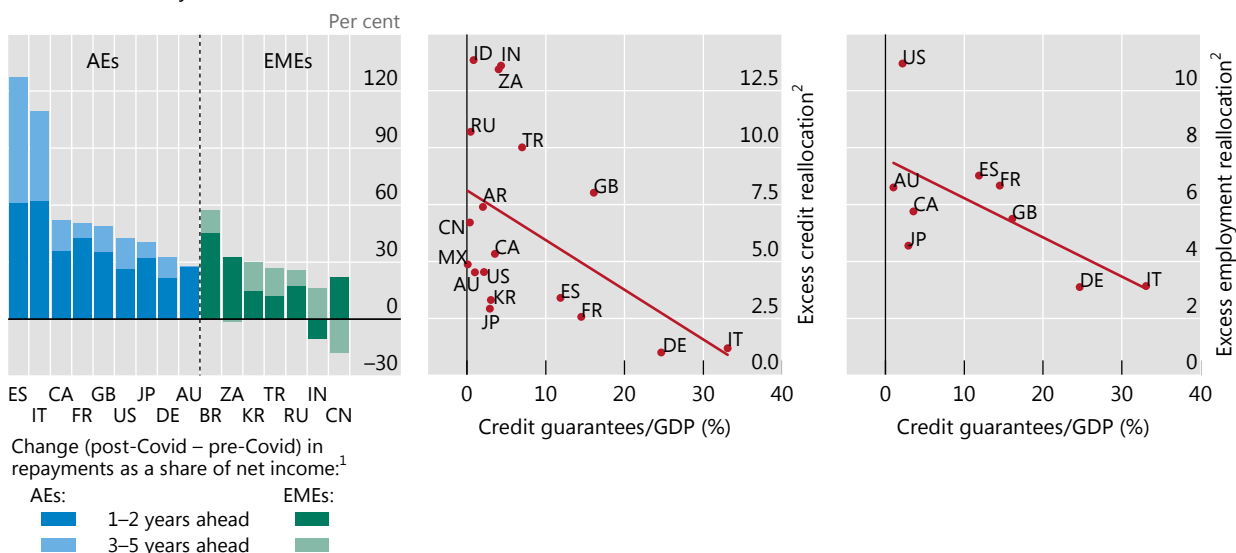
## Higher debt will weigh on investment and reallocation

Graph I.14

Large rise in short-term debt coming due in next two years

Credit reallocation

Employment reallocation



<sup>1</sup> Average yearly repayments for the stated period, as a share of 2019 net income, keeping a balanced sample of firms across time periods. Includes debt securities and loans. Repayments as a share of net income calculated as the sum of yearly total repayments in each country and year divided by the sum of annual net income in each country in 2019. "Post-Covid" includes amount outstanding for the latest stocks of debt securities and bank loans reported, whereas "pre-Covid" includes similar amounts outstanding up to and including Q4 2019. <sup>2</sup> Excess reallocation equals total credit/employment reallocation minus the minimum amount required to accommodate the net change in credit/employment across all firms. For more details, see A Herrera, M Kolar and R Minetti, "Credit reallocation", *Journal of Monetary Economics*, vol 58, 2011.

Sources: IMF, *Fiscal Monitor Database of Country Fiscal Measures in Response to the COVID-19 Pandemic*, April 2021; S&P Capital IQ; BIS calculations.

## Covid-19 and the corporate credit loss outlook

Corporate credit losses from the Covid-19 pandemic could increase as containment measures persist, new consumption patterns and business practices accelerate the downsizing of specific sectors, and the exhaustion of liquidity buffers pushes some firms into insolvency. These losses will need to be absorbed, either by the financial system or by taxpayers. Yet there is considerable uncertainty about their future evolution. Much will depend on the strength of the economic recovery, whether financial conditions remain accommodative and on the extent and duration of government support.<sup>①</sup>

This box examines the outlook for corporate credit losses through the lens of two approaches. The first is top-down and based on sectoral-level analysis.<sup>②</sup> This approach estimates credit loss rates (ie losses as a share of total debt) at a sectoral level for the G7 countries, China and Australia. It applies existing estimates of the sensitivity of credit losses to GDP to economic projections from a multi-sector macroeconomic model.<sup>③</sup> The model's aggregate GDP projections are similar to the "central scenario" discussed in the main text, while the sectoral projections account for the uneven effects of the pandemic on different economic sectors. The analysis then uses data on bonds and bank loans by sector to map credit loss rates into total credit losses by country.

The second approach is bottom-up and based on firm-level data for nine AEs and nine EMEs.<sup>④</sup> The analysis involves three steps. First, a "shadow rating" is assigned to each firm based on historical patterns and firm-level financial statement data for 2020 to measure its inherent credit quality.<sup>⑤</sup> Second, a default rate is assigned for each rating which depends on projected economic and financial conditions.<sup>⑥</sup> Finally, firm-level default probabilities are multiplied by loss-given-default (LGD) estimates, which vary by country, sector and debt type, to compute credit losses.<sup>⑦</sup> The specific firms covered in this analysis tend to enjoy better than average credit quality, as they are primarily large firms that have published financial results for 2020. As a result, this approach projects lower expected credit losses than the top-down one, which implicitly captures the credit losses of all firms. However, even if based on a less representative sample, the bottom-up approach can still shed light on the yearly *change* in credit losses and provide a comparison with experiences in previous recessions.

The top-down approach suggests that credit losses could increase in 2021 relative to recent years. Conditional on the model-based GDP projections, the approach estimates that credit loss rates for bonds could peak at 1.9% in 2021, up from 0.5% in 2019 (Graph I.E, left-hand panel). Despite the substantial increases for some countries and sectors, aggregate credit loss rates would rise by less than during the GFC, when loss rates on non-financial corporate bond debt reached 2.9%.

The bottom-up baseline scenario presents a more optimistic outlook. Credit losses are projected to actually decline in 2021 if the analysis is based on credit ratings estimated with end-2020 balance sheets, on analysts' cash flow forecasts for 2021, on current financial conditions and on Consensus 2021 GDP growth forecasts (ie similar to the economic projections in the top-down analysis; see Graph I.E, centre and right-hand panels, solid red and blue lines). Relative to their GFC peaks, projected credit losses in EMEs are higher than in AEs, reflecting much larger GDP declines in many EMEs during the pandemic.

The bottom-up analysis, however, highlights the significant uncertainty around 2021 credit loss projections. Much will depend on the duration and effectiveness of government support measures. Government support reduces projected credit losses in three ways. First, by lowering default probabilities within each rating bucket owing to the widespread provision of debt moratoriums and loan guarantees. Second, by influencing the analysts' cash flow forecasts used to assign firms to rating buckets. This influence can be both direct (eg furlough schemes providing a boost to firm cash flows) and indirect (eg by raising aggregate GDP growth). Finally, by flattering the firms' end-2020 balance sheets. This translates into higher "shadow ratings" and lower projected credit losses than might be warranted based on firms' fundamentals alone.

Given the uncertainty about how much government support measures will suppress defaults, it is worth considering a range of possibilities. The shaded fans in Graph I.E, centre and right-hand panels, show the range of credit losses that could occur based on annual default rates over the past 25 years. To compute the range, default rates for each rating bucket in a given year are applied to the estimated ratings based on 2021 cash flow forecasts and end-2020 balance sheet variables. The top and bottom of the range represent the highest and lowest estimated credit losses produced by this method.

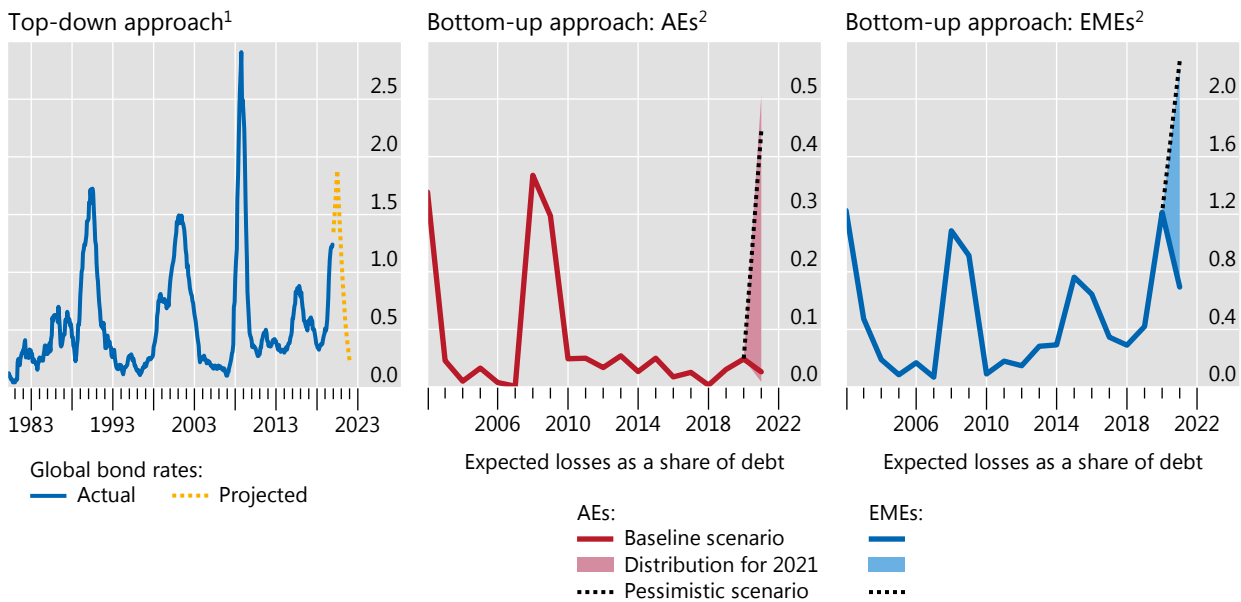
The baseline credit loss projection sits at the lower end of the range based on historical default probabilities. This suggests that forecast earnings, and the macroeconomic projections on which they are based, are quite optimistic about the efficacy of government support measures. By contrast, the upper bound of the projected loss range implies an increase in non-financial corporate credit losses to roughly the same level as in the GFC for AEs, and twice as high as in that episode for EMEs. Such a scenario is consistent with a continuation of strained 2020 cash flows and a default incidence per rating bucket at the levels experienced during the GFC (dotted line in Graph I.E, centre and right-hand panels).



## Credit losses could increase by less than during the GFC, but vary by cash flow assumptions

In per cent

Graph I.E



<sup>1</sup> Global bond loss rates available until end-November 2020 are projected forward to 2021 and 2022 based on top-down country-level credit loss projections as described in the text. <sup>2</sup> Estimates of credit losses across the median country in sample of G20 economies. AEs: AU, CA, FR, DE, ES, GB, IT, JP, US. EMEs: BR, CN, ID, IN, KR, MX, RU, TR and ZA. Baseline estimates for 2021 based on 2021 estimated ratings and default probabilities. The distribution for 2021 is based on the range of historical default probabilities applied to the 2021 estimated ratings. The pessimistic scenario for 2021 is based on end-2020 ratings and 2009 default probabilities.

Sources: IMF, *World Economic Outlook*; Moody's CreditEdge; Moody's Investor Service; S&P Capital IQ; authors' calculations.

Thus, credit losses could increase sharply if economic conditions deteriorate or government support measures are less effective than anticipated. Large losses could also arise if the degree of sectoral reallocation induced by the pandemic – implicitly captured in our analysis by sectoral GDP projections and analysts' earnings forecasts – turns out to be larger than these approaches assume.

① R Banerjee, J Noss and J Vidal-Pastor, "Liquidity to solvency: transition cancelled or postponed?", *BIS Bulletin*, no 40, March 2021. ② For details, see B Mojon, D Rees and C Schmieder, "How much stress could Covid put on corporate credit? Evidence using sectoral data", *BIS Quarterly Review*, March 2021. ③ D Rees, "What comes next?", *BIS Working Papers*, no 898, November 2020. ④ The bottom-up analysis uses the same sample of AEs as the top-down analysis, with the addition of Spain. The difference between the two sets of results is not driven by country composition. ⑤ Ratings are predicted using the model  $rating_{isct} = \beta_2 Y_{isct} + \alpha_s + \gamma_c + \varepsilon_{isct}$ , where  $rating_{isct}$  is the rating of firm  $i$  in sector  $s$  in country  $c$  in year  $t$  and  $Y_{isct}$  are firm-level variables: Altman z-score (which is a function of working capital, retained earnings, earnings before interest payments and taxes (EBIT), sales and price-to-book (public firms) and book equity (private firms) ratio); return on assets, interest coverage ratio, leverage and size.  $\alpha_s$  and  $\gamma_c$  are sector and country fixed effects. The model is estimated over the period 1985–2019. For the baseline scenario projected ratings, we use 2021 analyst forecasts for the cash flow variables (EBIT, sales, return-on-assets), if available. If not, we use the average forecasts for firms in the same country and sector. For balance sheet variables (working capital, retained earnings, leverage, total assets), we use end-2020 balance sheet data. Interest expenses are also based on end-2020 financial statement data. ⑥ To project conditional default probabilities for each rating bucket in 2021, we estimate the model  $default\ rate_{rt} = \beta_1 GDP\ growth_{rt} + \beta_2 Financial\ Conditions_{rt} + \rho\ default\ rate_{rt-1} + \alpha + \varepsilon_{rt}$ , for each rating category  $r$  in year  $t$ , again over the sample 1985–2019. We then use the estimated coefficients,  $\beta_1$  and  $\beta_2$  together with 2021 consensus GDP growth forecasts and financial conditions for the country in which the firm is based to project default probabilities for each rating category. ⑦ Country-level loss-given-default (LGD) rates are based on data from the World Bank's Doing Business Report. Sector and debt-type LGD rates are based on data from Moody's and Standard & Poor's.

the past year, countries with larger credit guarantee schemes have seen less reallocation of credit across firms (Graph I.14, centre panel). Larger guarantee schemes have also gone hand in hand with less labour reallocation across firms (right-hand panel). If they constrain resource reallocation to more productive firms, these developments could hold back growth prospects even after lockdowns ease and consumption growth recovers.

This scenario would be more challenging in many respects than the previous one, particularly for EMEs. While global financial conditions would probably remain supportive, policy space in these economies would be stretched if weaker domestic economies and pre-existing vulnerabilities heightened international investors' risk aversion.

## General considerations

The scenarios described above point to a number of considerations. First, it is important to limit the spread of Covid-19 globally. Large virus outbreaks are associated with the most adverse economic outcomes, particularly if the solvency of financial institutions comes into question. This speaks to the value of international cooperation in the provision of vaccines and support to health systems when they come under pressure. Second, for some countries economic and financial turbulence could arise despite strong global economic growth. This highlights the need for policymakers to monitor emerging risks closely. Finally, for most countries the legacy of the pandemic will probably be felt long after the virus is brought under control. Corporate and private debt levels will remain high for years to come, and reallocation of capital and labour has barely started. Policymakers will need to take account of these developments when planning their response to evolving economic conditions.

## Macroeconomic policy challenges

In the near term, the key macroeconomic policy task is to support the economy through the recovery. The specific policy configuration will depend on the path of economic activity, taking into account the uncertainties involved. In contrast to the early phase of the crisis, large differences in economic conditions across countries will call for a more differentiated approach, which will challenge countries where economic conditions are weaker.

In the longer term, there are two policy prerogatives. The first is to gradually normalise, once conditions allow, to regain space for both monetary and fiscal policy. The second is to manage the relationship between the two policies in an environment in which their implementation would be less interdependent than during the early stages of the pandemic.

## Near-term challenges

In the central scenario, the policy challenges would be a natural evolution of those faced over the past year.<sup>16</sup> Although the economic recovery has proved stronger than expected, constraints on certain activities persist, and considerable uncertainty surrounds the evolution of the pandemic and its long-term legacy. As a result, following a risk management approach, authorities will need to continue to provide the necessary support while facilitating the required reallocation of resources, even while its extent and precise contours remain unclear. Ensuring that the inevitable policy adjustments in the light of evolving economic conditions are not misinterpreted poses a complex communication challenge.



The recovery, together with the need to preserve precious policy space, suggests that fiscal policy will need to become more targeted. Indeed, in some countries blanket stimulus is already being phased out. In Canada, for example, broad-based wage subsidies have been replaced with hiring subsidies reserved for firms whose revenues have yet to fully recover. As the crisis transitions from its liquidity to its solvency phase, governments are also adjusting policies to better distinguish viable from non-viable businesses in order to facilitate restructuring. In Singapore, for instance, firms are now obliged to resume principal repayments on loans covered by debt moratoriums and give banks more information about their viability.<sup>17</sup> At the same time, the high degree of uncertainty rewards flexibility. Trade-offs arise here too. Experience suggests that quickly addressing the debt overhang and cutting any sectoral excess capacity supports sounder recoveries than a gradual approach.<sup>18</sup> That said, a surge in firm closures could overwhelm countries' restructuring capacity.

Monetary policy will also need to remain accommodative but, as the recovery progresses, central banks will face a delicate communication challenge. On the one hand, there is the need to provide sufficient reassurance to avoid a market-driven pre-emptive tightening of financial conditions. On the other, emphasising policy predictability poses the risk of constraining central banks, making them unable to adjust promptly if the economy surprises on the upside. In the trade-off, the potential side effects of prolonged and extraordinary monetary accommodation would play a role. Indeed, the continued exceptionally easy financial conditions and unusual buoyancy of house prices have already raised some concerns. In recent months, central banks in Australia, Canada and Switzerland, among others, have highlighted the risks from soaring house prices in statements accompanying their monetary policy decisions, while the Reserve Bank of New Zealand has been tasked with considering the impact of its decisions on house prices when setting policy.<sup>19</sup> Central banks have tried to address this dilemma by modifying their forward guidance, playing down the calendar-based aspects and emphasising its dependence on economic conditions.<sup>20</sup>

Some central banks, however, may have little choice but to tighten. Already in 2021, higher inflation has prompted central banks in Brazil, Russia and Turkey to hike interest rates. Should commodity prices continue to rise or global bond yields resume their climb, other EME central banks could feel compelled to follow suit (Box I.F). That said, not all EMEs are equally exposed to developments abroad. In some East Asian countries, subdued inflation and ample foreign exchange reserves could give central banks more scope to keep policy settings tailored to domestic economic conditions.

Prudential policy faces two challenges. The first is ensuring that banks are sufficiently well capitalised to absorb potential losses. Risks remain, although to date banks have predicated their provisioning decisions on a smooth central scenario, with some banks actually reducing loss provisions in the second half of 2020.<sup>21</sup> Hence the active use of heightened monitoring to ensure that banks recognise all impairments and price credit risks correctly. Authorities have also used stress tests to gauge the financial system's sensitivity to tough scenarios, such as a renewed wave of strict lockdowns. The second challenge is helping to contain the build-up of financial imbalances, particularly in housing markets. For instance, in recent months prudential authorities in Canada, the Netherlands and New Zealand have introduced macroprudential measures aimed at cooling the housing market, including tighter loan-to-value limits and higher floors on the interest rates banks use to evaluate mortgage affordability.

One limitation prudential policy will face in addressing the build-up of vulnerabilities is that the current toolkit is not fully fit for purpose. The prudential

## Tighter global financial conditions and EMEs

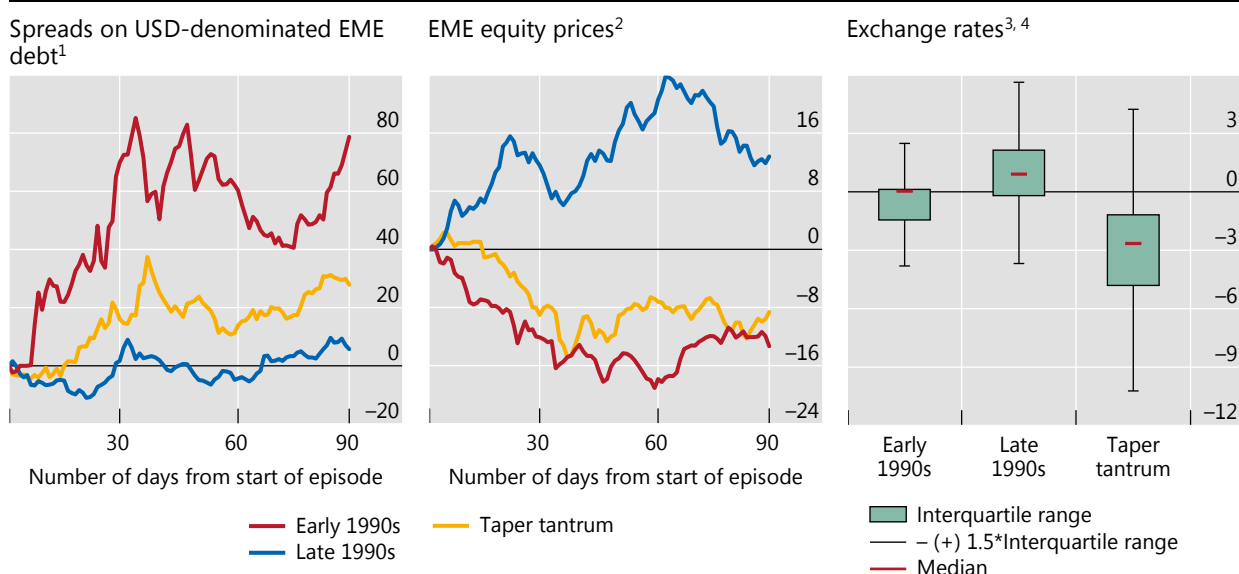
The strong economic recovery in many AEs and China is a mixed blessing for other EMEs. On the one hand, faster global growth increases demand for EME exports and tends to lift commodity prices, benefiting their exporters. On the other hand, stronger growth in AEs is typically accompanied by tighter global financial conditions. Indeed, long-term bond yields have risen substantially in many countries in 2021, although broader measures of financial conditions have so far remained exceptionally accommodative. This confluence raises three related questions. First, does the cause of higher US bond yields matter for the tightening of global financial conditions? Second, how vulnerable are EMEs to such a tightening? And third, what could policymakers do to manage the fallout?

Rising US long-term bond yields have often preceded tighter financial conditions in EMEs, but the intensity of the impact varies greatly across episodes. Some, such as those beginning in February 1994 and May 2013 (known as the “taper tantrum”) coincided with capital outflows, a sharp rise in funding costs and lower equity prices (Graph I.F.1, left-hand and centre panels). The taper tantrum also prompted large exchange rate depreciations in several EMEs (right-hand panel). Exchange rates did not initially respond as much in 1994, in part because many EMEs had exchange rate pegs. However, several EMEs experienced large devaluations a few months later, most notably Mexico, which received assistance from international organisations to cope with the resulting financial crisis. By contrast, some other episodes of rising US bond yields were much more benign. For example, the gradual increase in US long-term bond yields that began in April 1999 was associated with stable bond spreads and rising equity prices in EMEs. While exchange rates depreciated in some EMEs in that episode, they appreciated in others.

### EME financial variables during selected episodes of rising US bond yields

In per cent

Graph I.F.1



<sup>1</sup> Change in the EMBI bond spread since the start of the episode. <sup>2</sup> Change in the MSCI Emerging Markets Index since the start of the episode. <sup>3</sup> The sample includes AR, BR, CL, CO, CZ, HK, HU, ID, IL, IN, KR, MX, MY, PE, PH, PL, RO, RU, SG, TH, TR, VN and ZA, subject to data availability. <sup>4</sup> Thirty-day change in nominal USD exchange rate from the start of the episode.

Sources: IMF; OECD; Bloomberg; JPMorgan Chase; BIS calculations.

Financial market expectations of monetary policy in the United States are key in determining whether a rise in US yields generates disruptive spillovers.<sup>①</sup> Both the 1994 episode and the taper tantrum involved a sharp financial market reassessment of the likely pace of US monetary policy tightening. In contrast, the rise in yields in 1999 seemed to largely reflect gradually evolving expectations of higher US inflation on the back of a long expansion rather than large US monetary policy surprises.

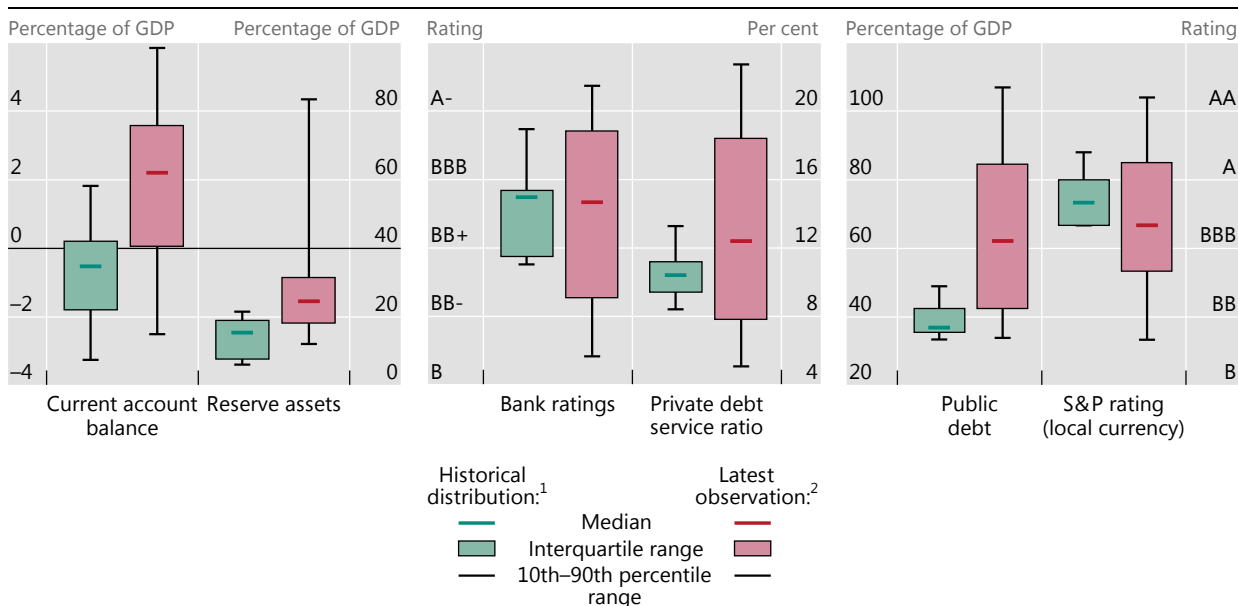
Besides US monetary policy, factors related to the composition of capital inflows influence whether higher US bond yields will trigger a financial tightening in EMEs. US yield increases that occur after a period of

trend EME currency appreciations and sizeable capital inflows, typically on the back of strong risk-taking, are more often associated with tighter financial conditions. A larger amount of foreign currency debt and greater participation of foreign investors in local currency sovereign debt markets also tends to exacerbate the effect of rising US yields on EME financial conditions.<sup>2</sup>

In addition to debt composition, investor perceptions of the fundamentals and creditworthiness of EMEs can be important determinants of the severity of the hit to EMEs as a group and individually. By some measures, EMEs look to be better placed than in the past. Foreign exchange reserves are generally higher and current account balances more favourable than in previous episodes of rising US bond yields (Graph I.F.2, left-hand panel). Bank credit ratings are also somewhat higher on average than in previous episodes, albeit with a wide dispersion (centre panel). Despite generally low interest rates, private sector debt service ratios are, on average, at a similar level to the past and could rise rapidly if funding costs increased. Many EMEs also have more resilient institutional settings. In particular, improved monetary policy frameworks have made for better anchored inflation expectations, moderating exchange rate pass-through into consumer prices.<sup>3</sup> These factors should reduce the likelihood and size of capital outflows in response to tightening financial conditions.

Stronger current accounts and FX buffers today, but weaker fiscal positions

Graph I.F.2



<sup>1</sup> Distribution of the median of the variables shown on the x-axis at the outset of the 20 largest increases in 10-year US bond yields over non-overlapping three-month windows over the period 1990–2019. The sample comprises AR, BR, CL, CN, CO, HK, ID, IN, KR, MX, MY, PE, PH, PL, RU, SG, TH, TR and ZA. Fewer observations for earlier episodes due to data constraints. <sup>2</sup> For external debt, latest available IMF WEO forecasts for the current year at the beginning of each episode, except for the last episode (April 2021 forecasts). For other variables, latest available observations for the beginning of each episode.

Sources: IMF, ARA template for emerging markets, *Balance of Payments Statistics*, *International Financial Statistics* and *World Economic Outlook*; Consensus Economics; S&P Global Ratings; BIS credit to the non-financial sector statistics; national data; BIS; BIS calculations.

However, by other measures, in particular related to fiscal positions, EMEs look more vulnerable than in past episodes. To cushion the effects of the Covid-19 pandemic, many EMEs are running large fiscal deficits, public and external debt levels in relation to GDP have generally increased, and credit ratings have deteriorated, at least for local currency debt (Graph I.F.2, right-hand panel). Historically, these vulnerabilities have coincided with greater investor retrenchments.

Of course, there are again significant differences today across countries along these dimensions. Some may be more resilient because of, say, more robust financial sectors or less dependence on external financing; others may be more vulnerable, either because of international investors' perceptions about the stability of policy frameworks or because fiscal deficits are not counterbalanced by expectations of strong growth potential over the medium term. There is evidence that international investors have become more attuned over time to these and other cross-country differences in vulnerabilities.<sup>4</sup>

If global financial conditions tighten, EME policymakers will have to respond, for which they can draw on their experience and pragmatism in deploying a broad set of tools.<sup>5</sup> Foreign exchange intervention, which is relatively nimble, can serve as a first line of defence against undue currency volatility resulting from swings in

capital flows. In addition to operating in spot markets, providing protection against exchange rate swings for lenders and domestic investors can help compensate for thin hedging markets. At the same time, foreign exchange reserves are finite and in some cases may be insufficient to cope with a severe financial tightening. Meanwhile, a number of monetary policy instruments can be used to stabilise financial markets and influence domestic financial conditions. Although lowering interest rates is the standard monetary response to worsening economic conditions, EME central banks are often constrained from doing so when financial conditions tighten as it can hasten capital outflows. At such times, balance sheet operations can offer an extra degree of freedom for central banks as they formulate their response. The use of asset purchases in particular can provide support for local currency bond markets, which have become more important in many EMEs. Refinancing operations for financial institutions are another option for shoring up market functioning, supporting the flow of credit and offsetting a tightening of financial conditions. Where macroprudential regulations have previously been used to strengthen the resilience of financial institutions, these can be eased. However, macroprudential policies are ill-suited to dealing with a sudden worsening of conditions, given their long implementation and transmission lags.

The exact mix of tools and their sequencing will depend on country-specific features and economic circumstances. For example, some central banks in countries with a history of fiscal dominance and high inflation are prohibited from purchasing government securities. Or they may face tight limits on such purchases or simply be reluctant to do so. The nature of vulnerabilities is also key. The need for foreign exchange intervention, for example, will be determined in large part by the prevalence of unhedged foreign exchange exposures, which can reside in a variety of sectors. Similarly, the benefits of asset purchases depend importantly on the degree of foreign participation in local currency bond markets as well as the ability of local financial institutions to step in and absorb any selling pressure. Determining the most appropriate mix and sequence of tools to deploy promptly during periods of heightened financial market stress is a key practical challenge.<sup>⑥</sup>

<sup>①</sup> See eg Committee on the Global Financial System, *Changing patterns of capital flows*, CGFS Papers, no 66, May 2021.

<sup>②</sup> See eg E Cavallo, "International capital flow reversals", *IDB Working Paper Series*, no IDB-WP-1040, August 2019. <sup>③</sup> See eg M Jašova, R Moessner and E Takáts, "Exchange rate pass-through: what has changed since the crisis?", *International Journal of Central Banking*, vol 15, September 2019, pp 27–58.

<sup>④</sup> See eg S Ahmed, B Coulibaly and A Zlate, "International financial spillovers to emerging market economies: How important are economic fundamentals?", *Journal of International Money and Finance*, vol 76, September 2017.

<sup>⑤</sup> See BIS, "Monetary policy frameworks in EMEs: inflation targeting, the exchange rate and financial stability", *Annual Economic Report*, June 2019, Chapter II for an overview of policy frameworks and tools in EMEs. <sup>⑥</sup> For an overview of how EME central banks evaluate the nature of shocks to capital flows and incorporate these into their policy frameworks see BIS, *Capital flows, exchange rates and policy frameworks in emerging Asia*, report by a working group of the Asian Consultative Council, November 2020; and BIS, *Capital flows, exchange rates and monetary policy frameworks in Latin American and other economies*, report by a group of central banks including members of the Consultative Council for the Americas and the central banks of South Africa and Turkey, April 2021.

tools at the command of authorities do not cover many non-bank financial institutions.<sup>22</sup> The post-GFC financial reforms targeted primarily banks, insurance companies and market infrastructures, in particular central counterparties (CCPs), but large swathes of the financial system have not seen significant reforms. The asset management industry – the territory of both leveraged and unleveraged players – is the most notable example. It is these institutions that were at the epicentre of the tremors in March 2020 and among which the most recent signs of stress have emerged, including in the cryptocurrency segments.<sup>23</sup> A prolonged period of aggressive risk-taking suggests that substantial leverage and liquidity mismatches may hide below the surface. Work is under way in the international community to tackle some of the structural vulnerabilities in this area.<sup>24</sup> In the near term, the challenge will be to monitor developments closely and to make sure that the core of the financial system, notably banks and CCPs, remains resilient.

In the first alternative scenario, where growth and inflation exceed expectations and financial conditions tighten, policies may need to be recalibrated. Fiscal authorities could afford to phase out accommodation more quickly, although there is considerable inertia built in to some of the announced initiatives. Prudential policy, meanwhile, could ensure that prudential buffers return to pre-crisis levels faster.

Monetary policy would face the trickiest challenges. A tightening of financial conditions in response to an inflation surprise – most likely in the United States – would put central banks in a delicate position. If a central bank disagreed with the market assessment, it could remain committed to a more accommodative stance and attempt to shape expectations of the economic outlook and its reaction function. This would not necessarily be a smooth process, and bouts of market volatility would be likely so long as investors continued to doubt the central bank's economic projections or commitment to its stated policy trajectory. Communication would be tested even more than in the central scenario. The final outcome would depend on the actual inflation trajectory and the speed with which market expectations adapt.

Spillovers to the rest of the world would raise different issues. Where higher inflation would be welcome given past undershoots of targets, central banks could afford to remain patient. By contrast, more EME central banks than in the central scenario would be under pressure to tighten, especially where currencies dropped and fuelled inflation above tolerable levels. This would further widen the divergence in economic conditions around the world.

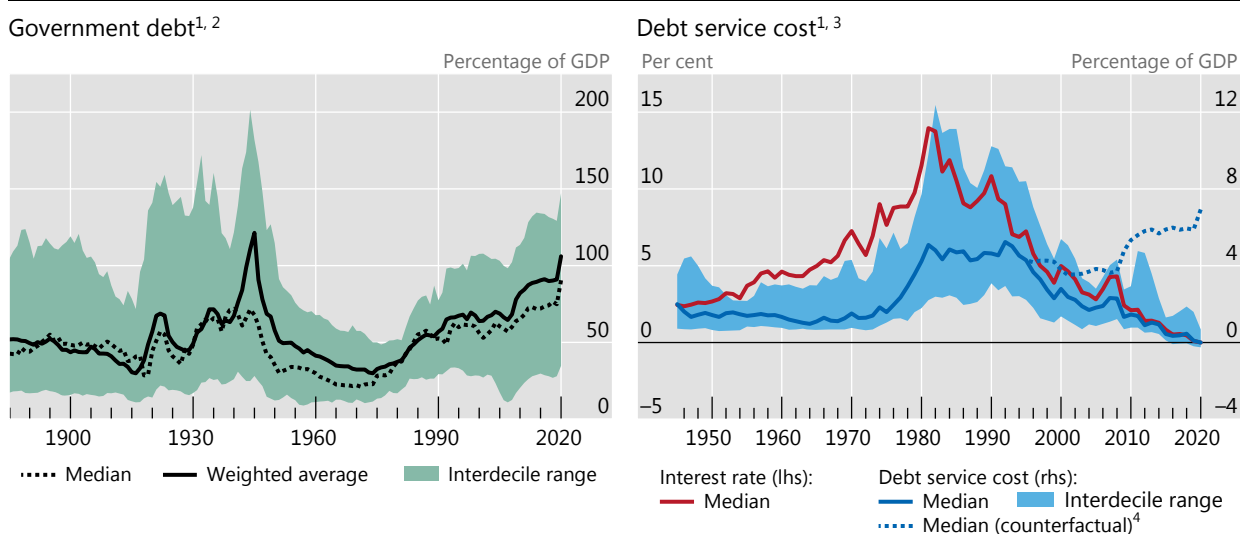
In the second alternative scenario, where growth disappoints, even more accommodative policies may be called for. In hindsight, many economies entered the pandemic with more room to provide policy accommodation than had previously been realised, in the case of EMEs facilitated by monetary and financial easing in AEs. However, providing additional stimulus could test policy space in a number of countries. Some may need to reintroduce emergency measures used early last year, such as liquidity provision to financial institutions and support for corporate bond markets, particularly if financial markets seized up. Additional support for businesses may be also required. Again, EMEs would be particularly vulnerable, not least because they have already depleted much of their conventional policy space and the use of unconventional measures there is subject to more constraints – of an economic and political economy nature – than in AEs.

This scenario would also exacerbate the intertemporal trade-offs. By prolonging the duration of exceptionally accommodative monetary policy, it would risk further stoking imbalances in asset prices, particularly in housing markets. A further narrowing of interest rate margins would challenge bank profitability and make it more difficult to rebuild capital. The combination of weak banks, easy financial conditions and low business profitability could see the emergence of more zombie firms, leaving a legacy of lower productivity growth.

## Longer-term challenges

Peering further into the future, once the pandemic is left behind and the economy is restored to health, a key challenge will be to reorient policy back towards longer-term objectives. This will involve fostering a sustainable path to stronger growth while at the same time gradually normalising monetary and fiscal policies and dealing effectively with any tension that might arise between the two along that path. In doing so, policymakers will have to contend with the legacy of the pandemic, including much higher public debt, lower interest rates and larger central bank balance sheets.

Normalising monetary and fiscal policy over the longer term would provide safety margins to cope with both unexpected and unwelcome developments, such as the current pandemic and inevitable future recessions. The starting point is unprecedented. On the one hand, fiscal expansion has pushed government debt-to-GDP ratios to levels on a par with, or higher than, those in the aftermath of World War II (Graph I.15, left-hand panel). On the other hand, according to historical records, nominal interest rates have never been so low (right-hand panel). In fact,



<sup>1</sup> Sample of 19 AEs and five EMEs. <sup>2</sup> General government debt at nominal value, latest available quarter for 2020. <sup>3</sup> Debt/GDP multiplied by the simple average of short- and long-term interest rates. <sup>4</sup> Median debt service if nominal interest rates had stayed at the 1995 level.

Sources: O Jordà, M Schularick and A Taylor, “Macrofinancial history and the new business cycle facts”, in M Eichenbaum and J Parker (eds), *NBER Macroeconomics Annual 2016*, vol 31, 2016; S A Abbas, N Belhocine, A El-Ganainy and M Horton, “A historical public debt database”, *IMF Working Papers*, no 10/245, 2010; European Commission, AMECO database; IMF, *World Economic Outlook*; OECD, *Economic Outlook*; Bloomberg; Datastream; Global Financial Data; Oxford Economics; BIS total credit statistics; BIS calculations.

they are so low that, despite the exceptionally high debt ratios, debt service costs are at historical troughs. The debt burden has never felt so light.

Policy normalisation cannot be taken for granted. The years leading up to the Covid-19 pandemic illustrate the challenges. Pre-pandemic, few central banks had managed to raise policy interest rates from the levels prevailing in the immediate aftermath of the GFC, even in countries that saw a long economic expansion and low unemployment rates. In many AEs, central bank balance sheets grew further, to peacetime highs. Public debt levels generally rose too, before the pandemic pushed them higher still.

One reason why normalisation is so hard is because it involves intertemporal trade-offs. The costs of normalisation, such as generally lower growth and higher unemployment, are immediate and concrete. Its benefits, such as having more room to combat economic downturns, are less tangible and accrue only in the future. Paradoxically, these difficulties are felt most keenly in AEs, where policymakers have greater freedom to delay normalisation to avoid its contractionary effects. In EMEs, where financial markets are typically less tolerant of narrowing policy headroom, the greater risk may be a premature tightening despite a weak economy.

A second reason reflects economic conditions. Ideally, faster growth and a pickup in inflation would support normalisation. But generating sustained inflation has proved surprisingly difficult, especially in AEs, where it has remained stubbornly below targets. While the large fiscal stimulus programmes under way in a number of countries could boost inflation in the years ahead, the evidence indicates that this is more likely in EMEs (Box I.G). Normalisation could be easier for central banks that pay greater attention to output and financial imbalances and that are more willing to tolerate inflation shortfalls providing that longer-run expectations remain anchored. Even so, if inflation fails to pick up, there is a limit to how far central banks can normalise without threatening the credibility of their current inflation objectives. How much inflation will rise on a *sustainable* basis remains an open

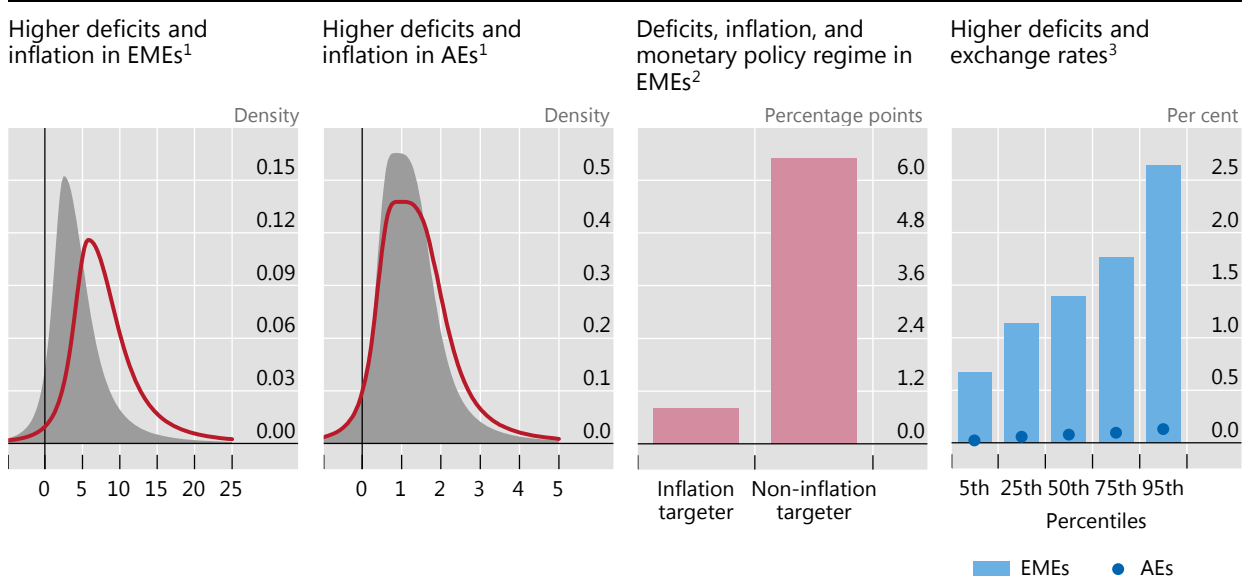
## Fiscal inflation?

The policy response to Covid-19 has strengthened the nexus between fiscal and monetary policy. In the early stages of the crisis this involved close cooperation between the two policies to stabilise financial markets and cushion the impact of the pandemic on households and firms. This, however, has contributed to record-high public debt and deficits, rising central bank holdings of public debt and a high sensitivity of government debt service burdens to monetary policy. Some observers have also expressed concern that the historically large increase in deficits could lead to resurgent inflation. The inflationary consequences of the US fiscal stimulus are currently a subject of debate. In addition, fiscal vulnerabilities have been prominent in a number of historical episodes of high inflation and macroeconomic instability, especially in EMEs.<sup>①</sup>

Graph I.G shows evidence that the relationship between an increase in fiscal deficits and the distribution of future inflation outcomes has been considerably stronger in EMEs than in AEs. The underlying “inflation at risk” model relates the one-year-ahead distribution of possible inflation outcomes to the change in fiscal deficits, as well as to output growth, current inflation, the change in the exchange rate and the oil price, and a dummy variable for sovereign debt crises.<sup>②</sup> The estimates, based on a sample that includes a number of high-inflation episodes, suggest that a one standard deviation increase in EME fiscal deficits raises inflation by 5.5 percentage points at the median of the distribution (first panel); this effect is more than 10 times larger than that for AEs (second panel).<sup>③</sup> The evidence is consistent with other findings in the literature. In particular, a number of studies find that deficits have larger effects on inflation in countries with higher inflation rates or during periods of higher inflation globally.<sup>④</sup>

### Inflationary effects of deficits vary between economies and policy regimes

Graph I.G



<sup>1</sup> Change in one-year-ahead conditional inflation forecast distribution (change from grey to red) when there is a one standard deviation increase in fiscal deficits. To compute the distributions, all other variables are set at their means. The sample, covering 21 AEs and 26 EMEs, runs from 1960 to 2019. The length of the country-specific samples depend on data availability. <sup>2</sup> The effect of a one standard deviation increase in deficits on future inflation in EMEs, computed at the 50th percentile of the future inflation distribution. The equation includes an interaction variable between a dummy variable for inflation targeters and the change in deficits, as well as the dummy variable included on its own. The interaction variable is statistically significant at the 5% level. <sup>3</sup> Bars show the effect of a 1 percentage point increase in the fiscal deficit on the depreciation of the EME currency against the US dollar in the following year; dots show the corresponding effect for AEs. The results are shown by the quantile of the exchange rate depreciation. Based on quantile regressions with the change in the bilateral US dollar exchange rate as the dependent variable. All percentiles except the fifth are statistically significant at conventional levels for EMEs; no percentiles are statistically significant for AEs.

Sources: R Banerjee, J Contreras, A Mehrotra and F Zampolli, “Inflation at risk in advanced and emerging market economies”, *BIS Working Papers*, no 883, September 2020; BIS calculations.

Fiscal-monetary policy interactions affect the strength of the deficit-inflation link. Reflecting the importance of the monetary regime, the third panel suggests that an increase in deficits leads to a smaller increase in future inflation in inflation targeting regimes. A one standard deviation increase in EME fiscal deficits is



estimated to raise future inflation by around 0.8 percentage points when a central bank pursues inflation targeting, and by 6.5 percentage points when another monetary policy regime is in place (Graph I.G, third panel). Given the prevalence of price stability-oriented monetary policy frameworks in EMEs in recent years – for example, over two thirds of G20 EMEs now pursue inflation targeting – inflation risks from higher deficits are probably much more muted than in the past.<sup>⑤</sup>

Exchange rate dynamics could partly account for the observed differences between AEs and EMEs. A fiscal expansion could lead to a loss of investor confidence, especially if a country is perceived to have little or no fiscal space. As sovereign risk rises, pressure for the exchange rate to depreciate may build and inflation expectations may start to drift away from target. Such effects could be especially relevant in EMEs as they generally have less perceived fiscal space and their inflation is more sensitive to exchange rate movements. Indeed, empirical estimates suggest that in EMEs a rise in fiscal deficits increases the probability of larger exchange rate depreciations (Graph I.G, fourth panel, bars). By contrast, higher deficits do not appear to affect exchange rates in an economically or statistically significant way in AEs (dots).

In conclusion, higher deficits can translate into higher inflation pressures, with the effects likely to vary significantly across economies. Relevant factors include the extent of fiscal space, the credibility of monetary policy and the degree to which inflation expectations are anchored – often working in close interaction with exchange rates.

① See eg C Esquivel, T Kehoe and J Nicolini, “Lessons from the monetary and fiscal history of Latin America”, Federal Reserve Bank of Minneapolis, *Research Department Staff Reports*, no 608, July 2020; P Krugman, “Fighting Covid is like fighting a war”, *The New York Times*, 7 February 2021; and L Summers, “The Biden stimulus is admirably ambitious. But it brings some big risks, too”, *The Washington Post*, 4 February 2021. ② The model is estimated using a quantile panel regression framework using annual data from 1960s onwards for 21 AEs and 26 EMEs and developing economies. The length of the country-specific samples depends on data availability. For a description of the methodology, see R Banerjee, J Contreras, A Mehrotra and F Zampolli, “Inflation at risk in advanced and emerging market economies”, *BIS Working Papers*, no 883, September 2020; and R Banerjee, A Mehrotra and F Zampolli, “Fiscal sources of inflation risk”, mimeo, 2021. ③ Fiscal deficits also generally have an economically larger effect on the right-hand tail of the inflation distribution, implying that they raise upside inflation risks in particular. However, the differences in the effects along the distribution are generally not statistically significant. ④ See eg L Catao and M Terrones, “Fiscal deficits and inflation”, *Journal of Monetary Economics*, vol 52, issue 3, April 2005; S Fischer, R Sahay and C Vegh, “Modern hyper- and high inflations”, *Journal of Economic Literature*, vol 40, no 3, September 2002; and H-Y Lin and H-P Chu, “Are fiscal deficits inflationary?”, *Journal of International Money and Finance*, vol 32, February 2013. ⑤ In the estimation sample, around 95% of the country-year observations featuring inflation targeting occurred in the 2000s and 2010s.

question, not least because the longer-term effects of the pandemic on structural forces such as globalisation and technology have yet to play out.

A third reason is that postponing normalisation beyond a certain point may actually make it harder. Keeping monetary policy accommodative to support fiscal consolidation could encourage a further build-up of financial imbalances in the private sector. Given the exceptionally low service burdens, it could also induce further increases in government debt. In both cases, the economy’s sensitivity to higher interest rates would rise.

The joint need to normalise monetary and fiscal policies poses specific challenges. Along the path, normalisation in one area could complicate normalisation in the other. Fiscal consolidation would act as a drag on economic activity and inflation, hindering prospects for monetary policy normalisation. Conversely, given increased debt burdens, higher interest rates would increase the size of the required fiscal adjustment. In fact, the interest sensitivity of service costs is already very high. For example, should interest rates return to the levels prevailing in the mid-1990s, when inflation had already been conquered, median service costs would exceed the previous wartime peaks (Graph I.15, right-hand panel).

From this perspective, large-scale central bank purchases of government debt can heighten the interest rate sensitivity of borrowing costs. Considering the consolidated public sector balance sheet, these operations retire long-term government debt from the market and replace it with overnight debt – interest-



bearing central bank reserves. Indeed, despite the general tendency for governments to issue at longer maturities, central bank purchases have shortened the effective maturity of public debt. Where central banks have used such purchases more extensively, some 15–45% of public debt in the large AE jurisdictions is in effect overnight.<sup>25</sup>

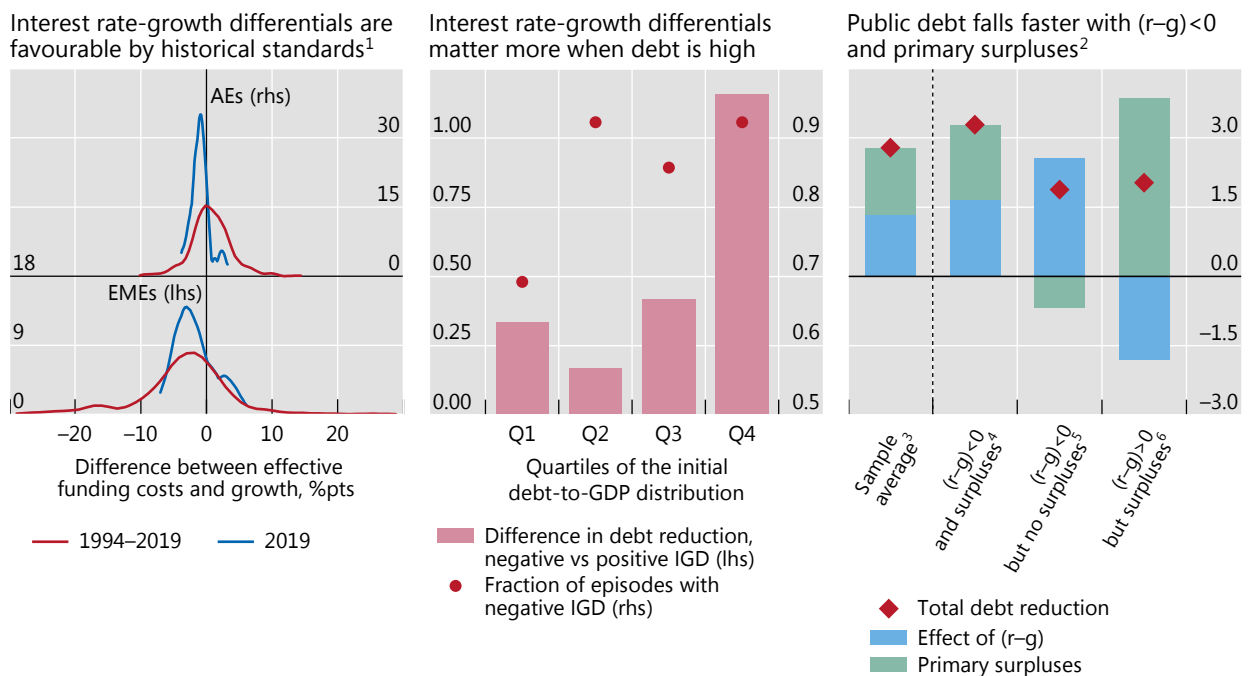
One cause for optimism concerning fiscal policy normalisation prospects is that interest rates have been generally below growth rates for some time. Such a favourable configuration sets a ceiling on the ratio of debt to GDP for a given fiscal deficit and means that the ratio will start to decline when deficits are sufficiently small. It can also facilitate an increase in the average duration of public debt, lowering rollover risk in countries where fiscal sustainability is a concern. And indeed, interest rate-growth differentials are very favourable from a longer-term perspective (Graph I.16, left-hand panel), in part because real interest rates have been negative for an exceptionally long time.

However, the history of successful episodes of consolidation raises a note of caution. Successful debt-to-GDP reductions have relied exclusively on a favourable interest rate-growth differential only in a small fraction (22%) of cases. Primary surpluses alone have hardly ever succeeded (only 15% of cases), particularly when public debt is high (Graph I.16, centre panel). Instead, a combination of surpluses and favourable interest rate-growth differentials has generally been necessary (64% of cases). Such a combination naturally also increases the speed of adjustment, by

## How have countries successfully lowered public debt?

In percentage points

Graph I.16



<sup>1</sup> Ratio of gross interest payments and one-year lagged gross liabilities minus nominal GDP growth, multiplied by 100. Sample consists of 22 AEs and 15 EMEs. <sup>2</sup> Average yearly drop in public debt to GDP (D/Y), during periods where D/Y falls for at least three consecutive years. Sample consists of 57 public debt reduction episodes in 22 AEs and 10 EMEs over the period 1960–2020. <sup>3</sup> All debt reduction episodes. <sup>4</sup> Debt reductions when D/Y fall was accompanied by  $(r-g) < 0$  (ie the effective interest rate was less than the GDP growth rate) and primary surpluses. <sup>5</sup> Debt reductions when D/Y fall was accompanied by  $(r-g) < 0$  and primary deficits. <sup>6</sup> Debt reductions when D/Y fall was accompanied by primary surpluses and  $(r-g) < 0$ .

Sources: IMF; OECD; BIS calculations.

some 50% (right-hand panel). Thus, the window of opportunity provided by favourable interest rate-growth differentials should not be missed.

The fact that, along the normalisation path, the objectives of fiscal and monetary policy could give rise to tensions raises the spectre of fiscal dominance.<sup>26</sup> Fiscal dominance denotes a situation in which monetary policy is unable to tighten as a result of fiscal constraints. The mechanism operates through the sensitivity of debt service costs to higher interest rates.

Fiscal dominance can arise for two reasons: economic conditions and political economy pressures. In the case of fiscal dominance related to economic conditions, higher interest rates cause major economic damage, forcing the central bank to refrain from tightening even when it would otherwise be desirable to do so. An archetypal example in EMEs is when the higher interest rates necessary to counter inflation undermine the government's creditworthiness, triggering a disruptive capital outflow, a sharp currency depreciation and even higher inflation. In the case of political economy pressures, the government forces the central bank to deviate from its objectives in order to limit the rise in its borrowing costs. All this suggests that the risk of fiscal dominance depends on institutional and economic factors, and is generally higher where the creditworthiness of the sovereign is weaker.

The remedies for fiscal dominance depend on the type. Addressing political economy pressures puts a premium on strong institutional arrangements to buttress the central bank's autonomy. But when the origin is purely economic constraints, even an independent central bank may have little choice but to keep interest rates low. In this case, the only remedy is fiscal consolidation.

Given the scale of the challenges involved, a key imperative is to adopt policies that strengthen sustainable growth without seeking to achieve it simply through easy monetary policy or fiscal stimulus. Structural reforms that promote a vibrant, flexible and competitive economy are essential. At the current juncture, those facilitating a reallocation of resources in the light of the pandemic-induced changes in demand patterns have a specific role to play. In addition, besides a supportive tax regime, the allocation of government expenditure matters. The necessary large increases in government transfers to households and firms during the pandemic seem to have come at the cost of lower public investment. Shifting the composition of spending back towards investment as economic conditions improve would provide welcome support. That said, as history indicates, the political economy obstacles to the implementation of growth-friendly policies should not be underestimated.

## Securing a durable recovery

After the travails of the past 18 months, global economic activity is expanding vigorously. But, as this chapter has emphasised, the recovery has been very uneven, with its speed and extent varying substantially across countries and sectors. Even in the central scenario, countries' economic conditions could diverge further in the coming year, given differences in vaccination rates and policy stimulus. The more challenging scenarios described above would exacerbate these differences, with many EMEs being among the most vulnerable. The recovery's unevenness also heightens the near-term policy challenges, particularly in countries where tighter global financial conditions could go hand in hand with sluggish domestic recoveries.

In addition to meeting these near-term challenges, securing a durable recovery will require addressing the more enduring consequences of the pandemic. A sustainable expansion cannot rely on policy stimulus alone. Even if the sectoral composition of economic activity reverts to its pre-pandemic pattern as constraints

ease, changes such as the unprecedented adoption of remote work and expansion of online retailing are unlikely to be fully reversed. How these developments play out will have widespread implications, including for individual firms, asset classes (not least commercial property) and financial services, such as the digitisation of payments (Chapter III). In some sectors, pandemic-induced shifts in business practices could accelerate innovation and investment. Policymakers can encourage this process, with a leading example being incentives to adopt green energy, as included in several countries' fiscal recovery packages.

While presenting new opportunities, the pandemic-induced structural changes will not benefit everyone. As the economic landscape evolves, some firms will close and some workers will lose their jobs. This process could pose a number of social challenges, including by raising inequality. Many branches of economic policy have a role to play in addressing them, including monetary policy (Chapter II).

## Endnotes

- <sup>1</sup> See BIS, “A global sudden stop”, *Annual Economic Report 2020*, June, Chapter I.
- <sup>2</sup> See BIS, “A monetary lifeline: central banks’ crisis response”, *Annual Economic Report 2020*, June, Chapter II.
- <sup>3</sup> For a review of central bank responses to the pandemic, see C Cantú, P Cavallino, F De Fiore and J Yetman, “A global database on central bank’s monetary responses to Covid-19”, *BIS Working Papers*, no 934, March 2021.
- <sup>4</sup> See R Banerjee, J Noss and J-M Vidal Pastor, “Liquidity to solvency: transition cancelled or postponed?”, *BIS Bulletin*, no 40, March 2021.
- <sup>5</sup> See The Economist, “Relapse and recovery”, 16 January 2021, [www.economist.com/finance-and-economics/2021/01/13/what-is-the-economic-impact-of-the-latest-round-of-lockdowns](http://www.economist.com/finance-and-economics/2021/01/13/what-is-the-economic-impact-of-the-latest-round-of-lockdowns).
- <sup>6</sup> See UN World Tourism Organization, *2020: A year in review*, [www.unwto.org/covid-19-and-tourism-2020](http://www.unwto.org/covid-19-and-tourism-2020).
- <sup>7</sup> See also Chapter II.
- <sup>8</sup> For a review of the recent literature on fiscal multipliers, see V Ramey, “Ten years after the financial crisis: what have we learned from the renaissance in fiscal research”, *Journal of Economic Perspectives*, vol 33, Spring 2019; and D Wilson, “The Covid-19 fiscal multiplier: lessons from the Great Recession”, *FRBSF Economic Letter*, no 2020-13, May 2020.
- <sup>9</sup> For a recent exploration of the anchoring of inflation expectations in AEs and EMEs, see R Moessner and E Takáts, “How well-anchored are long-term inflation expectations?”, *BIS Working Papers*, no 869, June 2020.
- <sup>10</sup> For a discussion of the role of globalisation and other long-term structural factors in flattening the Phillips curve, see R Auer, C Borio and A Filardo, “The globalisation of inflation: the growing importance of global value chains”, *BIS Working Papers*, no 602, January 2017; and K Forbes, “Has globalization changed the inflation process?”, *BIS Working Papers*, no 791, July 2019.
- <sup>11</sup> See K Forbes, J Gagnon and C Collins, “Low inflation bends the Phillips curve”, *Peterson Institute for International Economics Working Paper*, no 20-6, April 2019.
- <sup>12</sup> See S Aramonte and F Avalos, “What drove the recent increase in the US inflation break-even rate?”, *BIS Quarterly Review*, March 2021, pp 12–13.
- <sup>13</sup> See Board of Governors of the Federal Reserve System, “December 2020 stress test results”, December 2020; and Bank of Japan, *Financial System Report*, April 2021.
- <sup>14</sup> See S Claessens, N Coleman and M Donnelly, “‘Low-for-long’ interest rates and banks’ interest margins and profitability: Cross-country evidence”, *Journal of Financial Intermediation*, vol 35, July 2018.
- <sup>15</sup> See S Kalemli-Özcan, L Laeven and D Moreno, “Debt overhang, rollover risk, and corporate investment: evidence from the European crisis”, *NBER Working Papers*, no 24555, August 2020.
- <sup>16</sup> See BIS, “A global sudden stop”, *Annual Economic Report 2020*, June, Chapter I.
- <sup>17</sup> See Financial Stability Board, “Covid-19 support measures: Extending, amending and ending”, April 2021, <https://www.fsb.org/wp-content/uploads/P060421-2.pdf>.
- <sup>18</sup> See C Borio, B Vale and G von Peter, “Resolving the financial crisis: are we heeding the lessons from the Nordics?”, *BIS Working Papers*, no 311, June 2010.
- <sup>19</sup> See Swiss National Bank, “Monetary policy assessment of 25 March 2021”, March 2021; T Macklem, “Monetary Policy Report press conference opening statement”, April 2021; and Reserve Bank of Australia, “Statement by Philip Lowe, Governor: Monetary Policy Decision”, April 2021.

- <sup>20</sup> See G DeBelle, "Monetary policy during COVID", Shann Memorial Lecture, May 2021.
- <sup>21</sup> See D Araujo, B Cohen and P Pogliani, "Bank loan loss provisioning during the Covid crisis", *BIS Quarterly Review*, March 2021, pp 9–10.
- <sup>22</sup> See C Borio, M Farag and N Tarashev, "Post-crisis international financial regulatory reforms: a primer", *BIS Working Papers*, no 859, April 2020.
- <sup>23</sup> See Financial Stability Board, *Holistic Review of the March Market Turmoil*, November 2020, [www.fsb.org/wp-content/uploads/P171120-2.pdf](http://www.fsb.org/wp-content/uploads/P171120-2.pdf).
- <sup>24</sup> See Financial Stability Board, *FSB Work Programme for 2021*, January 2021, [www.fsb.org/wp-content/uploads/P200121.pdf](http://www.fsb.org/wp-content/uploads/P200121.pdf).
- <sup>25</sup> See the updates of S Arslanalp and T Tsuda, "Tracking global demand for advanced economy sovereign debt", *IMF Economic Review*, vol 62, October 2014, [www.imf.org/~media/Websites/IMF/imported-datasets/external/pubs/ft/wp/2012/Data/\\_wp12284.ashx](http://www.imf.org/~media/Websites/IMF/imported-datasets/external/pubs/ft/wp/2012/Data/_wp12284.ashx).
- <sup>26</sup> For more discussion of these issues, see C Borio and P Disyatat, "Monetary and fiscal policy: privileged powers, entwined responsibilities", *SUERF Policy Note*, no 238, May 2021.

## II. The distributional footprint of monetary policy

### **Key takeaways**

- The long-term rise in economic inequality since the 1980s is largely due to structural factors, well outside the reach of monetary policy, and is best addressed by fiscal and structural policies.
- Monetary policy can most effectively contribute to a more equitable society by fulfilling its mandate, which addresses two key factors causing inequality at shorter horizons. This requires keeping inflation low and limiting the incidence and duration of macroeconomic and financial instability, which disproportionately hurt the poor.
- Central banks can also help mitigate economic inequality wearing their “non-monetary hats”, notably as prudential authorities, promoters of financial development and inclusion, and guardians of payment systems.

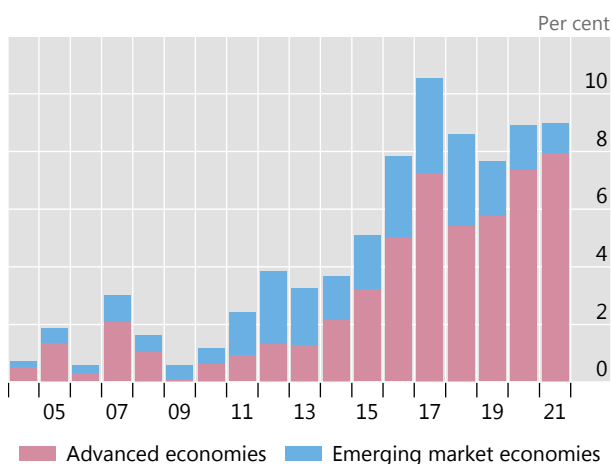
The distribution of income and wealth, or economic opportunities more broadly, has gained prominence in policy debates over the past decades. Heightened awareness of these issues owes in large part to a broad-based increase in economic inequality, a trend that the uneven impact of the Covid-19 recession has exacerbated.

The growing focus on rising inequality in the central banking community, however, is more recent and dates back to the Great Financial Crisis (GFC). In its aftermath, central banks have deployed policies featuring exceptionally low interest rates and extensive use of balance sheets to support economic activity and lower unemployment. Such measures have fuelled concerns that central banks’ actions, by boosting asset prices, have benefited mostly the rich, shining the spotlight on the distributional footprint of monetary policy.

Central bankers’ greater attention to inequality concerns is reflected in the growing references to “inequality” in their public speeches (Graph II.1, left-hand panel). An analysis of the context in which inequality is mentioned suggests that central banks acknowledge the challenges posed by rising income and wealth inequality and stress the relevance of policies, including their own, in addressing distributional considerations (right-hand panel).

This chapter reviews the relation between economic inequality and the formulation and conduct of monetary policy. The trends of rising inequality since the 1980s are due to structural factors, well outside the reach of monetary policy. That said, inequality influences the transmission mechanism of monetary policy and, in turn, is affected by monetary policy over shorter time spans. The two main causes of inequality at business cycle frequency are high inflation and recessions, which disproportionately hurt the disadvantaged in society. Addressing these factors is precisely what central bank mandates call for. Therefore, the most effective way monetary policy can contribute to a more equitable society is to pursue its mandated objectives. This means keeping inflation low and limiting the incidence and duration of macroeconomic and financial instability. This task, however, has become increasingly complex over time due to a change in the nature of the business cycle: with inflation low and stable, as well as less responsive to economic slack, financial factors have come to play a bigger role in amplifying business cycle

Share of speeches mentioning inequality<sup>1</sup>



Frequency of occurrence of words in short excerpts of speeches around mentions of inequality<sup>2</sup>



<sup>1</sup> All speeches of central bankers mentioning the keywords “inequality” and “distributional consequences/impact of monetary policy” expressed as a share of all central bankers’ speeches in the BIS database. Only selected speeches in English and, for the United States, only speeches by members of the Board of Governors of the Federal Reserve System and the Federal Reserve Bank of New York are included in the database. Data until end-May 2021. <sup>2</sup> The cloud contains selected words and phrases that appear in short excerpts around the mentions of “inequality” and “distributional consequences/impact of monetary policy” in central bankers’ speeches. The size of each phrase reflects its relative frequency.

Sources: BIS; BIS calculations.

fluctuations. This has given rise to intertemporal trade-offs between near-term price stability, on the one hand, and financial and hence macroeconomic stability in the longer term – trade-offs that, by the same token, also apply to the impact of monetary policy on inequality. To better address these trade-offs, a more balanced mix of prudential, fiscal and structural policies is called for as part of a holistic macro-financial stability framework.

At the same time, central banks can also help tackle inequality wearing their “non-monetary hats”. These include, in particular, their responsibilities as prudential authorities, promoters of financial development and inclusion, and guardians of payment systems.

This chapter is organised as follows. The first section briefly summarises long-term trends in inequality and their structural causes. The second examines how inequality increases in the absence of price and macroeconomic, including financial, stability – the goals enshrined in monetary policy mandates. The third delves more deeply into the two-way relationship between inequality and the conduct of monetary policy and highlights how changes in the nature of the business cycle have given rise to short-run trade-offs between central banks’ main objectives. The fourth considers the critical role of other policies in both complementing monetary policy in stabilising the economy and tackling the structural causes of inequality. The final section concludes.

## Poverty and inequality: trends and determinants

Economic growth improves living standards and lifts disadvantaged households out of poverty. Historically, sustained growth has been the main cause of significant and durable declines in poverty rates worldwide. Before the Covid-19 pandemic,

poverty rates had declined globally, and especially so in EMEs (Graph II.2, left-hand panel). These countries also saw their median income catch up with that of advanced economies (AEs). As a result, inequality *across countries* declined.

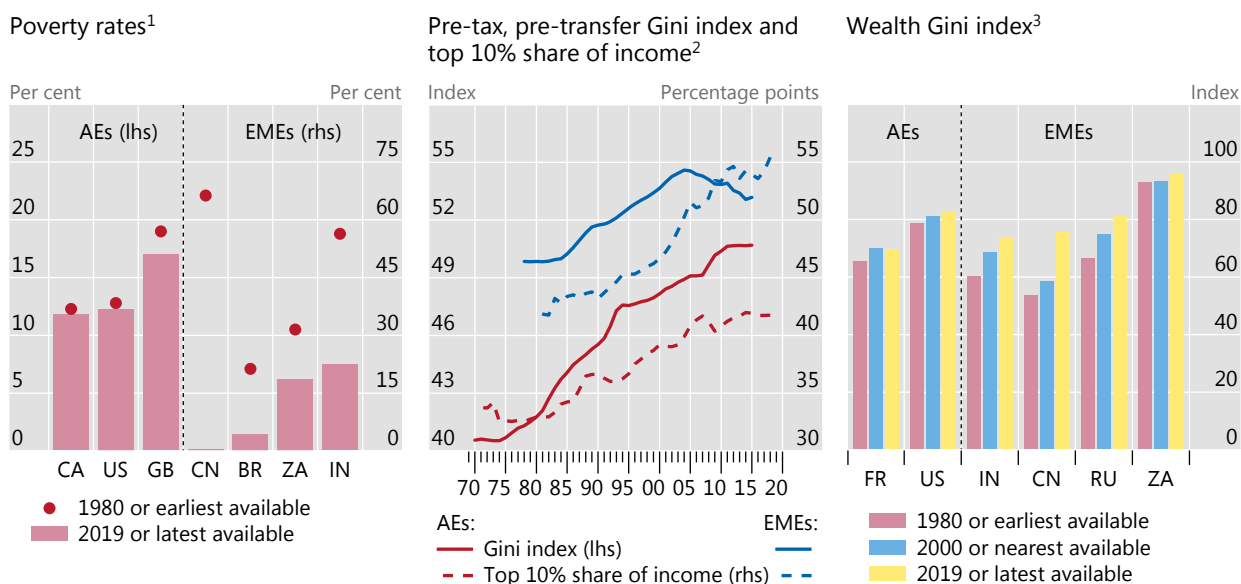
At the same time, the *within-country* distribution of pre-tax and pre-transfer income<sup>1</sup> increasingly became more concentrated at the top. Standard measures of within-country income inequality, such as the Gini coefficient or the share of income accruing to the top 10% of earners, have trended up globally from the 1980s (Graph II.2, centre panel).<sup>2</sup> Wealth inequality, in contrast, started from higher levels globally and increased more visibly in EMEs than in AEs (right-hand panel). Yet looking more closely at the top of the wealth distribution reveals a marked increase in the concentration of wealth also in some AEs (Box II.A).

The opposing trends in poverty and income inequality within countries reflect the different concepts they represent. Poverty quantifies the distance of current income from a certain threshold.<sup>3</sup> Inequality captures differences in income (or wealth) levels across segments of the population. As such, inequality can increase even if all households benefit from economic growth, if they do so to a varying extent. Conversely, absent economic growth, a society can be more equal but remain or become poor.

Over the past several decades, the same structural forces that have greatly expanded economic opportunities and spurred growth have also contributed to the long-term trends in income and wealth inequality within countries. As has been amply documented, two such forces stand out: technological progress and globalisation,<sup>4</sup> both of which reflect or can be influenced by government policies.

Inequality on the rise amid declining poverty rates

Graph II.2



<sup>1</sup> For AEs, poverty headcount ratio at national poverty line is used. For EMEs, a common poverty headcount ratio at \$1.90 a day (2011 purchasing power parity) is used. For CA, (1981, 2018); for US, (1989, 2019); for GB, (1995, 2018); for CN, (1990, 2016); for BR, (1981, 2018); for ZA, (1993, 2014); for IN, (1983, 2011). <sup>2</sup> Pre-tax, pre-transfer Gini index is calculated using the amount of money coming into the household pre-tax, excluding government cash or near-cash benefits. Top 10% share of income represents pre-tax national income share held by top 10% of population. Weighted averages of selected economies, based on 1980 GDP and PPP exchange rates. AEs = CA, DE, FR, GB, JP and US; EMEs = BR, CN, IN and ZA. <sup>3</sup> For FR, (1980, 2000, 2014); for US, (1980, 2000, 2019); for IN, (1981, 2002, 2012); for CN, (1980, 2000, 2015); for RU, (1995, 2000, 2015); for ZA, (1993, 2000, 2017).

Sources: OECD; World Bank; Standardized World Income Inequality Database (SWIID); World Inequality Database (WID); Datastream; national data; BIS calculations.



## A taxonomy of inequality

The concept of economic inequality relates to a distribution of valuable “resources” (eg income, wealth or more generally opportunities) within a given population. As such, inequality is inherently a relative concept and is not synonymous with welfare. Nevertheless, economic inequality has important implications for social cohesion and has been studied for centuries.<sup>①</sup>

By far the most widely studied forms of economic inequality concern income and wealth. Wealth inequality arises from cumulative income flows and from valuation effects on the existing stock of wealth. This complicates the comparison of income and wealth inequality. Conceptually, measures of wealth should include the (discounted) value of future income from human and financial wealth. Financial wealth is relatively easily measured through the price of assets traded on markets, although there is inevitable arbitrariness when valuing non-liquid assets such as housing or non-traded equities (eg ownership of small and medium-sized enterprises). Measuring human wealth is even more challenging, as there are no obvious proxies for the discounted present value of income from labour. For this reason, measures of wealth inequality generally omit human wealth altogether – as is also the case in this chapter. Income inequality, by contrast, is generally easier to measure, as data on income flows are routinely collected by tax authorities and surveys.

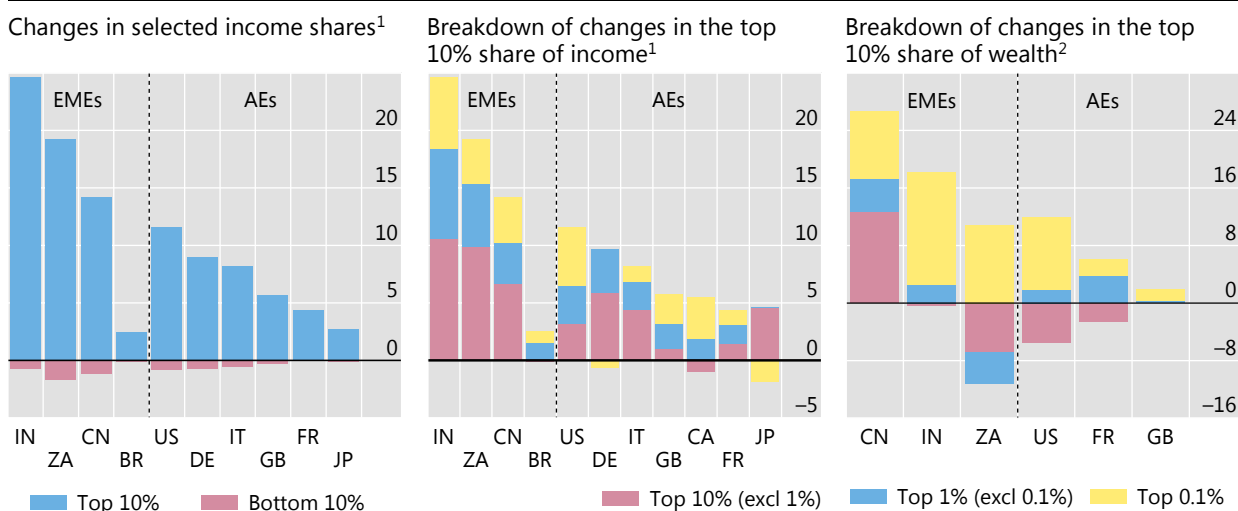
Measuring inequality typically involves summarising the heterogeneity in the distribution of the variable of interest in a single number. Popular approaches involve looking at the share of income or wealth accruing to different percentiles of the population, eg the top 10% or 1%, as well as taking ratios of top and bottom percentiles, eg the top 20% over the bottom 20%. Other measures instead seek to be more comprehensive and summarise the entire distribution by means of indices, such as the one bearing the name of Italian statistician Corrado Gini.

Different measures may yield different results, depending on which part of the distribution they focus on. By construction, looking at specific percentiles ignores what happens in the rest of the distribution. Ratios of quantiles are invariant to changes in both the numerator and the denominator, eg when an increase in the wealth accruing to the top 20% is accompanied by an increase in the bottom 20%, at the expense of the middle of the distribution. Similarly, with synthetic measures, such as the Gini coefficient, changes in different segments of the population may even out.

## Long-run changes in pre-tax income and wealth inequality

In percentage points

Graph II.A



<sup>1</sup> Pre-tax national income share held by a given percentile group. Pre-tax national income is the sum of all pre-tax personal income flows, before taking into account the operation of the tax/transfer system, but after taking into account the operation of the pension system. Changes between 1980 and 2019; for BR, between 2001 and 2019; for JP and ZA, between 1990 and 2019. <sup>2</sup> Share of net personal wealth held by a given percentile group, equally split within couples for CN, FR, IN, US and ZA, individualised for GB. Net wealth is the sum of non-financial and financial assets owned by households, minus their financial liabilities. Changes in the last four decades; for CN, between 1980 and 2015; for IN, between 1981 and 2012; for ZA, between 1993 and 2017; for US, between 1980 and 2019; for FR, between 1980 and 2014; for GB, between 1980 and 2009.

Sources: World Inequality Database (WID); BIS calculations.

More refined measures can reflect alternative facets of economic inequality and help governments better calibrate their policies. For instance, in most jurisdictions, the increase in overall income inequality over the past four decades has been largely due to a rise in the share of income accruing to the top 10% of earners, coupled with a mild decline in the share of income going to the bottom 10% (Graph II.A, left-hand panel). Similarly, decomposing the top 10% of the income distribution itself (top 10% to top 1%; top 1% to top 0.1%; and top 0.1%) reveals interesting patterns (centre panel). While for most EMEs income gains were fairly broad-based and shared across the three top percentiles, the bulk of the increase in income inequality in some major AEs (the United States, United Kingdom, France and Canada) is accounted for by the top 1% and even the top 0.1%; in fact in Canada, households in the top 10% of the income distribution – though not those in the top 1% – actually saw a small decline in their share of aggregate income over the past four decades.

Wealth inequality has always been quite high and relatively more stable than income inequality, especially in AEs. For the set of countries for which data are available, the increase in wealth concentration over the past 30–40 years appears to reflect mainly the increase in the share of the very rich, the top 0.1%. In France and the United States, those in the top 10% excluding the top 1% of the wealth distribution have actually seen their share of aggregate wealth decline, to the advantage of the top 1% (Graph II.A, right-hand panel).

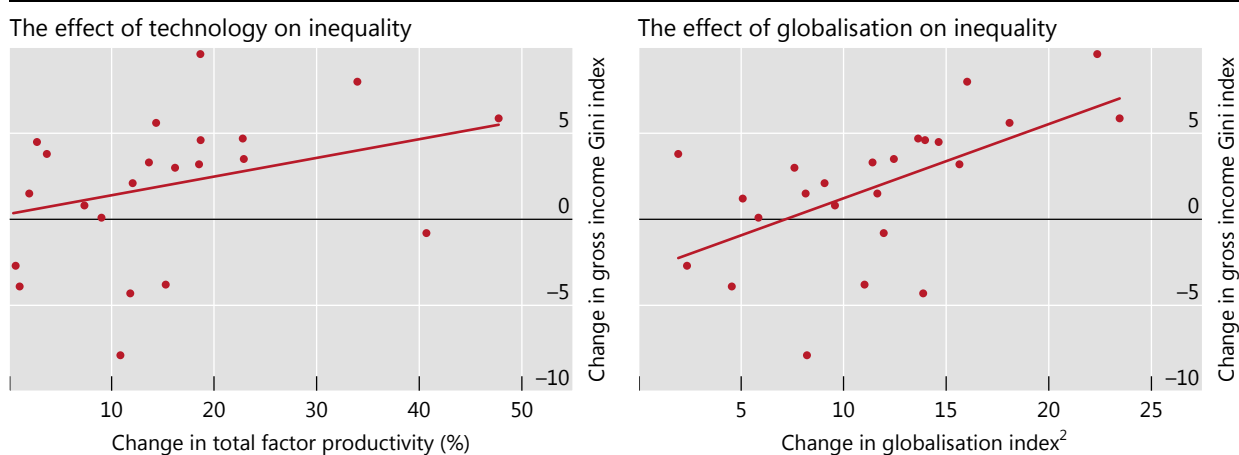
① Fundamental contributions to the literature on inequality include V Pareto, *Cours d'économie politique*, 1896; A Atkinson, "On the measurement of inequality", *Journal of Economic Theory*, vol 2, no 3, September 1970, pp 244–63; S Kuznets, "Economic growth and income inequality", *American Economic Review*, vol 45, no 1, March 1955; and T Piketty, *Capital in the twenty-first century*, Harvard University Press, 2014.

Technological progress has increased the productivity of highly skilled workers more than that of their low-skilled counterparts, amplifying the income gap between the two groups. In particular, automation and the digital economy have played an important role. Empirical evidence suggests that over the past three decades, an increase in total factor productivity growth – a proxy for the impact of technology on the production process – has been associated with an increase in the Gini index of income inequality (Graph II.3, left-hand panel).

Globalisation and the associated increase in trade interconnectedness have also contributed to higher within-country inequality. They have done so by eroding workers' bargaining power, especially for the low-skilled, and firms' pricing power, especially for the smaller ones, not least through the threat of outsourcing.

## Structural forces have pushed up inequality<sup>1</sup>

Graph II.3



<sup>1</sup> The sample includes 15 AEs and nine EMEs; changes are computed over the period 1981–2015 (or shorter, depending on country-level data availability). <sup>2</sup> Based on the KOF Globalisation Index.

Sources: UNU-WIDER, World Income Inequality Database (WIID); Penn World Table; KOF Swiss Economic Institute; BIS calculations.

Particularly in AEs, delocalisation-induced job losses in the manufacturing sectors have probably pushed lower-skilled workers towards lower value-added jobs, often in the service sectors. Empirical evidence confirms the link: globalisation goes hand in hand with rising within-country income inequality (Graph II.3, right-hand panel).

Globalisation and technological progress have naturally reinforced each other.<sup>5</sup> Together, they have also given rise to the emergence of large “winner takes all” industries in some sectors, thereby further increasing profits and the income share of capital at the expense of that of labour.<sup>6</sup>

That said, the ultimate impact of these forces on pre-tax inequality is policy-dependent (see below).<sup>7</sup> The benefits and opportunities that technological progress and globalisation bring could be shared more equally with the help of adequate education and training. For example, technological progress and globalisation boost the demand for highly skilled workers and polarise income distribution by increasing skill premia. Hence policies that raise the supply of skilled workers can mitigate the impact on inequality.<sup>8</sup>

Covid-19 has further exacerbated inequality due to its uneven impact and is likely to have left a significant longer-term imprint given its specific nature. The pandemic has disproportionately hit the services sector, which employs more low-skilled and low-income workers (see also Chapter I). Moreover, it has given further impetus to e-commerce and technological adoption more broadly, including in working arrangements. These demand-induced effects may be lasting ones, resulting in an impact that goes way beyond that of a standard recession.

## Inequality and monetary policy mandates

Long-term structural factors such as globalisation and technology shape the environment in which monetary policy operates, but are clearly outside its influence. That said, monetary policy plays a key role in shaping other determinants of inequality at shorter horizons. Two forms of macroeconomic instability – falling squarely within monetary policy mandates<sup>9</sup> – are especially important in this context, as they disproportionately penalise the weaker segments of the population. One is high and volatile inflation, which has been particularly important in many EMEs and is frequently coupled with meagre growth. The other is recessions, particularly when accompanied by financial instability and crises, which increase their depth and duration.<sup>10</sup> How do these two forces, over which monetary policy has a substantial influence, affect inequality more specifically? Consider each in turn.

### Inequality and inflation

In most AEs and in several EMEs, inflation has been low and stable over the past several decades. Yet it would be imprudent to forget the costs of high and runaway inflation. It is well understood that uncontrolled inflation leads to a significant misallocation of resources and numerous inefficiencies and hence to overall lower economic growth.<sup>11</sup> While high and runaway inflation, such as that experienced by many AEs in the 1970s, can hamper growth, hyperinflation of the likes of Germany in the 1920s or Latin America in the 1980s can wreak economic havoc and in the process destroy public trust in governments and institutions.

The impact of inflation on inequality has been widely studied. Inflation shifts income and wealth away from those who are least aware of it, or least able to protect against it. These segments of the population often coincide with lower-income groups, which explains why inflation has often been portrayed as a most

regressive form of tax. The “inflation tax” takes its toll through the erosion of the value of financial assets and contracts fixed in nominal terms.

As regards wealth distribution, the financial assets that are most vulnerable to inflation are cash and bank accounts – the typical savings vehicles held by the poorest segments of the population. This is mostly because the poorest have access only to limited investment options to protect their savings. By contrast, not only can richer households avail themselves of more sophisticated inflation hedges; they may also be able to easily transfer their assets abroad, thus shielding their wealth from depreciations of the domestic currency.

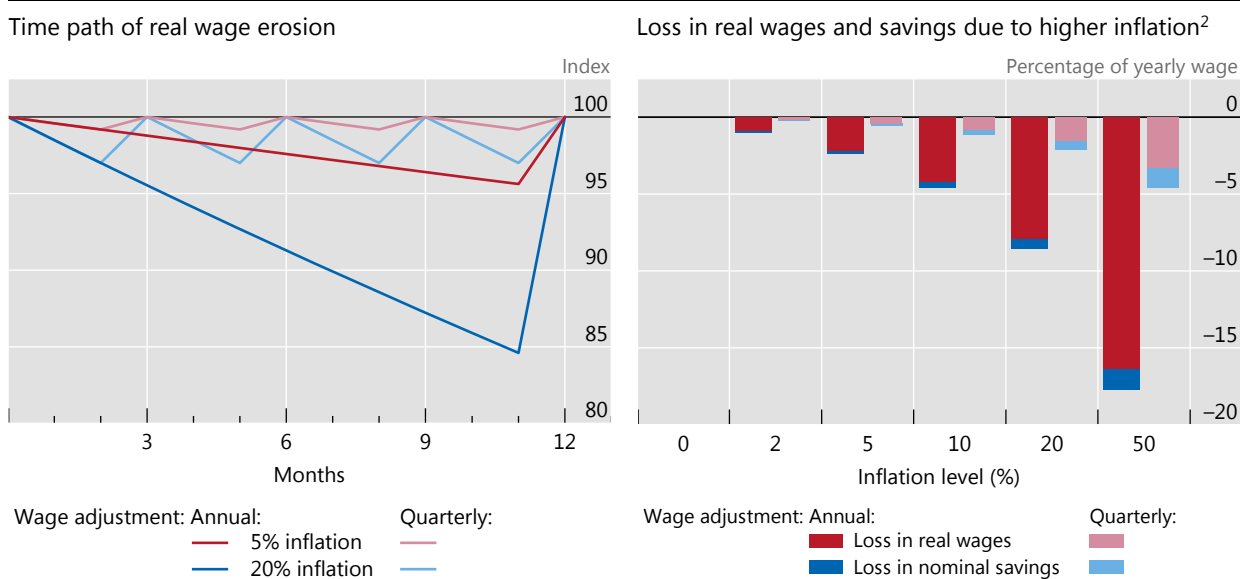
As regards income distribution, wages and pensions – the main sources of income for a large majority of households and even more so for the poorest half of the population – are typically fixed in nominal terms and hence vulnerable to inflation. Indexation mechanisms, such as those adopted in many AEs in the 1970s, are no panacea: they may fail to keep pace as inflation accelerates (Graph II.4, left-hand panel); and they may themselves fuel and entrench inflation further.

The impact of inflation on income inequality depends on how high the inflation rate is. In particular, the erosion of real wages (Graph II.4, right-hand panel) is very small for an inflation rate of 5% (or less) per year, but becomes sizeable when inflation steps up to 20% – even when wages are adjusted at a quarterly frequency. The cost of 20% inflation is about 2% of annual earnings when there are quarterly wage adjustments, but jumps to 8.5% when wages are adjusted only once a year. The impact on wages is the most sizeable effect of inflation on the bottom of the income distribution; only a tiny share of the overall loss is due to the erosion of cash savings for the poor, given their relatively small holdings.

Bringing runaway inflation under control not only improves growth prospects; it also mitigates inequality, all else equal. Empirical evidence shows that this is especially the case for EMEs, where the “conquest of inflation” has often been associated with reductions in income inequality. As an illustration, it is sufficient to

Inflation erodes income and wealth of the poorest<sup>1</sup>

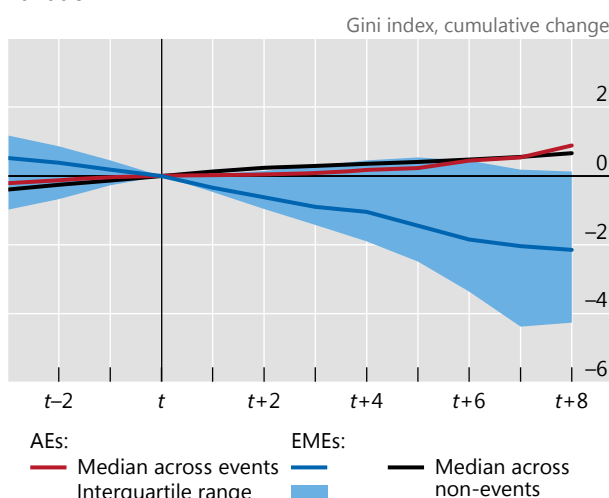
Graph II.4



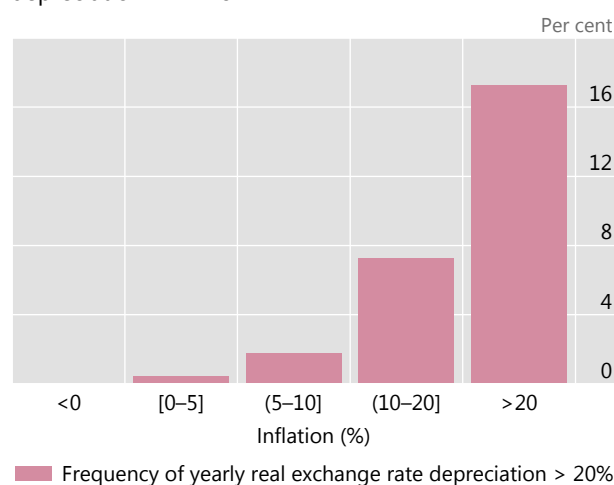
<sup>1</sup> Simulated real wages when a household is assigned a monthly nominal salary (revised every quarter/year, based on past quarter/year's inflation) and an amount of savings equal to half a month's salary, held in cash; the setup is based on E Cardoso, "Inflation and poverty", *NBER Working Papers*, no 4006, March 1992. <sup>2</sup> Loss due to inflation when wages are adjusted once a quarter or year by past inflation.

Source: BIS calculations.

The conquest of inflation and subsequent income Gini variation<sup>1</sup>



Higher inflation increases the likelihood of large depreciation in EMEs<sup>2</sup>



<sup>1</sup> Year  $t$  is the year in which the 10-year average realised inflation rate fell below 5% for the first time, without subsequent reversal of average to 1 percentage point above that. The vertical axis represents variation of the net income Gini index relative to year  $t$ . Based on 34 “conquest of inflation” episodes which satisfied the above criteria and occurred between 1992 and 2016. The non-events line reflects the median evolution of the Gini index for all time periods which were not associated with conquests of inflation. <sup>2</sup> Realised frequency at which the real effective exchange rate depreciation exceeded 20% within a given year. Based on 1995–2020 data for 23 EMEs.

Sources: IMF, *International Financial Statistics* and *World Economic Outlook*; World Bank; BIS; BIS calculations.

look at the cross-country evolution of the income Gini index around 34 “conquests of inflation” during the past 30 years. In the cases involving EMEs, the median income Gini index declined by two points in the seven to eight years after central banks reduced annual inflation below 5% on a sustained basis (Graph II.5, left-hand panel). The benefits of lower inflation in the form of a more equal income distribution may partly reflect that it brings an overall improvement in the business environment, thereby boosting economic growth.<sup>12</sup>

By contrast, other 10 countries that did not sustainably reduce inflation or whose inflation was already below 5% – the non-event countries – experienced a mild increase in inequality. That said, for AEs which sustainably reduced inflation to below 5%, the relationship between inflation and income inequality is similar to that for the group of countries that did not attain such a reduction, suggesting that other factors have prevailed in pushing up inequality.

Exchange rate fluctuations are an important factor strengthening the link between inflation and income inequality in EMEs. Naturally, high inflation rates do not bode well for the stability of the domestic currency. In turn, exchange rate depreciations pass through domestic prices more strongly than in AEs, which fuels and entrenches inflation. The frequency of large currency depreciations clearly increases with the level of inflation (Graph II.5, right-hand panel). This, in turn, raises the risk of outright crises, which increase unemployment and inequality.

### Inequality and recessions

Recessions are particularly harmful for the most disadvantaged because unemployment tends to hit unskilled workers harder and for longer. The experience during the Covid-19 pandemic is a case in point: low-income earners were the first to be laid off (Graph II.6, left-hand panel) and often faced significant difficulties

when trying to re-enter the labour market (centre panel).<sup>13</sup> Even when successful, unskilled workers might be forced to accept jobs paying lower salaries and offering fewer advancement opportunities compared with their pre-recession jobs.

The impact of weak economic activity on income inequality, while initially small, tends to grow over time (Graph II.6, right-hand panel). A stylised exercise illustrates this by tracing out the effect of an increase in unemployment, as typically experienced during recessions. Estimates point to an only slight increase in income inequality in the short run that then rises substantially over time.

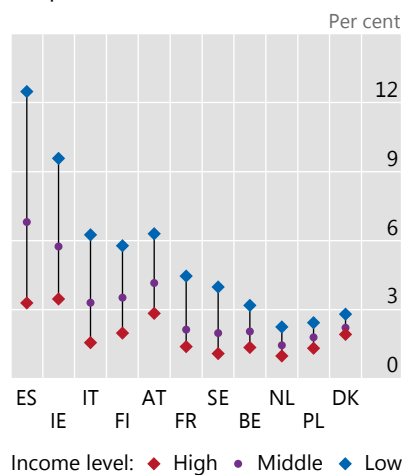
While recessions tend to increase inequality, inequality, in turn, can intensify the depth and duration of recessions. As a result, recessions and inequality can reinforce each other over business cycle fluctuations. Aggregate demand shortfalls during downturns appear to be larger when the income distribution is more polarised, ie when the top earners account for a larger share of total income at the expense of the bottom earners. As noted above, low-income workers are typically the first to be laid off and hence see their incomes disproportionately curtailed. As much evidence confirms, the propensity to consume is higher for households with low income. Hence, if those at the bottom of the distribution lose their income in a downturn, a sharper contraction in aggregate consumption follows.

The evidence supports this view. All else equal, countries with higher income inequality appear to experience steeper declines in consumption during recessions (Graph II.7, left-hand panel).<sup>14</sup> The pattern is also apparent across states in the United States. During the GFC, states with higher income inequality experienced significantly larger drops in consumption (right-hand panel). The variation in the share of income accruing to the top decile of the distribution across states accounts

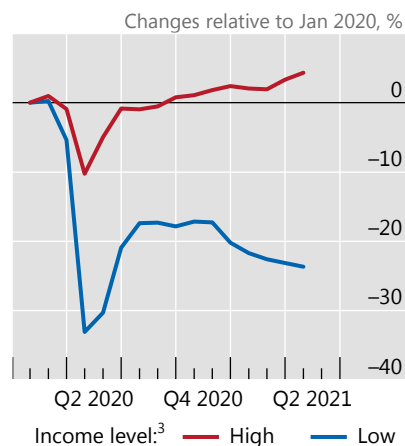
## The pandemic hit low-income workers harder

Graph II.6

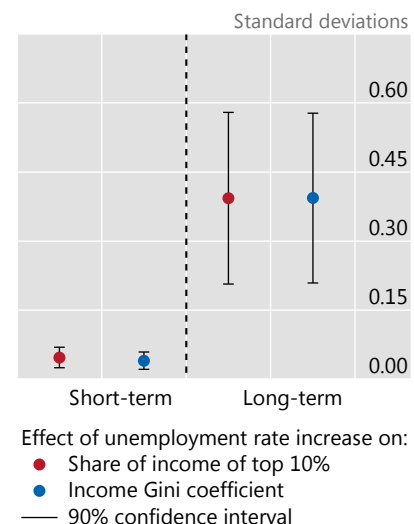
EU: risk of job loss by income during the pandemic<sup>1</sup>



US: employment by income<sup>2</sup>



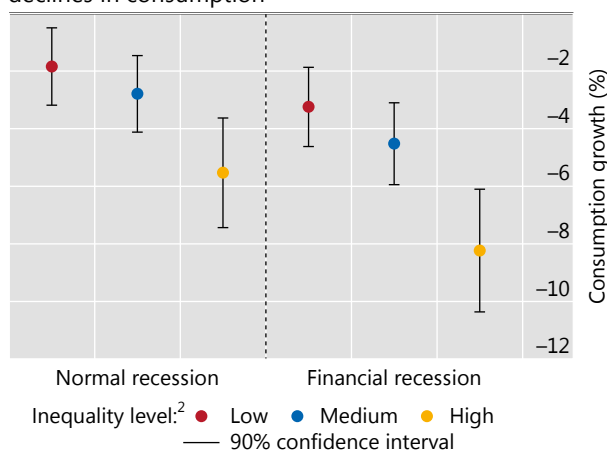
Unemployment ushers in inequality<sup>4</sup>



<sup>1</sup> Probability of job loss is estimated by Eurostat using a logit model with controls for age, gender, skill level required by the occupation, sector of activity and type of work contract. The reference period for the labour market information is Q2 2020 and using data from the Labour Force Survey. High = individuals in deciles 8, 9 and 10; middle = deciles 4, 5, 6, 7; low = deciles 1, 2 and 3. <sup>2</sup> Number of active employees. Monthly averages of daily data up to 20 April 2021; not seasonally adjusted. <sup>3</sup> High = households with a median income above \$78,000 per year; low = households with a median income below \$46,000 per year. <sup>4</sup> Estimated effects of a one standard deviation rise in the unemployment rate on the inequality measures, also in standard deviations. Short-term indicates the impact within a year. Long-term indicates the asymptotic effect, namely the short-term effect divided by one minus the coefficient of the lagged dependent variable. The sample includes 22 AEs and 27 EMEs from 1960 to 2019.

Sources: World Bank; Eurostat; Opportunity Insights, Economic Tracker; BIS calculations.

Recessions in more unequal countries lead to larger declines in consumption<sup>1</sup>



More unequal US states experienced larger declines in consumption during the GFC<sup>3</sup>



<sup>1</sup> Estimated declines in real per capita private consumption during a recession at the specified percentile of income inequality. Recessions are defined as a year of negative real GDP growth, and the share of income of the top 10% is taken as the indicator of income inequality. Estimates are based on a dynamic panel specification that includes country and time fixed effects. Specifically, real per capita private consumption growth is regressed on its lag, a recession dummy, the share of income held by the top 10% and the interaction between the latter two variables. Based on 1981–2019 data for 91 countries. Financial recessions are recessions that were associated with sovereign debt, banking or currency crises. For further details, see E Kohlscheen, M Lombardi and E Zakrajšek, “Income inequality and the depth of economic downturns”, *Economics Letters*, vol 205, no 109934, August 2021. <sup>2</sup> Inequality taken from the sample distribution of the panel: low = 10th percentile; medium = 50th percentile; high = 90th percentile. <sup>3</sup> The vertical axis shows the residuals from the regression of state-level per capita private consumption growth between 2007 and 2009 on the change in unemployment and growth in house prices over the same period; the horizontal axis shows the residuals from the regression of state-level income shares of the top 10% in 2006 on the change in unemployment and growth in house prices between 2007 and 2009. Based on all US states except District of Columbia.

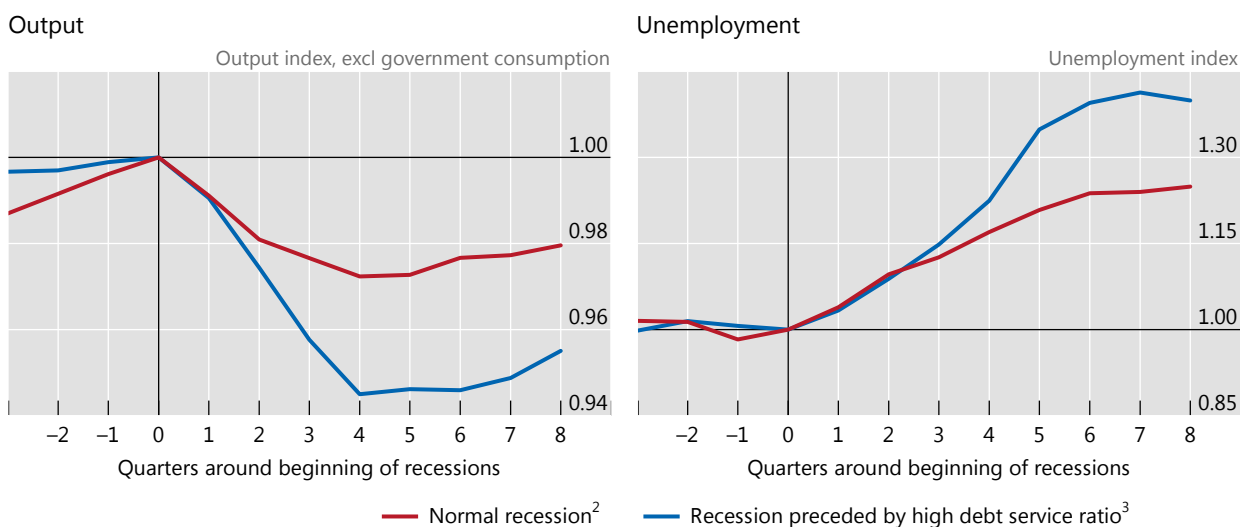
Sources: World Bank; national data; BIS calculations.

for more than a quarter of the variation in state-level consumption growth during the GFC. This is so even after filtering out the impact of the increases in state-level unemployment rates and declines in house prices.

There is also evidence that financial recessions, even if they do not coincide with financial crises, are deeper and longer, and hence more costly in terms of inequality (Graph II.8). One way of seeing this is by considering recessions preceded by relatively high debt service ratios – a proxy for overindebtedness. The estimates suggest that eight quarters after the start of the recession, the average output drop is 2.5% larger and unemployment is 12% higher in financial recessions than in normal ones.

Inequality may not just amplify recessions; more subtly, it may also sow the seeds for them. For instance, it has been argued that higher inequality in the United States may have contributed to the build-up of housing debt. This was particularly the case for households with stagnating and less steady income, who were enticed into subprime borrowing. In turn, this higher leverage of households played a key amplifying role in the GFC, the archetypical “financial recession”. The reasoning is that low-income households have a larger need to borrow (eg to buy houses). If credit supply becomes more ample, this could encourage them to become overindebted. Down the road, an overburdened household sector can then trigger, or at least amplify, phases of weak economic activity. This impact is larger whenever the banking system comes under stress. Indeed, some observers have argued that this mechanism contributed to the subprime crisis that sparked off the GFC.<sup>15</sup>





<sup>1</sup> Based on 1980–2020 data for AT, AU, BE, CA, CH, CZ, DE, DK, ES, FI, FR, GB, HU, IE, IT, JP, KR, LU, NL, NO, NZ, PT, SE and US. <sup>2</sup> Recessions for which the preceding debt service ratio for the private non-financial sector (share of interest payments plus amortisations in income) was below the country-specific average plus 2 percentage points. <sup>3</sup> Recessions for which the preceding debt service ratio was at or above the country-specific average plus 2 percentage points.

Sources: National data; BIS; BIS calculations.

## Inequality and the conduct of monetary policy

Inequality influences the conduct of monetary policy and, in turn, the conduct of monetary policy influences inequality over the business cycle. On the one hand, the distribution of income and wealth shapes monetary policy’s impact on and transmission to economic activity as well as the broader political and social context in which the central bank operates. On the other hand, monetary policy can influence inequality: it can do so directly in the near term, through changes in stance; and above all indirectly, over the business cycle, by seeking to keep inflation under control and to limit recessions and hence unemployment.

### The impact of inequality on the transmission of monetary policy

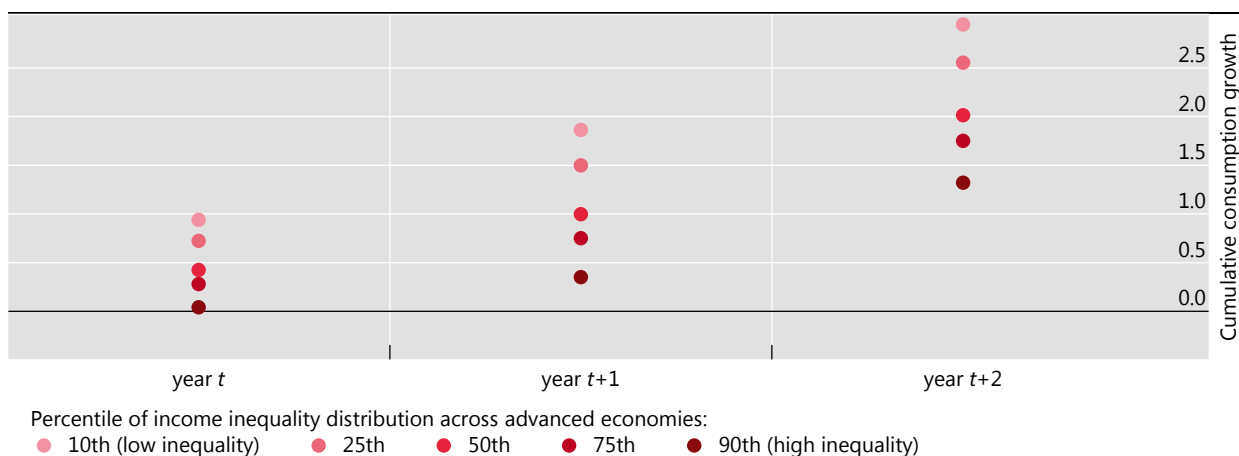
Beyond a certain point, inequality across households may weaken the transmission of monetary policy. Households at the bottom and at the very top of the income distribution exhibit low sensitivity of consumption to changes in interest rates: the former may be unable to take advantage of easier credit conditions due to tight borrowing constraints, while the latter have a low propensity to increase their already high consumption.<sup>16</sup> By contrast, households at the bottom of the income distribution have higher marginal propensity to consume, and hence are more sensitive to changes in their disposable income.

Empirical evidence suggests that inequality tends to dampen the transmission of monetary policy (Graph II.9). Across countries and time, consumption responds less to an unanticipated monetary policy easing when income inequality is greater – here measured by the share of income accruing to the top 10% of earners. Two years after such an easing, the cumulative difference in consumption growth between a country at the first and the third quartiles of the income inequality measure is estimated to be 0.8 percentage points. This empirical result complements

## High inequality mutes the impact of monetary policy on activity

In per cent

Graph II.9



The dots represent the estimated response of consumption from year  $t-1$  until the specified year to an expansionary monetary policy shock of 100 basis points in year  $t$ . These estimates are obtained through a two-step procedure. In the first step, a panel vector autoregression (PVAR) featuring CPI inflation, real GDP growth and the short-term policy interest rate is estimated for AEs using quarterly data from Q1 1999 to Q4 2019. Based on this PVAR, economy-specific monetary policy shocks are identified as quarterly innovations to policy interest rates that are orthogonal to those to economic growth and inflation. In this stage, the euro area is considered as a group. In the second step, we aggregate the quarterly monetary policy shocks to annual frequency for 21 AEs and estimate a local projection equation, where the logarithm of real (per capita) consumption in each country is regressed on its own lag, monetary policy shocks, the share of income accruing to the top 10% of earners and their interaction, as well as country fixed effects.

Sources: World Bank; BIS calculations.

theoretical findings in the recent academic literature, which highlight the importance of household characteristics as a determinant of the transmission of monetary policy to economic activity (Box II.B).

More broadly, inequality may influence central bank decisions by shaping the political economy environment. Growing inequality can make the public less receptive to central bank actions perceived to increase it. This can constrain the central bank's choices and eventually hamper its ability to achieve its mandated goals. For example, out of concerns about the impact of higher asset prices on wealth inequality, the central bank could come under criticism for keeping interest rates very low for long periods as it tries to engineer the needed recovery in the wake of a financial recession.

### Monetary policy stance and inequality

Changes in the stance of monetary policy inevitably have some short-run distributional effects. Every time the central bank adjusts interest rates, changes its lending terms or purchases assets, distributional consequences follow. For example, any such adjustment redistributes interest income between debtors and creditors and influences asset prices, which reallocate income and wealth in the population depending on holdings (see Box II.C for a detailed analysis of this point). But the more important influence of monetary policy on inequality is through its impact on inflation, employment and economic activity. These are the main macroeconomic factors that shape inequality over the business cycle.

This also means that central bank mandates are fully consistent with tackling the influence of the factors that can raise inequality over that horizon. While mandates have evolved over time, these days they are primarily interpreted as delivering low and stable inflation and limiting business fluctuations – measured in

## Heterogeneity and distribution in macroeconomic models

The growing focus on inequality in the economic debate has gone hand in hand with a change of perspective in macroeconomic modelling. Recent research has moved away from macroeconomic models based on a single representative agent and has focused instead on frameworks that incorporate heterogeneity in skills or wealth among households.<sup>①</sup> This has allowed researchers to explore how inequality shapes macroeconomic outcomes and how macroeconomic shocks and stabilisation policies affect it. In these models – known as heterogeneous agent New Keynesian (HANK) models – several traditional policy prescriptions change when household heterogeneity is taken into account.

In traditional representative agent New Keynesian (RANK) models, monetary policy operates almost exclusively through a direct “real interest rate channel”: changes in the policy rate affect the real interest rate and induce households to reallocate consumption and saving over time. For instance, lower rates encourage them to bring consumption forward, reducing saving rates today. Yet empirical evidence shows that the response of consumption to monetary policy is mainly due to the indirect impact arising from an increase in employment and wages.<sup>②</sup>

In RANK models, the impact of these indirect effects on consumption is small because the representative agent is generally assumed to be able to smooth consumption over time and is therefore not highly responsive to temporary income changes.

In HANK models, the direct impact from the “real interest rate channel” is small because a sizeable share of agents – especially those at the very bottom of the distribution – have negligible wealth. These agents’ consumption reacts little to changes in interest rates but is instead highly sensitive to changes in labour income (“labour income channel”). In addition, agents at the top of the wealth distribution hold equity and hence benefit from asset price increases (“equity price channel”) in response to an expansionary monetary policy.<sup>③</sup>

Overall, the transmission of a monetary policy expansion can be weaker in HANK models than in RANK models. This depends on the distribution of income and wealth, and on other household characteristics that affect the relative strength of the different channels. The impact will be smaller in HANK if the “labour income channel” and the “equity price channel” are not strong enough to offset the weaker “real interest rate channel”.

In HANK models distributional factors also shape the optimal policy design: the main objective remains low and stable inflation, but the relative weight on unemployment in central banks’ strategy is higher. Considering inequality, a larger weight on unemployment stabilisation benefits the majority of households, as a more aggressive reaction to unemployment lowers earnings risk and precautionary savings by the employed and unemployed households at low and medium wealth deciles.<sup>④</sup>

<sup>①</sup> Models with heterogeneous agents featured prominently in the recent review of monetary policy strategy at the Federal Reserve; see L Feiveson, N Goernemann, J Hotchkiss, K Mertens and J Sim, “Distributional considerations for monetary policy strategy”, Board of Governors of the Federal Reserve System, *Finance and Economics Discussion Series*, no 2020-073, August 2020. <sup>②</sup> See G Kaplan, B Moll and G Violante, “Monetary policy according to HANK”, *American Economic Review*, vol 108, no 3, pp 697–743, March 2018. <sup>③</sup> See A Auclert, “Monetary policy and the redistribution channel”, *American Economic Review*, vol 109, no 6, pp 2333–67, June 2019. <sup>④</sup> See N Gornemann, K Kuester and M Nakajima, “Doves for the rich, hawks for the poor? Distributional consequences of monetary policy”, Board of Governors of the Federal Reserve System, *International Finance Discussion Papers*, no 1167, May 2016.

terms of output and employment. And although financial stability need not be mentioned explicitly, it is naturally subsumed under the objective of smoothing fluctuations: just as price stability, financial stability is a necessary condition for output and employment to grow *sustainably* over time. This is true regardless of whether financial instability is interpreted narrowly – as banking or financial crises – or more broadly – as the amplification of business cycles and recessions induced by financial factors.<sup>17</sup>

Once high inflation or recessions materialise, the needed monetary response may have an undesirable short-run impact on inequality, in order to secure the long-term gains. Hence the importance of avoiding inflation and recessions in the first place.

Bringing inflation under control will generally call for a monetary policy tightening, which can induce recessions and hence increase income inequality. In AEs, a clear example is the “Volcker shock” of the early 1980s in the United States, which set the basis for the conquest of inflation. In EMEs, the episodes are more common and severe. For instance, the Central Bank of Brazil had to raise the policy rate by more than 10 percentage points between 2001 and 2003 to rein in a surge in inflation.

Similarly, sustaining a recovery in the aftermath of a severe economic recession requires keeping interest rates low for longer, especially if they are constrained by the effective lower bound.<sup>18</sup> For example, had monetary policy refrained from deploying all necessary tools to keep borrowing costs low in the aftermath of the GFC and the Covid-19 pandemic, the recessions would have been deeper and longer. This, in turn, would have exposed the most disadvantaged to longer

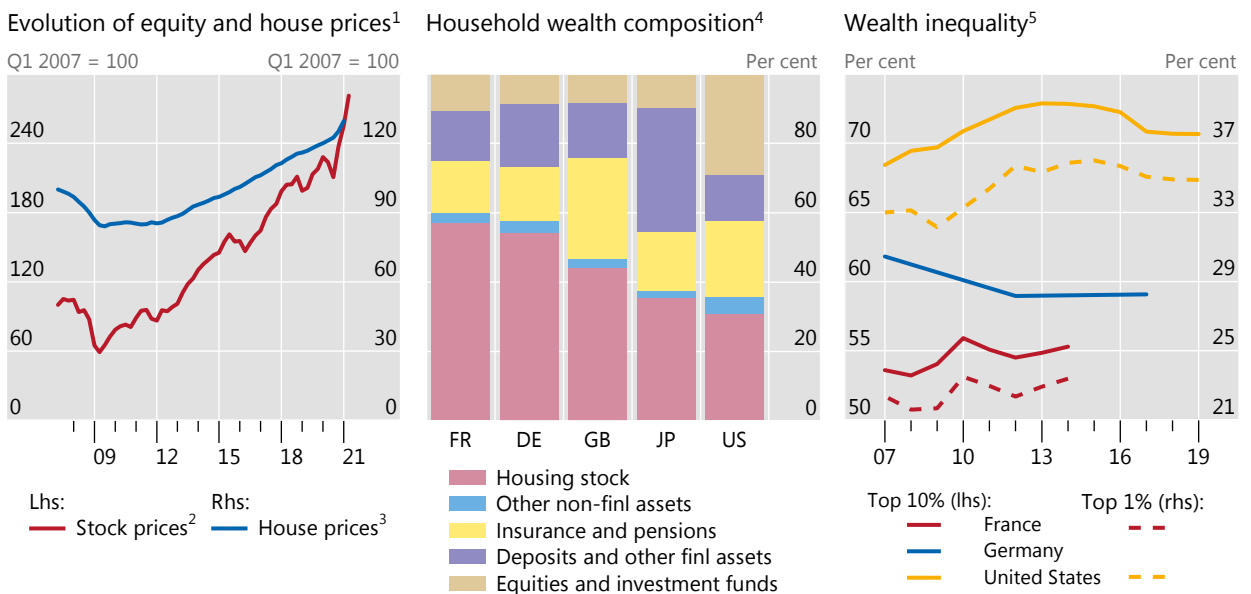
Box II.C

## The impact of interest rates on wealth inequality

With interest rates remaining very low for long periods post-GFC, their impact on inequality has come into focus. Interest rates influence wealth inequality primarily through their effect on asset prices – a key channel in the monetary transmission mechanism. For instance, low interest rates and quantitative easing boost asset prices. Low rates in general increase them by raising the present value of future income streams from those assets and by encouraging borrowing for their acquisition. Central bank asset purchases, in addition, directly boost the corresponding assets’ prices, notably at the long end of the maturity spectrum. Accordingly, stock market indices and house prices have soared since the GFC in major AEs and reached new highs as interest rates have been exceptionally low and central banks have resorted to large-scale asset purchases (Graph II.C, left-hand panel). There is a broad consensus that such policies reduce income inequality to the extent that they raise employment,<sup>①</sup> but what is their overall impact on wealth inequality?

### Rising asset prices, but modest changes in wealth inequality

Graph II.C



<sup>1</sup> Weighted averages of DE, FR, GB, JP and US, based on 2007 GDP and PPP exchange rates. <sup>2</sup> Total return broad market equity indices, including dividends. <sup>3</sup> Residential properties only. <sup>4</sup> Based on 2018 national accounts data. <sup>5</sup> Share of net wealth held by the top 10% and 1% of population.

Sources: IMF, *World Economic Outlook*; OECD; Datastream; national data; BIS; BIS calculations.

The effect of central banks' asset purchases and low-for-long interest rates on wealth inequality depends critically on who owns houses, bonds and equities. This varies a great deal across countries (Graph II.C, centre panel).<sup>②</sup> In general, home ownership tends to be far more dispersed in the population than equity ownership, which tends to be concentrated at the top of the income distribution. More people therefore experience wealth gains due to rising house prices. Depending on how much house prices rise relative to equity and the weights of these assets in households' portfolios, the net effect of lower interest rates can actually lead to a decrease in some wealth inequality measures, such as the Gini index. If, however, only the wealthiest segment of the population owns houses and equity, wealth inequality will tend to rise as a result of lower interest rates.<sup>③</sup> In fact, in the United States, France and Germany, post-GFC large-scale asset purchases have not coincided with a noticeable rise in wealth inequality among the top 10%, or even among the top 1% (right-hand panel). Of course, surging house prices would still have distributional implications between owners and tenants, typically favouring the old at the expense of the young and possibly raising concerns about home affordability.

In interpreting these results, it is worth bearing in mind that wealth inequality is harder to measure than income inequality (see Box II.A), and data are inevitably patchier. Firm conclusions on the evolution of wealth inequality over short horizons are therefore much harder to draw.

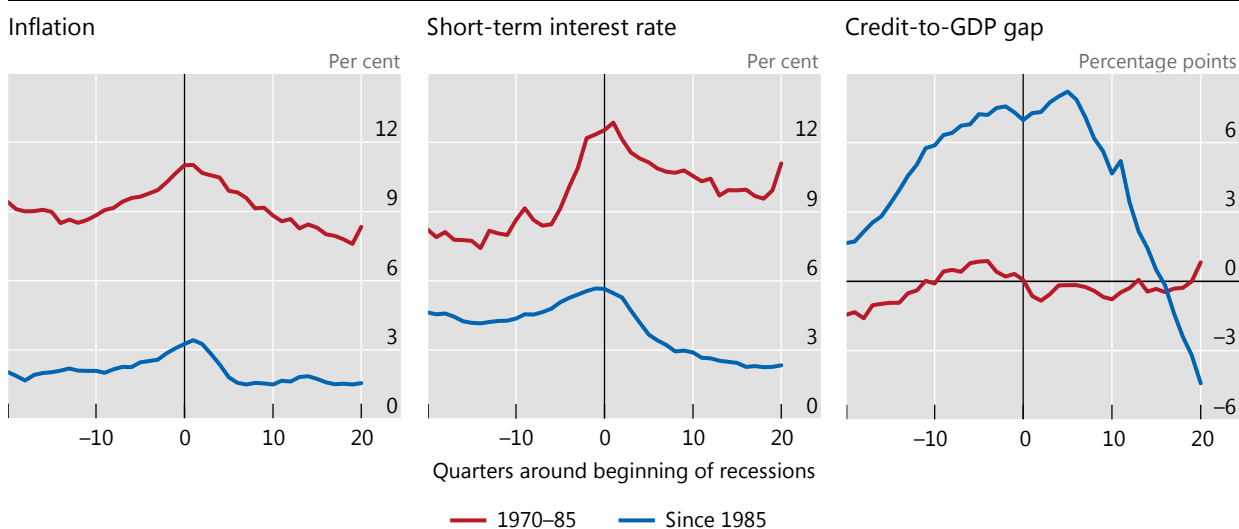
① See M Lenza and J Slacalek, "How does monetary policy affect income and wealth inequality? Evidence from quantitative easing in the euro area", *ECB Working Paper Series*, no 2190, October 2018. ② See also D Domanski, M Scatigna and A Zabai, "Wealth inequality and monetary policy", *BIS Quarterly Review*, March 2016, pp 45–64. ③ See K Adam and P Tzamourani, "Distributional consequences of asset price inflation in the euro area", *European Economic Review*, vol 89, October 2016, pp 172–92. The authors find that house price increases tend to reduce wealth inequality, at least in countries where home ownership is widespread. In addition, they document that the ECB's OMT announcements disproportionately benefited the richest, due to their effect on equity prices.

unemployment spells and worsened income inequality.<sup>19</sup> That said, while low interest rates mitigate *income* inequality substantially, their impact on asset prices, especially equities, may have the side effect of increasing *wealth* inequality in the near term. This outcome, however, is not a given and may be overturned for certain measures of inequality if home ownership is concentrated in the middle of the wealth distribution (Box II.C).

Trade-offs between actions aimed at achieving monetary policy objectives over different horizons have always been present. But changes in the nature of the business cycle since the mid-1980s have complicated the monetary policy task of keeping the economy on an even keel and exacerbated those trade-offs. As a result, the impact on inequality has also become more complex. The root cause has been a shift from recessions mainly induced by a monetary policy tightening to keep inflation under control to recessions in which financial factors play a key role in amplifying business cycle fluctuations, ie the financial recessions noted above.<sup>20</sup>

The shift is illustrated in Graph II.10, which covers a sample of AEs. Until the mid-1980s, in response to a rise in inflation (left-hand panel), the central bank would tighten policy considerably in the lead-up to the recession (centre panel), while nothing much would happen to credit – here measured by the deviation of the credit-to-GDP ratio (right-hand panel) from its long-term trend. Since the mid-1980s, by contrast, with inflation lower and more stable, monetary policy has not tightened much, but a major expansion of credit has given way to a subsequent sharp contraction, inducing a stronger and more prolonged monetary easing. This explains why measures of the financial cycle, or those of "froth" in credit markets, have become more useful for predicting turns in the business cycle. For instance, debt service ratios that are well above historical averages are a drag on GDP growth and signal a likely recession ahead.<sup>21</sup>

Two factors have contributed to this fundamental change in the nature of business cycle fluctuations. On the one hand, central banks have largely tamed inflation. Delivering low and stable inflation has cemented central banks' inflation-



The horizontal axis denotes quarters around recessions in the business cycles, with the peak date set at zero (vertical lines). Lines show the median evolution across 16 advanced economies and events in the respective time period.

Source: C Borio, M Drehmann and D Xia, "The financial cycle and recession risk", *BIS Quarterly Review*, December 2018, pp 59–71.

fighting credentials, helped anchor expectations and, in the process, contributed to making inflation less sensitive to pressures arising from tight economic conditions – the so-called flattening of the Phillips curve.<sup>22</sup> Structural factors, notably globalisation and technology, have strengthened these developments. On the other hand, financial liberalisation, both within and across national borders, has increased the scope for financial factors to influence household and business spending.<sup>23</sup> The self-reinforcing interaction between funding conditions, risk-taking and asset prices lies at the heart of the corresponding amplification mechanisms.<sup>24</sup> As just one example, a significant share of households' borrowing, particularly in AEs, now takes place using housing as collateral; as a result, house price fluctuations have much larger reverberations in the economy as a whole.<sup>25</sup>

This has given rise to a more complex intertemporal policy trade-off, reflected also in the relationship between monetary policy and inequality.

On the one hand, low and stable inflation, well anchored expectations and a flatter Phillips curve have provided central banks with greater leeway to be accommodative and let the labour market tighten. A dynamic and inclusive labour market may also limit scarring effects in the short and medium run. By the same token, it reduces income inequality. Such an accommodative policy stance is all the more justified where there are concerns that inflation is persistently below target, as in most AEs over the last decade, where unemployment remains high<sup>26</sup> and limited policy space makes the economy more vulnerable to deeper recessions. These conditions help explain why labour markets are playing a prominent role in several recent reviews of monetary policy strategies and frameworks in AEs (Box II.D).

On the other hand, pursuing such a strategy is not without risks. Protracted periods of easy monetary conditions can support the employment and income of the most disadvantaged, but may contribute to the slow build-up of financial imbalances, sowing the seeds of financial recessions further down the road.<sup>27</sup> And these are precisely the types of recession that are more costly in terms of income inequality and that require keeping interest rates low for longer, in turn prolonging any possible short-run adverse impact on wealth inequality.

## Labour markets and the reviews of monetary policy frameworks

Against the backdrop of the changing nature of business cycles, and capitalising on the lessons learnt since the GFC, several central banks in major AEs recently launched reviews of their monetary policy frameworks. The aim was to assess the adequacy of strategies and monetary policy instruments to achieve the mandated objectives. The Federal Reserve was the first, launching its review in 2019 and completing it in August 2020. The ECB and the Bank of Canada have also embarked on similar reviews, which are planned to be concluded in the second half of 2021.

Labour markets have played a prominent role in these reviews – especially in the case of the Federal Reserve.<sup>①</sup> To be sure, the Fed's reading of labour markets had been evolving for quite some time. For example, in a 2016 speech, Chair Yellen argued that running the economy at “high-pressure” could be a powerful tool to reverse the labour market hysteresis – a surge in unemployment coupled with a drop in participation rates – that followed the GFC.<sup>②</sup> In the wake of such considerations, the strategy review downplayed the concept of the “natural” rate of unemployment – ie the level above which the labour market is overheated and inflation should increase.<sup>③</sup> Such a “natural” rate of unemployment cannot be observed directly and needs to be estimated using various econometric techniques. Many approaches actually rely on the empirical relationship of unemployment and inflation, which has weakened over time.

In a context in which the natural rate of unemployment plays little role, inflation takes centre stage as a gauge of economic overheating. To the extent that inflation remains low, central banks can afford to let labour markets tighten. Due to the flattening of the Phillips curve, tighter labour markets may produce limited price pressures, so that inflation may well remain below target. To strengthen the commitment to delivering inflation at target, the review has led to the adoption of a flexible form of average inflation targeting. Following a period of below-target inflation, the central bank commits to keep an easier stance for longer, while it waits for the backward-looking average of actual inflation to reach the target. This may require inflation to “overshoot” the target by an amount and a duration that depends on the previously experienced undershooting. An accommodative monetary policy, in turn, will stimulate demand and output, to the point of enticing the discouraged workers back into the labour force. This should have a positive effect on potential output and further sustain inflation.

The Fed's new strategy is intended to bring benefits in terms of a more equitable income distribution.<sup>④</sup> A tight labour market can facilitate the inclusion in the labour force of the most disadvantaged segments of the population, lifting them out of poverty and marginalisation. Hence, on top of boosting potential growth, a wider labour force participation and more employment opportunities should dampen income inequality by boosting the income of the poorest.

The current review of the monetary policy framework at the Bank of Canada shares with the Fed's review a broader set of criteria than in the past against which to evaluate possible alternative frameworks. In particular, those criteria now also include the impact on the distribution of income and wealth.<sup>⑤</sup> The European Central Bank is also analysing a wide range of topics, many of which have important links to inequality. These include employment, digitalisation, globalisation, productivity, innovation and technological progress. Moreover, in early 2020, the ECB held a series of events with the general public to gather suggestions. A notable one was that the ECB should consider a direct way for its policies to have an impact on people, rather than through banks and financial institutions.<sup>⑥</sup>

<sup>①</sup> This is also because, at the time of writing, the strategy reviews in other central banks were already ongoing, so the information available was more limited. <sup>②</sup> See J Yellen, “Macroeconomic research after the crisis”, speech at the 60th annual economic conference sponsored by the Federal Reserve Bank of Boston, 14 October 2016. <sup>③</sup> This reasoning is consistent with the “plucking” theory of the business cycle in which employment, rather than hovering around a certain equilibrium level, is capped by a certain maximum level. According to this theory, the Phillips curve has a non-linear shape, so that inflation pressures only kick in in the proximity of the maximum attainable level of employment. See S Dupraz, E Nakamura and J Steinsson, “A plucking model of business cycles”, *NBER Working Papers*, no 26351, October 2019. <sup>④</sup> See, for example, M Daly, “Is the Federal Reserve contributing to economic inequality?”, speech at UC Irvine, 16 October 2020. <sup>⑤</sup> See C Wilkins, “Toward the 2021 renewal of the monetary policy framework”, opening remarks of the Bank of Canada Workshop, 26 August 2020. <sup>⑥</sup> See C Lagarde, “The monetary policy strategy review: some preliminary considerations”, speech at the “ECB and Its Watchers XXI” conference, 30 September 2020.



The trickier nature of the intertemporal trade-offs linked to the nature of the business cycle has complicated monetary policy's task of fulfilling its objectives. It has become harder to reconcile price with financial, and hence macroeconomic, stability in the near term. As a result, the consequences for inequality have also become larger. Monetary policy cannot adequately handle these intertemporal trade-offs on its own. As discussed next in more detail, they call for a more balanced policy approach in which other policies, notably prudential, fiscal and structural, also play a role.

## Beyond monetary policy

The previous analysis indicates that the best contribution monetary policy can make to a more equitable distribution of income and wealth is to deliver on its mandate – seeking to ensure macroeconomic stability, for which price and financial stability are prerequisites. By keeping the economy on an even keel, central banks facilitate sustainable growth. The benefits of doing so are first-order.

It would be unrealistic, and indeed counterproductive, to gear monetary policy more squarely towards tackling inequality. Monetary tools, by their very nature, act primarily on cyclical developments. That is why they are well suited to achieving macroeconomic stabilisation objectives. By contrast, a meaningful impact on slow-moving inequality trends would entail sustained application of the tools in particular ways. This would curtail the flexibility of monetary policy to stabilise the economy, potentially undermining the effectiveness of the monetary regime itself. This would be very costly, not least because the macroeconomic stability that those regimes can deliver is precisely what is most conducive to equitable income and wealth distributions.

With monetary policy playing a supportive role, other policies are, therefore, critical. Three types of policy deserve attention: those that complement monetary policy in delivering macroeconomic stability in the different phases of the business cycle; those that address structural inequality; and those that central banks can deploy in fulfilment of their non-monetary policy responsibilities.

## Macroeconomic stability

While monetary policy plays a key role in promoting macroeconomic stability, it cannot deliver it on its own. This is true regardless of the nature of the business cycle. It is well known, for instance, that fiscal sustainability is a prerequisite for macroeconomic stability, and that it can be especially constraining in EMEs (Chapter I). But changes in the nature of the business cycle have brought the limits of what monetary policy can do into starker relief. In order to better understand the need for complementary policies, consider a stylised business cycle associated with a financial recession.

During the expansionary phase of the business cycle, even if monetary policy keeps inflation in check, vulnerabilities may build up in the financial system as the financial cycle gathers momentum. This is because credit and asset prices can grow rapidly boosted by high risk-taking, so that balance sheets may become overstretched. Macroprudential measures can play a key role here. They can seek to slow down the financial expansion and restrain risk-taking, especially in the sectors deemed to pose the bigger risks to the financial system (Chapter I).

The role of microprudential policies, which are structural in nature and not aimed at smoothing the financial cycle per se, becomes evident once the recession sets in. Adequate microprudential safeguards must be in place so that the banking

system is resilient going into the downturn and can better support the economy. This is precisely what the post-GFC major international prudential reforms – notably Basel III – did pre-Covid. The reforms allowed banks to avoid deleveraging and to better support credit, thereby cushioning the blow to the economy (Chapter I).

That said, if the financial imbalances are large enough, the prudential safeguards may not be sufficient to prevent more widespread and intense financial stress. At this point, monetary policy enters crisis management mode, with central banks acting as lenders and, increasingly, as market-makers of last resort.<sup>28</sup> This may make central banks the target of criticism for favouring “Wall Street” at the expense of “Main Street”. But this is a false dichotomy, as such actions are necessary to prevent greater damage. A collapse of the financial system would curtail credit to business and households and spawn a deep recession, at great cost in terms of unemployment and income inequality. Also on this front, however, central banks cannot succeed on their own: fiscal backstops are essential to stabilise banks, the overall financial system and thereby the economy. In addition, government intervention to help repair balance sheets is critical to resolve the crisis and set the basis for a healthy recovery.

As financial conditions stabilise, the challenge becomes nursing the recovery and battling the headwinds of a debt overhang. Monetary policy accommodation can help mitigate the recession and speed up the recovery, but a balanced mix of monetary, fiscal and structural policies is called for to prevent central banks from becoming “the only game in town”. Fiscal policy can ease the burden on central banks and attenuate the impact of recessions on inequality. Automatic stabilisers are useful but may need to be complemented with discretionary measures. For example, thanks to sizeable income transfers, personal disposable income in most countries has actually grown faster (or declined less) than wage income during the pandemic (Chapter I, Graph I.2, left-hand panel). At the same time, it is essential that fiscal policy be run prudently to prevent it from becoming a source of macroeconomic instability. Imprudent fiscal policies can raise risk premia, fuel currency depreciation and eventually destabilise the economy, not least by generating full-blown financial crises. Structural policies are also important in this context, as they are the sole engine of sustainable longer-term growth, which cannot rely on persistent fiscal and monetary stimulus.

## Structural inequality

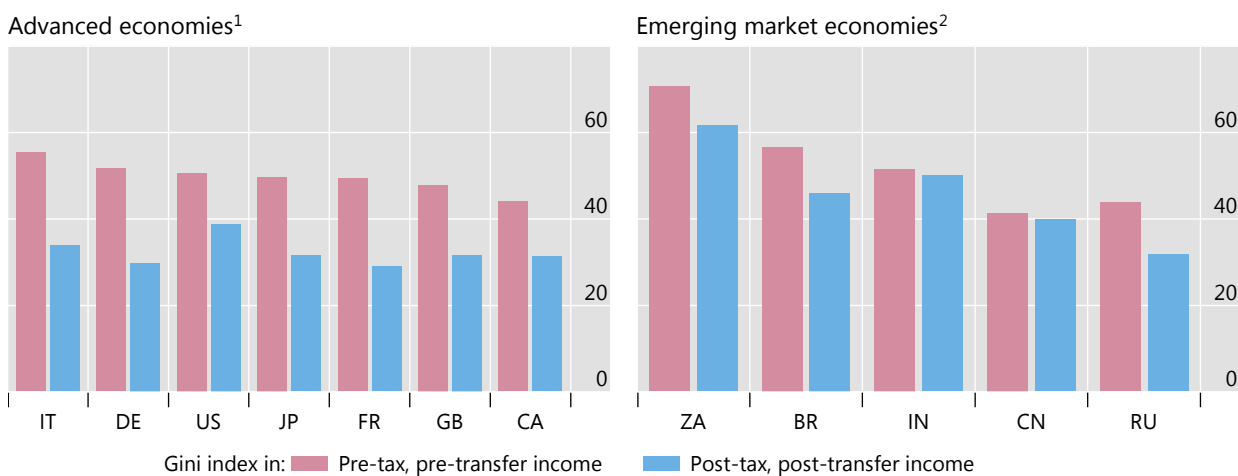
Addressing the structural trends in inequality is first and foremost a task for governments. They can avail themselves of a better and broader set of tools to tackle inequality, ranging from taxation to transfers as well as to policies aimed at improving education, property rights, health, competition and trade, among others. Moreover, politically, governments bear the responsibility for achieving a desirable distribution of resources.

Fiscal policy is best suited to offset the distributional impact of long-term real factors. Government spending and support programmes, such as unemployment benefits and retraining, can help the most disadvantaged cope with adverse structural forces. More generally, tax and transfer systems can be calibrated and targeted to redistribute income and wealth across different segments of the population (Box II.E). In AEs, such policies have indeed contributed to mitigating income inequality. Measures of income inequality based on the Gini coefficient are typically much higher pre- than post-taxes and transfers (Graph II.11, left-hand panel). The difference is more limited in EMEs (right-hand panel), one possible reason being the lower share of direct taxes in those jurisdictions.

## Fiscal policy redistributes income

Gini index

Graph II.11



<sup>1</sup> For CA, DE, GB and US, 2018; for FR, 2012; for IT, 2017; for JP, 2015. <sup>2</sup> For BR, 2014; for CN, 2015; for IN, 2013; for RU and ZA, 2018.

Sources: Luxembourg Income Study (LIS) Database; Standardized World Income Inequality Database (SWIID); BIS calculations.

Mitigating inequality also requires well designed growth-promoting structural policies. There is a range of relevant measures.

First and foremost, policies designed to improve access to, and the quality of, education and on-the-job learning are crucial to keep pace with rapid technological change. Such policies do not just raise output by increasing human capital and productivity; they also help level the playing field and reduce inequality by providing access to better-paid job opportunities.<sup>29</sup>

Labour market and competition policies sustain growth and also help tackle the challenges brought about by technological change and changes in the composition of demand in favour of high-skilled jobs. Easing re-entry of the long-term unemployed, typically the less skilled, into labour markets can reduce the income gap vis-à-vis higher-skilled workers. And labour market regulation can ensure minimum standards for wages and unemployment benefits, rebalancing bargaining power.

Trade openness can also contribute, especially for lower-income countries benefiting from the extra foreign demand. But it needs to be combined with proper compensation, retraining and reallocation policies for those who are displaced.<sup>30</sup> Evidence indicates that, absent redistribution policies, the removal of tariffs on agricultural and manufacturing goods increases aggregate output at the cost of an initial rise in income inequality.<sup>31</sup>

### Central banks' non-monetary hats

Central banks can also contribute to a more equitable society wearing their "non-monetary hats". These are functions attributed to them by statute beyond their monetary policy mandate.

The previous analysis has already discussed the important role of financial stability-related functions for inequality, including micro- and macroprudential regulation and supervision and those concerned with crisis management. But many more are relevant in this context: fostering financial development; furthering financial inclusion; protecting consumers of financial services; encouraging financial

## Fiscal policy and inequality

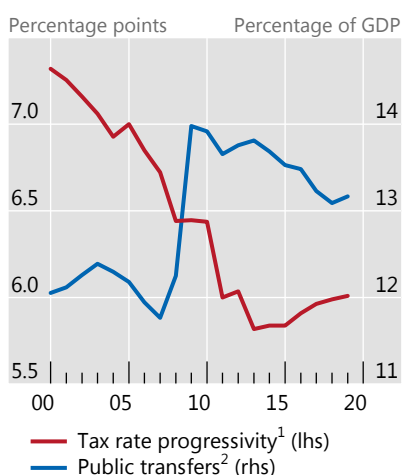
Governments can affect inequality using a number of different fiscal policy tools. On the revenue side, they can influence the income distribution by changing income taxes. Progressive taxation, which imposes higher tax rates on higher-income households, can reduce after-tax income inequality. Similarly, taxes on wealth or inheritance can reduce after-tax wealth inequality. On the expenditure side, governments can direct public transfers towards specific segments of the population to affect their disposable income and hence inequality. For instance, unemployment insurance can significantly limit the impact of recessions on inequality by sustaining the income of workers who lose their job. Public transfers also tend to reduce inequality since they usually aim to ensure minimum living standards, thereby disproportionately benefiting the poor.

Changes in taxes and transfers have had a differential direct impact on inequality. On the one hand, personal income tax progressivity has declined globally (Graph II.E, left-hand panel).<sup>①</sup> The decrease of about 1.5 percentage points over the past two decades amounts to a noticeable reduction in the tax burden of the highest-income households. On the other hand, public transfers as a share of GDP increased significantly in the wake of the GFC. They have declined somewhat since then but have remained notably above pre-GFC levels.

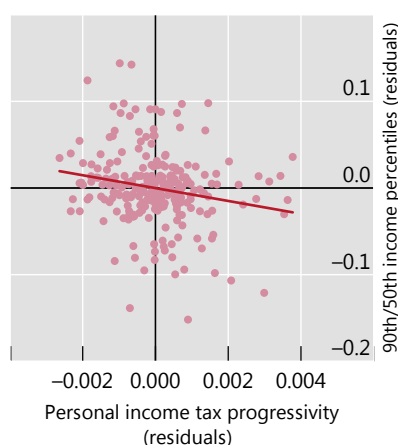
### Different fiscal policy tools can shape different parts of the income distribution

Graph II.E

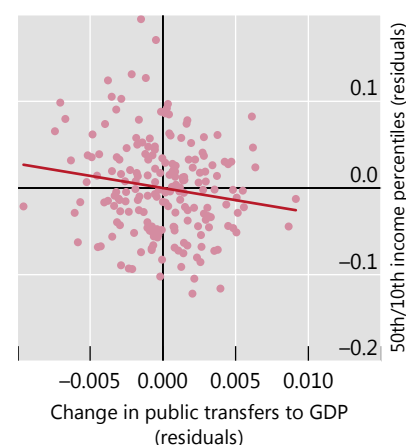
Evolution of tax rate progressivity and public transfers



Higher tax progressivity comes with lower inequality at the top...<sup>3</sup>



...while higher transfers come with lower inequality at the bottom<sup>4</sup>



<sup>1</sup> Tax progressivity is estimated for each country-year pair by regressing average tax rates on log-personal income. Personal income levels are defined as multiples of current GDP per capita, starting from 4% and ending at 400% with increments of 4 percentage points, making 100 hypothetical income levels for each country and year. Country sample: 27 AEs and eight EMEs. See D Duncan and K Sabirianova Peter, "Unequal inequalities: do progressive taxes reduce income inequality?", *IZA Discussion Papers*, no 6910, October 2012. Corresponding average tax rates are computed using OECD data on personal income tax rates and thresholds. <sup>2</sup> As a share of current GDP. <sup>3</sup> Partial correlation estimated by regressing the ratio of the 90th income percentile to the 50th income percentile for a panel of countries and incomes over the period 2000–19 on tax progressivity and average tax burden as well as lagged Gini index. The regression is estimated including country and time fixed effects. Country sample: AT, BE, CA, CH, CZ, DE, DK, ES, FI, FR, GB, IE, IT, KR, NL, NO, PT, SE and US. <sup>4</sup> Partial correlation estimated by regressing the ratio of the 50th income percentile to the 10th income percentile for a panel of countries and incomes over the period 2000–19 on the yearly change in public transfers as a share of current GDP, controlling for the lagged dependent variable. The regression is estimated including country and time fixed effects. Country sample: AT, BE, CA, CH, DE, DK, ES, FI, FR, GB, IT, NL, NO, SE and US.

Sources: OECD, *Economic Outlook* and Tax Database; Standardized World Income Inequality Database (SWIID); UNU-WIDER, World Income Inequality Database (WIID); BIS calculations.

Cross-country evidence confirms that a higher degree of tax progressivity is associated with lower inequality, particularly at the top of the income distribution (Graph II.E, centre panel).<sup>②</sup> A reduction in tax progressivity of the same order of magnitude as observed over the past two decades is associated with an increase of about 11 percentage points in the share of income of the top 10% of earners relative to the median income earners.

For their part, public transfers help reduce inequality at the bottom of the distribution.<sup>③</sup> Cross-country evidence shows that increases in public transfers as a share of GDP are associated with lower inequality in the

bottom half of the income distribution (Graph II.E, right-hand panel). This empirical regularity probably reflects changes in public transfers disproportionately benefiting the poor, especially as transfers tend to increase more steeply during recessions. Accordingly, increases in transfers have little impact at the top of the income distribution.

The variety of fiscal policy tools available to governments gives them significant scope to address inequality arising from different segments of the income distribution, and nudge it towards the desired outcome.

① Consistent longer-term evidence is provided in T Piketty, E Saez and G Zucman, “Distributional national accounts: methods and estimates for the United States”, *The Quarterly Journal of Economics*, vol 133, no 2, May 2018, pp 553–609.

② See also D Denvil and K Sabirianova Peter, “Unequal inequalities: do progressive taxes reduce income inequality?”, *International Tax and Public Finance*, vol 23, no 4, August 2016, pp 762–83. ③ See I Joumard, M Pisu and D Bloch, “Tackling income inequality: the role of taxes and transfers”, *OECD Journal: Economic Studies*, vol 2012, no 1, 2012.

literacy and education; and overseeing payment systems.<sup>32</sup> The extent to which central banks can contribute to fighting inequality performing these tasks naturally depends on their statutory responsibilities, which vary substantially across countries, and, importantly, on the range and effectiveness of the tools at their disposal.

The beneficial impact of these policies on inequality is multifaceted. Fostering financial development can widen the menu of options to hedge and diversify risks, enhancing investment opportunities and mitigating poverty and income inequality.<sup>33</sup> Promoting financial inclusion by providing safe savings vehicles or smooth payment infrastructures expands financial market access for the most disadvantaged, particularly in poorer countries.<sup>34</sup> Financial services consumer protection shields the poor and more vulnerable from predatory lending<sup>35</sup> and, together with financial literacy and education, from excessive risk-taking. Spearheading efforts to develop safe, smooth and competitive payment systems not only underpins financial stability; it also helps reduce overall costs, not least for cross-border remittances.

## Conclusion

Inequality is largely the result of long-term structural forces that are independent of monetary policy. Over the past few decades, globalisation and technology have played a prominent role. Policies that foster more equal opportunities or redistribute income are best suited to counteract the impact of long-term forces on income and wealth inequality. Structural policies, including those targeted to education, health and competition, give the relatively poor of today the instruments to become the well-off of tomorrow, promoting social mobility and equitable growth. Fiscal policies, notably through redistribution, help correct the uneven distribution of the aggregate gains from growth.

Monetary policy does not have adequate tools to offset the long-term distributional consequences of evolving structural factors. Nevertheless, depending on statutory responsibilities, central banks can make a significant contribution by wearing their “non-monetary hats”, to an extent that depends on the tools available. Promoting financial development, inclusion and literacy, protecting against unfair financial practices, and furthering low-cost payment services all contribute to a more equitable society.

This is not to say that monetary policy cannot foster a more equitable society; far from it. Monetary policy can make an important contribution by keeping the economy on an even keel in fulfilment of its mandate, ie by tackling macroeconomic, including financial, instability. Macroeconomic instability can have a first-order

impact on inequality over business cycle fluctuations. The two major forms of instability are high inflation, which disproportionately erodes income of households at the bottom of the distribution, and recessions, which hurt the poor through unemployment spells.

Changes in the nature of the business cycle over the recent decades have complicated monetary policy's ability to counteract macroeconomic instability and its impact on inequality. To be sure, inflation has largely been conquered – a major achievement. But financial factors have come to the fore as a key force amplifying business cycle fluctuations. Financial recessions tend to be deeper and longer, especially if a financial crisis breaks out, and therefore much more costly in terms of inequality. Moreover, they require the central bank to keep interest rates low for longer to nurture a recovery: by boosting asset prices, especially those of equities, this may raise wealth inequality in the short run even as it delivers substantial benefits by bolstering employment and reducing income inequality. The intertemporal trade-offs that arise pose a key challenge. With inflation less responsive to economic slack, the central bank can keep the monetary policy stance easier for longer. This brings more people into the labour force, supports employment and reduces inequality. But it may also contribute to a slow build-up of financial imbalances that sow the seeds of costlier financial recessions down the road.

In order to better address these trade-offs, a more balanced policy approach is needed. Prudential, fiscal and structural policies are important in this context, as part of a comprehensive macro-financial stability framework.

## Endnotes

- <sup>1</sup> Unless otherwise specified, the chapter focuses on measures of inequality before redistributive actions taken by governments, eg taxes and transfers. The impact of these on inequality is discussed in detail in the last section.
- <sup>2</sup> See also A Atkinson and F Bourguignon, *Handbook of income distribution*, vol 2, Elsevier, 2015.
- <sup>3</sup> For a survey of different approaches, see M Ravallion, "Poverty lines across the world", *World Bank Policy Research Working Papers*, no 5284, April 2010.
- <sup>4</sup> See eg D Acemoglu, "Technical change, inequality and the labor market", *Journal of Economic Literature*, vol 40, no 1, March 2002, pp 7–72; and F Bourguignon, *The globalization of inequality*, Princeton University Press, 2015.
- <sup>5</sup> For a survey of the academic literature on skill-biased technical change, see N Chusseau, M Dumont and J Hellier, "Explaining rising inequality: skill-biased technical change and north-south trade", *Journal of Economic Surveys*, vol 22, no 3, July 2008, pp 409–57.
- <sup>6</sup> See D Autor, D Dorn, L Katz, C Patterson and J Van Reenen, "The fall of the labor share and the rise of superstar firms", *The Quarterly Journal of Economics*, vol 135, no 2, May 2020, pp 645–709.
- <sup>7</sup> On this, see eg A Atkinson, *Inequality: what can be done?*, Harvard University Press, 2015.
- <sup>8</sup> See J Tinbergen, "Substitution of graduate by other labour", *Kyklos*, vol 27, no 2, January 1974, pp 217–26.
- <sup>9</sup> See A Carstens, "Central banks and inequality", remarks at Princeton University's Bendheim Center for Finance, 6 May 2021.
- <sup>10</sup> See D Krueger, K Mitman and F Perri, "On the distribution of the welfare losses of large recessions", *NBER Working Papers*, no 22458, July 2016.
- <sup>11</sup> See eg S Fischer, R Sahay and C Vegh, "Stabilization and growth in transition economies: the early experience", *Journal of Economic Perspectives*, vol 10, no 2, spring 1996, pp 45–66.
- <sup>12</sup> The significant interplay between inflation and income inequality in EMEs probably reflects the importance of the informal sector, as workers relying mostly on cash payments are particularly exposed to inflation. In AEs, by contrast, greater participation in banking services and higher financial literacy may enable more inflation hedging opportunities.
- <sup>13</sup> On the link between recessions and inequality, see D Krueger et al, op cit.
- <sup>14</sup> See E Kohlscheen, M Lombardi and E Zakrajšek, "Income inequality and the depth of economic downturns", *Economics Letters*, vol 205, no 109934, August 2021.
- <sup>15</sup> R Rajan, *Fault lines: how hidden fractures still threaten the world economy*, Princeton University Press, 2011.
- <sup>16</sup> See G Kaplan, B Moll and G Violante, "Monetary policy according to HANK", *American Economic Review*, vol 108, no 3, March 2018, pp 697–743.
- <sup>17</sup> On the financial amplification of business cycles, see R Kollmann, "Global banks, financial shocks, and international business cycles: evidence from an estimated model", *Journal of Money, Credit and Banking*, vol 45, no 2, December 2013, pp 159–95; and M Iacoviello, "Financial business cycles", *Review of Economic Dynamics*, vol 18, no 1, January 2015, pp 140–63.
- <sup>18</sup> Beyond the cyclical evolution of interest rates, there is a deeper question about the long-term drivers of the fall in *real* interest rates since the 1980s. Clearly, the real rates consistent with stable inflation and output at potential have declined – what is commonly referred to as *r*-star or the natural rate of interest. There is a large body of evidence indicating that the main forces at work have been of a structural nature, including factors such as demographics, long-term growth, a growing wedge between the required return on capital and the risk-free rate, the relative price



of capital and inequality itself, among others, all of which hardly depend on monetary policy. See eg M Marx, B Mojon and F Velde, "Why have interest rates fallen far below the return on capital?", *BIS Working Papers*, no 794, July 2019; and L Rachel and T Smith, "Are low real interest rates here to stay?", *International Journal of Central Banking*, vol 13, no 3, September 2017, pp 1–42 for recent surveys of the evidence. Some of the empirical work on the determinants of real rates finds much weaker evidence for such a link with those specific factors; see eg K Lunsford and K West, "Some evidence on secular drivers of US safe real rates", *American Economic Journal: Macroeconomics*, vol 11, no 4, 2019, pp 113–39; and C Borio, P Disyatat, M Juselius and P Rungcharoenkitkul, "Why so low for so long? A long-term view of real interest rates", *BIS Working Papers*, no 685, December 2017; forthcoming in the *International Journal of Central Banking*.

- 19 See eg M Lenza and J Slacalek, "How does monetary policy affect income and wealth inequality? Evidence from quantitative easing in the euro area", *ECB Working Paper Series*, no 2190, October 2018. The authors estimate that in the absence of a quantitative easing impulse in the euro area, the unemployment rate would have been up to 0.7 percentage points higher on average. This would have implied a loss of 1.1 million jobs.
- 20 See eg Box I.B in BIS, *Annual Economic Report*, June 2018.
- 21 C Borio, M Drehmann and D Xia, "Predicting recessions: financial cycle versus term spread", *BIS Working Papers*, no 818, October 2019.
- 22 The flattening of the Phillips curve may have been produced by secular trends such as globalisation, technology and the related erosion of workers' bargaining power (see eg BIS, *84th Annual Report*, June 2014, Chapter III) and/or by more firmly anchored inflation expectations due to successful monetary policy (see eg M McLeay and S Tenreyro, "Optimal inflation and the identification of the Phillips curve", *NBER Macroeconomics Annual*, 2019).
- 23 Demirgüç-Kunt and Detragiache (1998) time the start of financial liberalisations in most AEs to before 1985. See A Demirgüç-Kunt and E Detragiache, "Financial liberalization and financial fragility", *IMF Working Papers*, no 98/83, June 1998.
- 24 See C Borio, C Furfine and P Lowe, "Procyclicality of the financial system and financial stability: issues and policy options", *BIS Papers*, no 1, March 2001; and V Bruno and H S Shin, "Cross-border banking and global liquidity", *Review of Economic Studies*, vol 82, no 2, April 2015, pp 535–64.
- 25 See S Claessens, M Kose and M Terrones, "How do business and financial cycles interact?", *Journal of International Economics*, vol 87, no 1, May 2012, pp 178–90; and O Jordá, M Schularick and A Taylor, "When credit bites back", *Journal of Money, Credit and Banking*, vol 45, no s2, December 2013.
- 26 See L Svensson, "The possible unemployment cost of average inflation below a credible target", *American Economic Journal: Macroeconomics*, vol 7, no 1, January 2015, pp 258–96.
- 27 See A Mian, L Straub and A Sufi, "Indebted demand", *NBER Working Papers*, no 26940, April 2020 for a formal model of one type of intertemporal trade-off that could limit the effectiveness of monetary policy. Following financial crises, accommodative monetary policies may induce poor households to take on more credit to increase consumption. As policy later normalises, debt service payments may hit them disproportionately and force them to curtail consumption. Hence, an accommodative policy could provide short-term support to the economy at the price of heightened macroeconomic instability when the time to normalise comes.
- 28 See eg BIS, *Annual Economic Report*, June 2020, Chapter II.
- 29 J Mincer, "On-the-job training: costs, returns, and some implications", *Journal of Political Economy*, vol 70, no 5, October 1962, pp 50–79; T Schultz, "Reflections on investment in man", *Journal of Political Economy*, vol 70, no 5, October 1962, pp 1–8.
- 30 See eg BIS, *87th Annual Report*, June 2017, Chapter VI.
- 31 See E Artuc, G Porto and B Rijkers, "Trading off the income gains and the inequality costs of trade policy", *Journal of International Economics*, vol 120, September 2019, pp 1–45.

- <sup>32</sup> On the role of central banks in harnessing the power of digital technology to promote efficiency and equity, see L Pereira, “Monetary policy, technology and inequality”, remarks at the CEPR/IMF/Peterson Institute for International Economics roundtable, 11 December 2020.
- <sup>33</sup> See S Claessens, “Access to financial services: a review of the issues and public policy objectives”, *World Bank Research Observer*, vol 21, no 2, February 2006, pp 207–40.
- <sup>34</sup> See A Mehrotra and J Yetman, “Financial inclusion – issues for central banks”, *BIS Quarterly Review*, March 2015, pp 83–96; T Beck, A Demirgüç-Kunt and R Levine, “Finance, inequality and the poor”, *Journal of Economic Growth*, vol 12, February 2007, pp 27–49; S Claessens and E Perotti, “Finance and inequality: channels and evidence”, *Journal of Comparative Economics*, vol 35, no 4, December 2007, pp 748–73.
- <sup>35</sup> See D von Fintel and A Orthofer, “Wealth inequality and financial inclusion: evidence from South African tax and survey records”, *Economic Modelling*, vol 91, September 2020, pp 568–78.

### III. CBDCs: an opportunity for the monetary system

#### **Key takeaways**

- Central bank digital currencies (CBDCs) offer in digital form the unique advantages of central bank money: settlement finality, liquidity and integrity. They are an advanced representation of money for the digital economy.
- Digital money should be designed with the public interest in mind. Like the latest generation of instant retail payment systems, retail CBDCs could ensure open payment platforms and a competitive level playing field that is conducive to innovation.
- The ultimate benefits of adopting a new payment technology will depend on the competitive structure of the underlying payment system and data governance arrangements. The same technology that can encourage a virtuous circle of greater access, lower costs and better services might equally induce a vicious circle of data silos, market power and anti-competitive practices. CBDCs and open platforms are the most conducive to a virtuous circle.
- CBDCs built on digital identification could improve cross-border payments, and limit the risks of currency substitution. Multi-CBDC arrangements could surmount the hurdles of sharing digital IDs across borders, but will require international cooperation.

#### Introduction

Digital innovation has wrought far-reaching changes in all sectors of the economy. Alongside a broader trend towards greater digitalisation, a wave of innovation in consumer payments has placed money and payment services at the vanguard of this development. An essential by-product of the digital economy is the huge volume of personal data that are collected and processed as an input into business activity. This raises issues of data governance, consumer protection and anti-competitive practices arising from data silos.

This chapter examines how central bank digital currencies (CBDCs) can contribute to an open, safe and competitive monetary system that supports innovation and serves the public interest. CBDCs are a form of digital money, denominated in the national unit of account, which is a direct liability of the central bank.<sup>1</sup> CBDCs can be designed for use either among financial intermediaries only (ie wholesale CBDCs), or by the wider economy (ie retail CBDCs).

The chapter sets out the unique features of CBDCs, asking what their issuance would mean for users, financial intermediaries, central banks and the international monetary system. It presents the design choices and the associated implications for data governance and privacy in the digital economy. The chapter also outlines how CBDCs compare with the latest generation of retail fast payment systems (FPS, see glossary).<sup>2</sup>

To set the stage, the first section discusses the public interest case for digital money. The second section lays out the unique properties of CBDCs as an advanced representation of central bank money, focusing on their role as a means of payment

and comparing them with cash and the latest generation of retail FPS. The third section discusses the appropriate division of labour between the central bank and the private sector in payments and financial intermediation, and the associated CBDC design considerations. The fourth section explores the principles behind design choices on digital identification and user privacy. The fifth section discusses the international dimension of CBDCs, including the opportunities for improving cross-border payments and the role of international cooperation.

## Money in the digital era

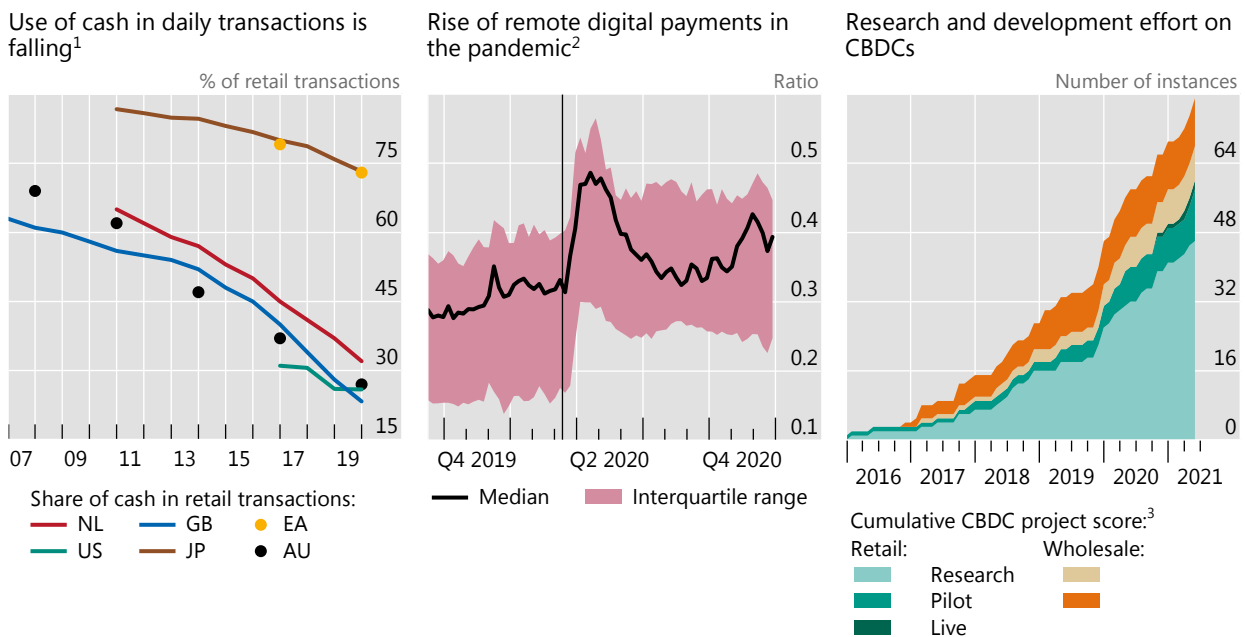
Throughout the long arc of history, money and its institutional foundations have evolved in parallel with the technology available. Many recent payment innovations have built on improvements to underlying infrastructures that have been many years in the making. Central banks around the world have instituted real-time gross settlement (RTGS) systems over the past decades. A growing number of jurisdictions (over 55 at the time of writing)<sup>3</sup> have introduced retail FPS, which allow instant settlement of payments between households and businesses around the clock. FPS also support a vibrant ecosystem of private bank and non-bank payment service providers (PSPs, see glossary). Examples of FPS include TIPS in the euro area, the Unified Payments Interface (UPI) in India, PIX in Brazil, CoDi in Mexico and the FedNow proposal in the United States, among many others. These developments show how innovation can thrive on the basis of sound money provided by central banks.

Yet further-reaching changes to the existing monetary system are burgeoning. Demands on retail payments are changing, with fewer cash transactions and a shift towards digital payments, in particular since the start of the Covid-19 pandemic (Graph III.1, left-hand and centre panels). In addition to incremental improvements, many central banks are actively engaged in work on CBDCs as an advanced representation of central bank money for the digital economy. CBDCs may give further impetus to innovations that promote the efficiency, convenience and safety of the payment system. While CBDC projects and pilots have been under way since 2014, efforts have recently shifted into higher gear (Graph III.1, right-hand panel).

The overriding criterion when evaluating a change to something as central as the monetary system should be whether it serves the public interest. Here, the public interest should be taken broadly to encompass not only the economic benefits flowing from a competitive market structure, but also the quality of governance arrangements and basic rights, such as the right to data privacy.

It is in this context that the exploration of CBDCs provides an opportunity to review and reaffirm the public interest case for digital money. The monetary system is a public good that permeates people's everyday lives and underpins the economy. Technological development in money and payments could bring wide benefits, but the ultimate consequences for the well-being of individuals in society depend on the market structure and governance arrangements that underpin it. The same technology could encourage either a virtuous circle of equal access, greater competition and innovation, or it could foment a vicious circle of entrenched market power and data concentration. The outcome will depend on the rules governing the payment system and whether these will result in open payment platforms and a competitive level playing field.

Central bank interest in CBDCs comes at a critical time. Several recent developments have placed a number of potential innovations involving digital currencies high on the agenda. The first of these is the growing attention received



<sup>1</sup> Based on volume of transactions. For AU, excludes payments over A\$9,999. For JP, based on value of transactions; excludes retail payments by bank transfer. <sup>2</sup> Share of card-not-present transactions in overall transactions, based on transaction counts. These remote transactions are often for online sales (“e-commerce”). The sample comprises AR, AU, BR, CA, CH, DE, ES, GB, HK, IN, IT, JP, NL, RU, SE, SG, US and ZA. The black vertical line in the centre panel indicates 11 March 2020. <sup>3</sup> Based on publicly communicated reports. Cumulative count of scores in each bucket. The score can take a value of 0 when there is no announced project, 1 in case of research studies, 2 in the case of an ongoing or completed pilot and 3 for a live CBDC. For more information see Auer et al (2020).

Sources: R Auer, G Cornelli and J Frost, “Rise of the central bank digital currencies: drivers, approaches and technologies”, *BIS Working Papers*, no 880, August 2020; F Alvarez, R Auer, G Cornelli and J Frost, “The impact of the pandemic on cash and retail payments: insights from a new database”, mimeo; central banks’ websites; Japan’s Ministry of Economy, Trade and Industry; global card networks; BIS calculations.

by Bitcoin and other cryptocurrencies; the second is the debate on stablecoins; and the third is the entry of large technology firms (big techs) into payment services and financial services more generally.

By now, it is clear that cryptocurrencies are speculative assets rather than money, and in many cases are used to facilitate money laundering, ransomware attacks and other financial crimes.<sup>4</sup> Bitcoin in particular has few redeeming public interest attributes when also considering its wasteful energy footprint.<sup>5</sup>

Stablecoins attempt to import credibility by being backed by real currencies. As such, these are only as good as the governance behind the promise of the backing.<sup>6</sup> They also have the potential to fragment the liquidity of the monetary system and detract from the role of money as a coordination device. In any case, to the extent that the purported backing involves conventional money, stablecoins are ultimately only an appendage to the conventional monetary system and not a game changer.

Perhaps the most significant recent development has been the entry of big techs into financial services. Their business model rests on the direct interactions of users, as well as the data that are an essential by-product of these interactions. As big techs make inroads into financial services, the user data in their existing businesses in e-commerce, messaging, social media or search give them a competitive edge through strong network effects. The more users flock to a particular platform, the more attractive it is for a new user to join that same network, leading to a “data-network-activities” or “DNA” loop (see glossary).

However, the network effects that underpin big techs can be a mixed blessing for users. On the one hand, the DNA loop can create a virtuous circle, driving greater financial inclusion, better services and lower costs. On the other, it impels the market for payments towards further concentration. For example in China, just two big techs jointly account for 94% of the mobile payments market.<sup>7</sup> Authorities have recently addressed concerns about anti-competitive practices that exclude competitors in associated digital services such as e-commerce and social media.<sup>8</sup> This concentration of market power is a reason why authorities in some economies are increasingly turning to an entity-based approach to regulating big techs, as a complement to the existing activities-based approach.<sup>9</sup>

Entrenchment of market power may potentially exacerbate the high costs of payment services, still one of the most stubborn shortcomings of the existing payment system. An example is the high merchant fees associated with credit and debit card payments. Despite decades of ever-accelerating technological progress, which has drastically reduced the price of communication equipment and bandwidth, the cost of conventional digital payment options such as credit and debit cards remains high, and still exceeds that of cash (Graph III.2, left-hand panel). In some regions, revenues deriving from credit card fees are more than 1% of GDP (right-hand panel).

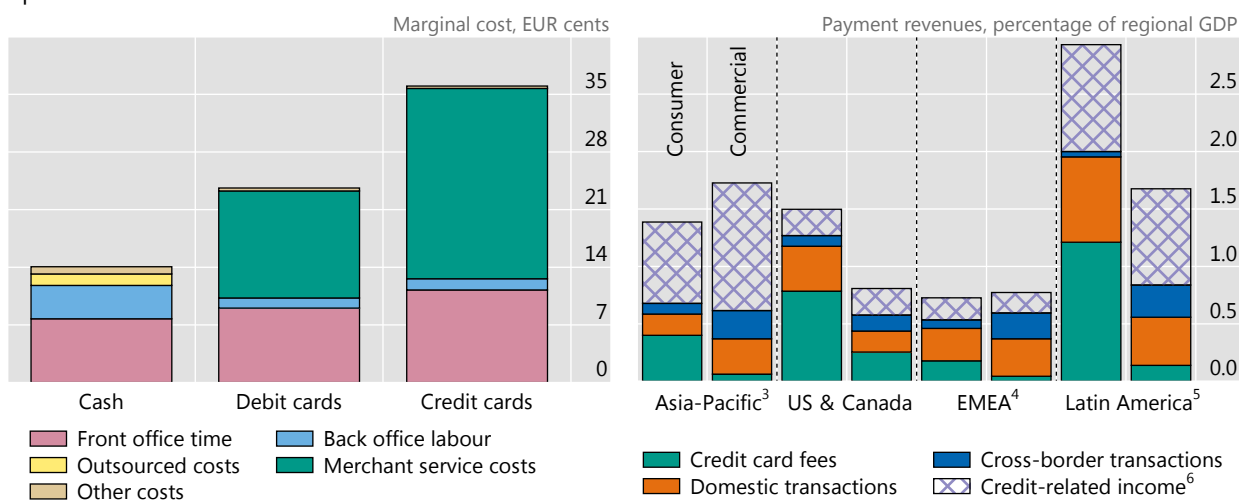
These costs are not immediately visible to consumers. Charges are usually levied on the merchants, who are often not allowed to pass these fees directly on to the consumer. However, the ultimate incidence of these costs depends on what share of the merchant fees are passed on to the consumer indirectly through higher prices. As is well known in the economics of indirect taxation, the individuals who ultimately bear the incidence of a tax may not be those who are formally required to pay that tax.<sup>10</sup> The concern is that when big tech firms enter the payments

### Current forms of digital payments remain expensive

Graph III.2

For merchants cash is still the least expensive payment option for a €25 transaction<sup>1</sup>

Payment costs are higher in card-dependent regions<sup>2</sup>



<sup>1</sup> Data for Europe (AT, BE, DE, ES, FR, GB, IT, NL, PL and SE), 2015. The graph reflects a scenario in which merchants were asked to assess fixed or variable costs for accepting cash, debit card and credit card payments for a €25 transaction over a three- to four-year time horizon. <sup>2</sup> Data for 2018. <sup>3</sup> AU, CN, HK, IN, ID, JP, KR, MY, NZ, PH, SG, TH and TW. <sup>4</sup> AT, BE, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LT, LU, LV, MT, NL, NO, PL, PT, RU, SA, SE, SI, SK, TR and ZA. <sup>5</sup> AR, BR, CL, CO, MX and PE. <sup>6</sup> Includes revenue that may be considered an ancillary service (credit) rather than revenues from payment services, eg net interest income for revolving balances.

Sources: V Alfonso, A Tombini and F Zampolli, "Retail payments in Latin America and the Caribbean: present and future", *BIS Quarterly Review*, December 2020, pp 71–87; European Commission, *Survey on merchants' costs of processing cash and card payments*, March 2015.

market, their access to user data from associated digital business lines may allow them to achieve a dominant position, leading to fees that are even higher than those charged by credit and debit card companies currently. Merchant fees as high as 4% have been reported in some cases.<sup>11</sup>

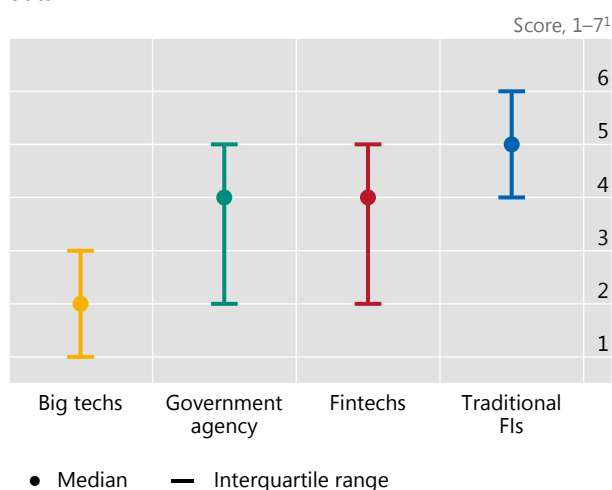
Related to the persistently high cost of some digital payment options is the lack of universal access to digital payment services. Access to bank and non-bank transaction accounts has improved dramatically over the past several decades, in particular in emerging market and developing economies (EMDEs).<sup>12</sup> Yet in many countries, a large share of adults still have no access to digital payment options. Even in advanced economies, some users lack payment cards and smartphones to make digital payments, participate in e-commerce and receive transfers (such as government-to-person payments). For instance, in the United States, over 5% of households were unbanked in 2019, and 14% of adults did not use a payment card in 2017. In France, in 2017, 13% of adults did not own a mobile phone.<sup>13</sup> Lower-income individuals, the homeless, migrants and other vulnerable groups are most likely to rely on cash. Due in part to market power and low expected margins, private PSPs often do not cater sufficiently to these groups. Remedies may necessitate public policy support as digital payments become more dominant.

The availability of massive amounts of user data gives rise to another important issue – that of data governance. Access to data confers competitive advantages that may entrench market power. Beyond the economic consequences, ensuring privacy against unjustified intrusion by both commercial and government actors has the attributes of a basic right. For these reasons, the issue of data governance has emerged as a key public policy concern. When US consumers were asked in a representative survey whom they trust with safeguarding their personal data, the respondents reported that they trust big techs the least (Graph III.3, left-hand panel). They have far more trust in traditional financial institutions, followed by

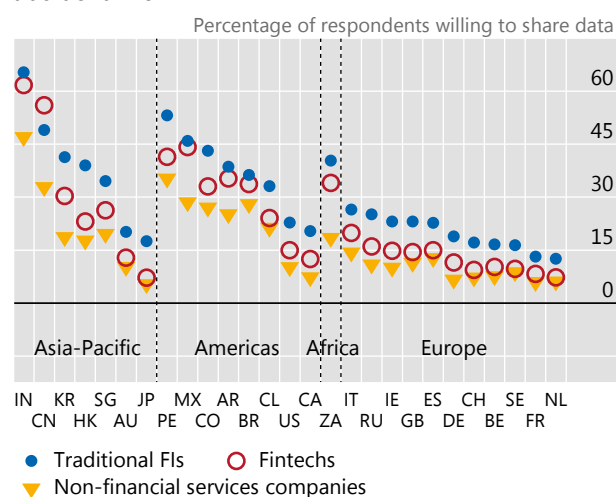
Consumers do not trust all counterparties equally to handle their data safely

Graph III.3

Americans trust big techs the least to safeguard their data



Consumers are generally more willing to share data with traditional FIs<sup>2</sup>



<sup>1</sup> 1 = "no trust at all"; 7 = "complete trust". <sup>2</sup> Survey of 27,000 respondents, February–March 2019. BE includes LU. The question reads "I would be comfortable with my main bank securely sharing my financial data with other organisations if it meant that I received better offers from a) other traditional financial intermediaries, b) fintech companies, c) non-financial services companies".

Sources: O Armantier, S Doerr, J Frost, A Fuster and K Shue, "Whom do consumers trust with their data? US survey evidence", *BIS Bulletins*, no 42, May 2021; S Chen, S Doerr, J Frost, L Gambacorta and H S Shin, "The fintech gender gap", *BIS Working Papers*, no 931, March 2021.



government agencies and fintechs. Similar patterns are present in other countries (right-hand panel). The survey reveals a number of concerns, but the potential for abuse of data emerges as an important element. A later section of this chapter discusses data governance issues more fully.

## Digital money as a central bank public good

The foundation of the monetary system is trust in the currency. As the central bank provides the ultimate unit of account, that trust is grounded on confidence in the central bank itself. Like the legal system and other foundational state functions, the trust engendered by the central bank has the attributes of a public good. Such “central bank public goods” underpin the monetary system.<sup>14</sup>

Central banks are accountable public institutions that play a pivotal role in payment systems, both wholesale and retail. They supply the ultimate means of payment for banks (bank reserves), and a highly convenient and visible one for the public (cash). Moreover, in their roles as operators, overseers and catalysts, they pursue key public interest objectives in the payments sphere: safety, integrity, efficiency and access (see glossary).

The central bank plays four key roles in pursuit of these objectives. The first is to provide the unit of account in the monetary system. From that basic promise, all other promises in the economy follow.

Second, central banks provide the means for ensuring the finality of wholesale payments by using their own balance sheets as the ultimate means of settlement, as also reflected in legal concepts of finality (see glossary). The central bank is the trusted intermediary that debits the account of the payer and credits the account of the payee. Once the accounts are debited and credited in this way, the payment is final and irrevocable.

The third function is to ensure that the payment system works smoothly. To this end, the central bank provides sufficient settlement liquidity so that no logjams will impede the workings of the payment system, where a payment is delayed because the sender is waiting for incoming funds. At times of stress, the central bank’s role in liquidity provision takes on a more urgent form as the lender of last resort.

The central bank’s fourth role is to oversee the payment system’s integrity, while upholding a competitive level playing field. As overseer, the central bank imposes requirements on the participants so that they support the functioning of the payment system as a whole. Many central banks also have a role in the supervision and regulation of commercial banks, which are the core participants of the payment system. Prudential regulation and supervision reinforce the system. Further, in performing this role, central bank money is “neutral”, ie provided on an equal basis to all commercial parties with a commitment to competitive fairness.

Central bank digital currencies should be viewed in the context of these functions of the central bank in the monetary system. Wholesale CBDCs are for use by regulated financial institutions. They build on the current two-tier structure, which places the central bank at the foundation of the payment system while assigning customer-facing activities to PSPs. The central bank grants accounts to commercial banks and other PSPs, and domestic payments are settled on the central bank’s balance sheet. Wholesale CBDCs are intended for the settlement of interbank transfers and related wholesale transactions, for example to settle payments between financial institutions. They could encompass digital assets or cross-border payments. Wholesale CBDCs and central bank reserves operate in a very similar way. Settlement is made by debiting the account of the bank that has net obligations to the rest of the system and crediting the account of the bank that

has a net claim on the system. An additional benefit of settlement in wholesale CBDCs is to allow for new forms of the conditionality of payments, requiring that a payment only settles on condition of delivery of another payment or delivery of an asset. Such conditional payment instructions could enhance the delivery-versus-payment mechanism in RTGS systems (see Box III.A).

Box III.A

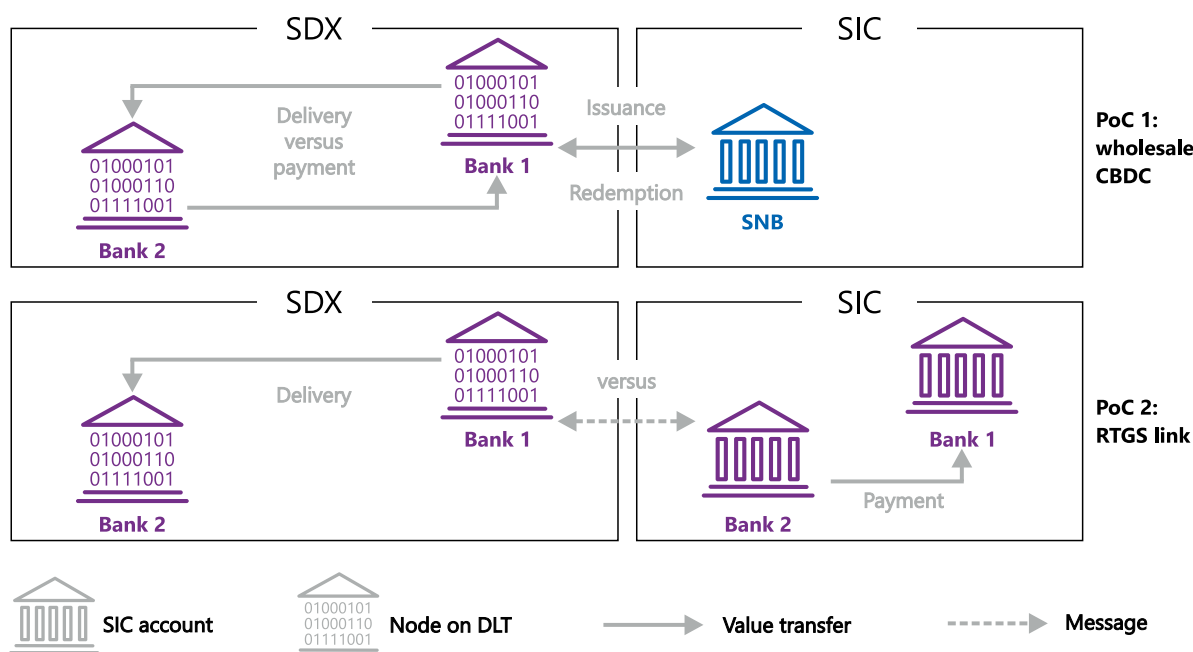
## Project Helvetia – exploring the use of wholesale CBDCs

Wholesale CBDCs are intended for the settlement of interbank transfers and related wholesale transactions. They serve the same purpose as reserves held at the central bank but with additional functionality. One example is the conditionality of payments, whereby a payment only settles if certain conditions are met. This could encompass a broad variety of conditional payment instructions, going far beyond today's delivery-versus-payment mechanism in real-time gross settlement (RTGS) systems. In effect, wholesale CBDCs could make central bank money programmable, to support automation and mitigate risks.<sup>①</sup> Further, wholesale CBDCs would be implemented on new technology stacks. This clean-slate approach would let wholesale CBDC systems be designed with international standards in mind to support interoperability.<sup>②</sup>

State-of-the-art approaches in this domain are exemplified by Project Helvetia – a joint experiment by the BIS Innovation Hub Swiss Centre, SIX Group AG and the Swiss National Bank. This project demonstrates the feasibility of settling digital assets in central bank money. Two proofs-of-concept (PoCs) were compared: (i) issuing a novel wholesale CBDC (Graph III.A, top panel) and (ii) building a link between the new SIX Digital Exchange (SDX) platform and the existing RTGS central bank payment system, Swiss Interbank Clearing (SIC) (bottom panel). Both PoCs were found to be functionally feasible, and transfers were shown to be legally robust and final. Each PoC presents different practical and operational benefits and challenges.

Two PoCs for settling digital assets in central bank money

Graph III.A



Source: BIS, SIX Group AG and Swiss National Bank, *Project Helvetia – Settling tokenised assets in central bank money*, December 2020.

<sup>①</sup> For details of the underlying technology, see R Auer, R Böhme and A Wadsworth, "An introduction to public-private key cryptography in digital tokens", *BIS Quarterly Review*, March 2020, p 73; M Bech, J Hancock, T Rice and A Wadsworth, "On the future of securities settlement", *BIS Quarterly Review*, March 2020, pp 67–83. <sup>②</sup> Arrangements for interoperability between domestic CBDCs are discussed in R Auer, P Haene and H Holden, "Multi-CBDC arrangements and the future of cross-border payments", *BIS Papers*, no 115, March 2021.

Compared with wholesale CBDCs, a more far-reaching innovation is the introduction of retail CBDCs. Retail CBDCs modify the conventional two-tier monetary system in that they make central bank digital money available to the general public, just as cash is available to the general public as a direct claim on the central bank.

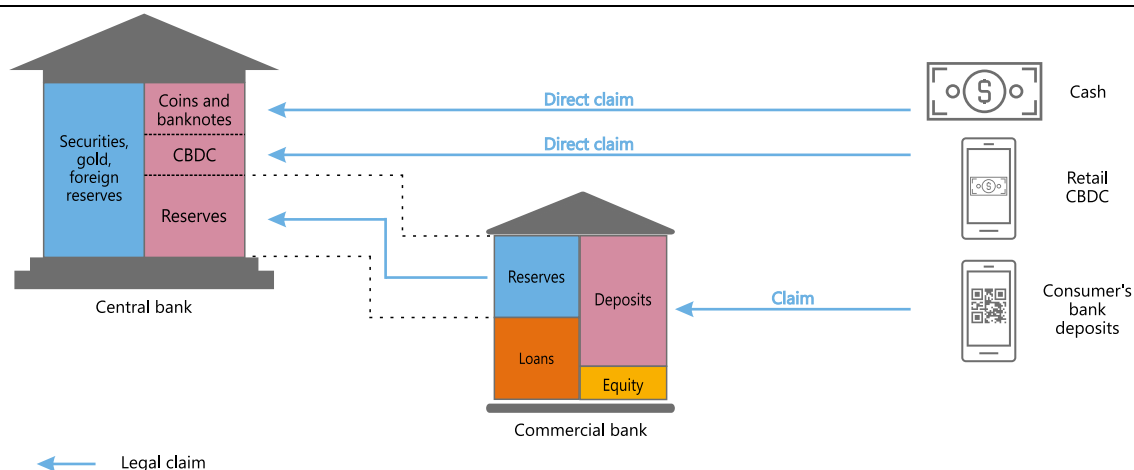
One attribute of retail CBDCs is that they do not entail any credit risk for payment system participants, as they are a direct claim on the central bank (Graph III.4). A retail CBDC is akin to a digital form of cash, the provision of which is a core responsibility of central banks. Other forms of digital retail money represent a claim on an intermediary. Such intermediaries could experience illiquidity due to temporary lack of funds or even insolvency, which could also lead to payment outages. While such risks are already substantially reduced through collateralisation and other safeguards in most cases, retail CBDCs would put an end to any residual risk.

Retail CBDCs come in two variants (Graph III.5). One option makes for a cash-like design, allowing for so-called token-based access and anonymity in payments. This option would give individual users access to the CBDC based on a password-like digital signature using private-public key cryptography, without requiring personal identification. The other approach is built on verifying users' identity ("account-based access") and would be rooted in a digital identity scheme.<sup>15</sup> This second approach is more compatible with the monitoring of illicit activity in a payment system, and would not rule out preserving privacy: personal transaction data could be shielded from commercial parties and even from public authorities by appropriately designing the payment authentication process. These issues are intimately tied to broader policy debates on data governance and privacy, which we return to in a later section.

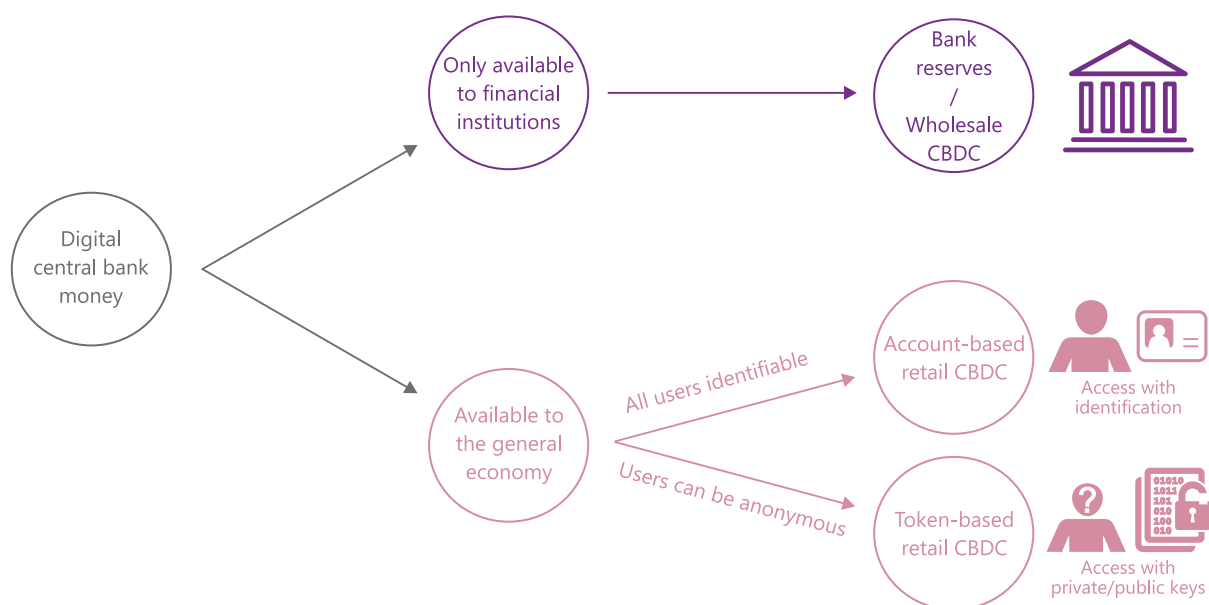
From the public interest perspective, the crucial issue for the payment system is how the introduction of retail CBDCs will affect data governance, the competitive landscape of the PSPs and the industrial organisation of the broader payments industry. In this connection, the experience of jurisdictions with a long history of operating retail FPS provides some useful lessons. Central banks can enhance the functioning of the monetary system by facilitating the entry of new players to foster private sector innovation in payment services. These goals could be achieved by creating open payment platforms that promote competition and innovation,

The monetary system with a retail CBDC

Graph III.4



Source: R Auer and R Böhme, "Central bank digital currency: the quest for minimally invasive technology", *BIS Working Papers*, no 948, June 2021.



In today's financial system, digital fiat money is available only to regulated financial institutions, in the form of reserves accounts held by commercial banks at the central bank. Wholesale CBDCs would similarly be restricted to financial institutions. Retail CBDCs in contrast are available to the general economy. Account-based retail CBDCs would be tied to an identification scheme and all users would need to identify themselves. Token-based retail CBDCs would be accessed via password-like digital signatures and could be accessed anonymously.

Source: BIS elaboration.

ensuring that the network effects are channelled towards a virtuous circle of greater competition and better services.<sup>16</sup>

Rules and standards that promote good data governance are among the key elements in establishing and maintaining open markets and a competitive level playing field. These can yield concrete economic benefits. The 2020 *BIS Annual Economic Report* drew a contrast between “walled gardens”, where users are served in a closed proprietary network, and a public town square in which buyers and sellers can meet without artificial barriers. In return for access to all buyers, the sellers must stick to the standards set by the public authorities with a view to promoting the virtuous circle of greater participation and better services.

The analogy with the payment system is that the market stallholders in the public town square are like PSPs, each offering basic payment functionality with their particular bundle of services, such as banking, e-commerce, messaging and social media. Just as the market stallholders must stick to the standards laid down by the town authorities, these PSPs must adhere to various technical standards and data access requirements. These include technical standards such as application programming interfaces (APIs) that impose a common format for data exchange from service providers (see Box III.B). Together with data governance frameworks that assign ownership of data to users, these standards ensure interoperability of the services between PSPs so that they can work seamlessly for the user. Two instances of APIs are account information services (AIS) and payment initiation services (PIS). AIS allow users to “port” data on their transactions from one provider to another. For instance, a user who has accounts with two different banks can open the app of one bank to check the balances in the other. PIS allow a user to operate the app of one PSP to make an outgoing payment from the account of another.

## APIs and the industrial organisation of payments

An application programming interface (API, see glossary) acts as a digital communication interface between service providers and their users. In its simplest form, a modern payment API first takes a request from an authorised user (eg a user who wants to send a friend money through a mobile banking app). It then sends the request to a server to obtain information (eg the friend's bank account details or the sender's account balance). Finally, it reports the retrieved information back to the user (the money has been sent).

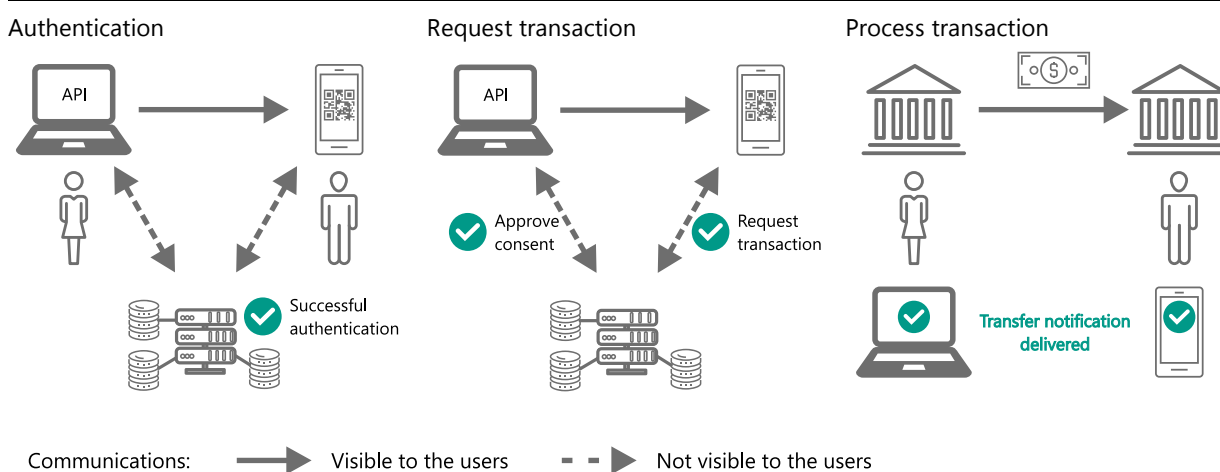
APIs ensure the secure exchange of data and instructions between parties in digital interactions. Through encryption, they allow only the parties directly involved in a transaction to access the information transmitted. They accomplish this by ensuring proper authentication (verifying the credentials of the parties involved, eg from a digital ID, as discussed further in a later section) and authorisation (which specifies the resources a user is authorised to access or modify). Crucially, APIs can be set up to transmit only data relevant to a specific transaction. For example, a bank may provide an API that allows other banks to request the full name of the holder of a specific account, based on the account number provided. But this API will not allow the querying bank to retrieve the account holder's home address or transaction history. Insofar as APIs provide strong security features, they can add an additional layer of security to interactions.

A key benefit of APIs is that they enable interoperability between different providers and simplify transactions. For example, many large financial institutions or big techs possess valuable consumer data, eg on payment transactions. By allowing other market participants to access and analyse data in order to develop and improve their products, APIs ensure a level playing field. This promotes competition and delivers benefits to consumers. An example is "open banking", which allows third-party financial service providers to access transaction and other financial data from traditional financial institutions through APIs. For example, a fintech could use banks' transaction data to assess credit risk and offer a loan at lower, more transparent rates than those offered by traditional financial institutions.

Payment APIs may offer software that allows organisations to create interoperable digital payment services to connect customers, merchants, banks and other financial providers. Examples include Mojaloop, an open source system, and the Unified Payment Interface (UPI) in India.<sup>①</sup> For example, to send money to another user via an API, all that is required from the sender's perspective is the unique phone number of the recipient. Behind the scenes, the payment process follows three general steps (Graph III.B). In the first step, the phone number provided is used to identify and authenticate the unique recipient, as well as their bank connection, account details etc. The second step is agreement, in which the recipient's bank (or financial services provider) needs to agree to the transaction on the customer's behalf. During this second step, it is verified that the transaction satisfies rules and regulations (eg sufficient funds and compliance with know your customer (KYC) and anti-money laundering and combating the financing of terrorism (AML/CFT) standards). Once there is agreement, in a third step funds are transferred and made available to the recipient immediately. In all steps, cryptography ensures that the transaction is non-repudiable and that information is shared securely.

Using an application programming interface (API) for a transaction

Graph III.B



Source: BIS elaboration.

APIs thus securely connect otherwise separate bank and non-bank payment service providers, benefiting consumers through cheaper services. Such APIs are a key enabler of interoperability between payment systems – relevant for both FPS and CBDC-based systems.

① See Mojaloop Foundation, “Open Source Software for Payment Interoperability”, accessed 11 May 2021; and D D’Silva, Z Filková, F Packer and S Tiwari, “The design of digital financial infrastructure: lessons from India”, *BIS Papers*, no 106, December 2019. “Moja” is Swahili for “one”, to underscore the aim of achieving interoperability in a single system.

Much as the local authorities preside over their town’s marketplace, a central bank can provide the payment system with access to its settlement accounts. In the case of a retail FPS, the balance sheet of the central bank is, metaphorically speaking, a public space where the sellers of the payment services all interact. The central bank is best placed to play this role, as it issues the economy’s unit of account and ensures ultimate finality (see glossary) of payments through settlement on its balance sheet. The central bank can also promote innovation in this bustling payments marketplace, where the network effects can be channelled towards achieving a virtuous circle of greater participation, lower costs and better services.

Whether retail CBDCs will play a similarly beneficial role will depend on the way that CBDCs frame the interaction between PSPs and their ancillary services. In a general sense, the public good nature of both CBDCs and retail FPS can be seen as resting on an open payment system around the interoperability of the services offered by PSPs. Table III.1 compares cash, retail CBDCs and FPS along dimensions relevant for users and public policy. Several similarities, but also differences, emerge.

Well designed CBDCs and FPS have a number of features in common. They both enable competing providers to offer new services through a range of interfaces – including in principle via prepaid cards and other dedicated access devices, as well as services that run on feature phones. Such arrangements not only allow for lower costs to users, but also afford universal access, and could thus promote financial inclusion.

Moreover, as the issuers of CBDCs and operators or overseers of FPS, central banks can lay the groundwork for assuring privacy and the responsible use of data in payments. The key is to ensure that governance for digital identity is appropriately designed. For both CBDC and FPS, such designs can incorporate features that support the smooth functioning of payment services without yielding control over data to private PSPs, as discussed above in the context of APIs. An open system that gives users control over their data can harness the DNA loop, breaking down the silos and associated market power of incumbent private firms with exclusive control over user data.

Although CBDCs and FPS have many characteristics in common, one difference is that CBDCs extend the unique features and benefits of today’s digital central bank money directly to the general public.<sup>17</sup> In a CBDC, a payment only involves transferring a direct claim on the central bank from one end user to another. Funds do not pass over the balance sheet of an intermediary, and transactions are settled directly in central bank money, on the central bank’s balance sheet and in real time. By contrast, in an FPS the retail payee receives final funds immediately, but the underlying wholesale settlement between PSPs may be deferred.<sup>18</sup> This delay implies a short-term loan between parties, together with underlying credit risk on those exposures (Graph III.6): the payee’s bank credits its account in real time, while it has an account payable vis-à-vis the payer’s bank. In an FPS with deferred settlement, credit exposures between banks accumulate during the delay, for

Comparison of cash, retail FPS and retail CBDCs as payment methods

Table III.1

	Cash	Retail CBDC	Retail FPS
Safety as a settlement asset	Direct central bank liability	Direct central bank liability	Liability of commercial banks and (in some cases) non-bank PSPs with collateralisation and deposit insurance, <sup>1</sup> and potentially non-bank PSPs without deposit insurance
Finality of the retail payment	Immediate upon receipt (but requires physical proximity)	Immediate upon confirmation by PSP	Immediate upon confirmation by PSP
Finality of the underlying wholesale payment	No wholesale settlement required	No deferred settlement required	Some use deferred settlement for interbank exposures; others use RTGS
Costs for users and merchants	Relatively low	Design choice, but must be competitive with cash and other digital payments	Generally low (typically cross-subsidised with other services), <sup>2</sup> can be regulated
Identification required for access?	None, except for high-value payments in many jurisdictions	Design choice (token- or account-based)	Yes
Anonymity and confidentiality for users	High	Design choice (token- or account-based)	No anonymity; but confidentiality protected by system design, bank secrecy and data protection laws
Offline payments	Yes	Design choice	No
New digital functions	No	Use in e-commerce, instant, available 24/7, further new functions, including programmability and ability to make micro-payments	Use in e-commerce, instant, available 24/7, further new functions, including programmability and ability to make micro-payments
Cross-border use	Yes, with physical transport (subject to limit/regulation)	May be more convenient and cheaper to operate than cash. Subject to design could provide convenient and cheaper access (see later section)	May interlink with other FPS abroad but requires inter-FPS settlement arrangements <sup>3</sup>

<sup>1</sup> Although the amounts covered by deposit insurance are limited in many jurisdictions, the sums required for payment needs may often be covered. <sup>2</sup> Banks and other PSPs often charge low fees to customers for payments, but earn a net interest margin on households' balances. <sup>3</sup> Interlinked FPS require an arrangement for the final settlement of interbank exposures arising from FPS payments across interlinked FPS.

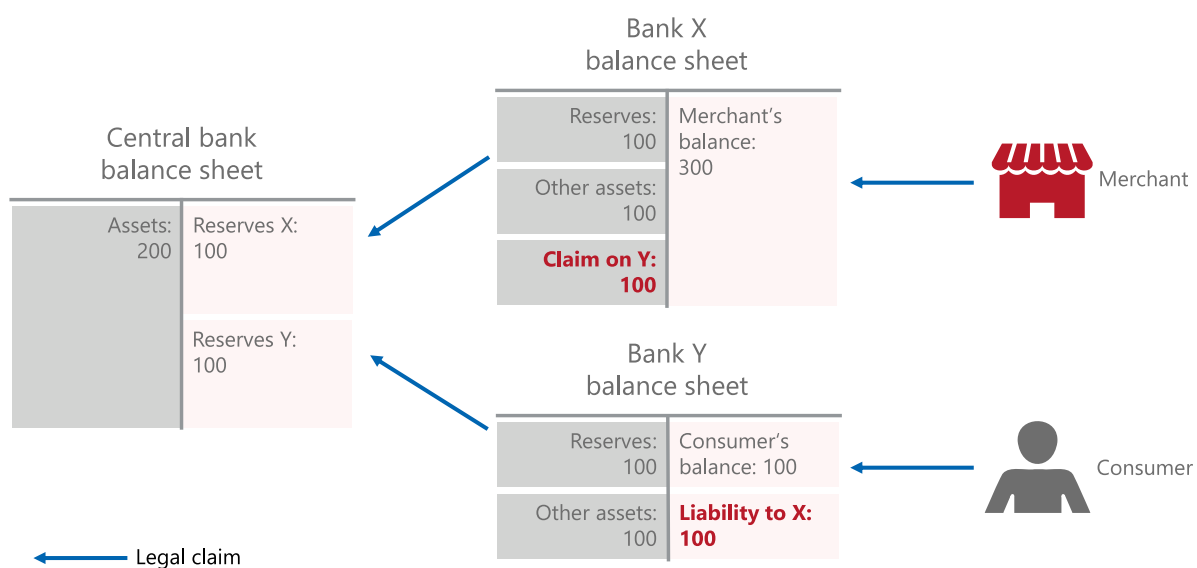
Source: BIS.

example over weekends. This exposure may be fully or partially collateralised – an institutional safeguard designed by the central bank.

Nevertheless, a CBDC allows for a more direct form of settlement, eliminating the need for intermediary credit and hence simplifying the architecture of the monetary system. An example of the potential benefits, to be discussed in a later section, is the potential to address the high costs and inefficiencies of international payments by extending these virtues of greater simplicity to the cross-border case.

At a more basic level, CBDCs could provide a tangible link between the general public and the central bank in the same way that cash does, as a salient marker of the trust in sound money itself. This might be seen as part of the social contract





The consumer's payment of 100 provides final funds to the merchant immediately on a 24/7 basis. However, settlement between the banks of the consumer and the merchant on the central bank balance sheet is deferred, implying a temporary loan: the merchant's bank credits its account in real time, and the merchant's bank has an account receivable vis-à-vis the consumer's bank. Only once the net of all retail fund transfers is settled on the central bank's books are all claims extinguished.

Source: BIS elaboration.

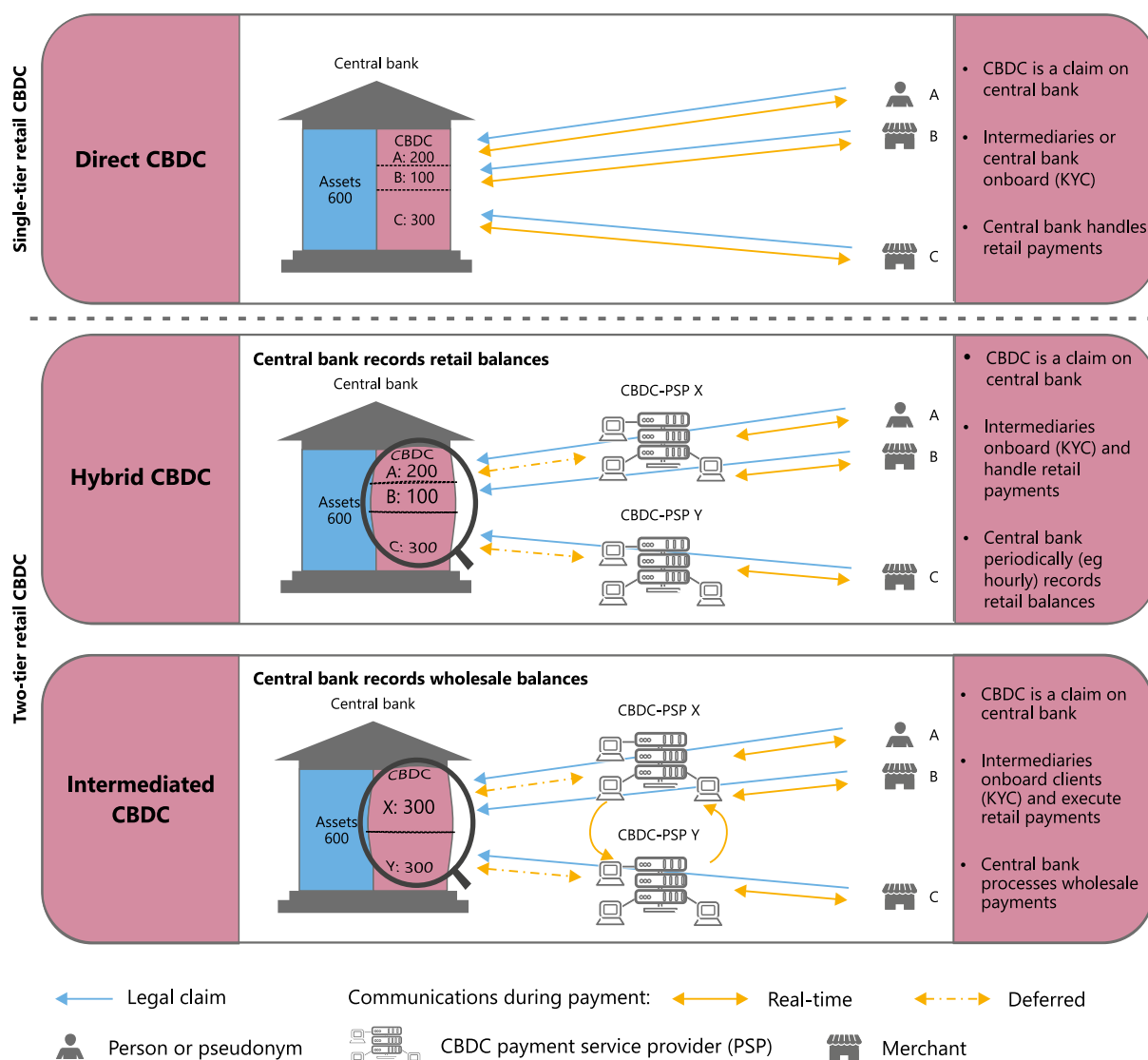
between the central bank and the public. CBDCs would continue to provide such a tangible connection even if cash use were to dwindle.

Ultimately, whether a jurisdiction chooses to introduce CBDCs, FPS or other systems will depend on the efficiency of their legacy payment systems, economic development, legal frameworks and user preferences, as well as their aims. Based on the results of a recent survey, payments safety and financial stability considerations (also in the light of cryptocurrencies and stablecoins) tend to weigh more heavily in advanced economies. In EMDEs, financial inclusion is a more important consideration.<sup>19</sup> Irrespective of the aims, an important point is that the underlying economics concerning the competitive landscape and data governance turn out to be the pivotal factors. These are shaped by the central bank itself.

## CBDC architectures and the financial system

Vital to the success of a retail CBDC is an appropriate division of labour between the central bank and the private sector. CBDCs potentially strike a new balance between central bank and private money.<sup>20</sup> They will be part of an ecosystem with a range of private PSPs that enhances efficiency without impairing central banks' monetary policy and financial stability missions. Central banks and PSPs could continue to work together in a complementary way, with each doing what they do best: the central bank providing the foundational infrastructure of the monetary system and the private PSPs using their creativity, infrastructure and ingenuity to serve customers.

Indeed, there are good arguments against a one-tier system fully operated by the central bank, ie a direct CBDC (Graph III.7, top panel).<sup>21</sup> Direct CBDCs would imply a large shift of operational tasks (and costs) associated with user-facing activities



In the direct CBDC model (top panel), the central bank handles all payments in real time and thus keeps a record of all retail holdings. A hybrid CBDC architecture (middle panel) incorporates a two-tier structure with direct claims on the central bank, while real-time payments are handled by intermediaries. However, the central bank periodically updates and retains a copy of all retail CBDC holdings. By contrast, an intermediated CBDC architecture runs a wholesale ledger (bottom panel). In this architecture, PSPs would need to be closely supervised to ensure at all times that the wholesale holdings they communicate to the central bank indeed add up to the sum of all retail accounts.

Source: Adapted from R Auer and R Böhme, "Central bank digital currency: the quest for minimally invasive technology", *BIS Working Papers*, no 948, June 2021.

from the private sector to the central bank. These include account opening, account maintenance and enforcement of AML/CFT rules, as well as day-to-day customer service. Such a shift would detract from the role of the central bank as a relatively lean and focused public institution at the helm of economic policy.

Equally important is the long-term impact on innovation. Banks, fintechs and big techs are best placed to use their expertise and creativity to lead innovative initiatives, and integrate payment services with consumer platforms and other financial products. Central banks should actively promote such innovations, not hinder them.

Most fundamentally, a payment system in which the central bank has a large footprint would imply that it could quickly find itself assuming a financial

intermediation function that private sector intermediaries are better suited to perform. If central banks were to take on too great a share of bank liabilities, they might find themselves taking over bank assets too.<sup>22</sup>

For these reasons, CBDCs are best designed as part of a two-tier system, where the central bank and the private sector each play their respective role. A logical step in their design is to delegate the majority of operational tasks and consumer-facing activities to commercial banks and non-bank PSPs that provide retail services on a competitive level playing field. Meanwhile, the central bank can focus on operating the core of the system. It guarantees the stability of value, ensures the elasticity of the aggregate supply of money and oversees the system's overall security.

However, as households and firms hold direct claims on the central bank in a retail CBDC, some operational involvement of the central bank is inevitable. Exactly where the line is drawn between the respective roles of the central bank and private PSPs depends on data governance and the capacity for regulation of PSPs.

One possibility is an operational architecture in which the private sector onboards all clients, is responsible for enforcing AML/CFT regulations and ongoing due diligence, and conducts all retail payments in real time. However, the central bank also records retail balances. This "hybrid" CBDC architecture (Graph III.7, centre panel) allows the central bank to act as a backstop to the payment system. Should a PSP fail, the central bank has the necessary information – the balances of the PSP's clients – allowing it to substitute for the PSP and guarantee a working payment system. The e-CNY, the CBDC issued by the People's Bank of China and currently in a trial phase, exemplifies such a hybrid design.<sup>23</sup>

An alternative model is one in which the central bank does not record retail transactions, but only the wholesale balances of individual PSPs (Graph III.7, bottom panel). The detailed records of retail transactions are maintained by the PSP. The benefits of such an "intermediated" CBDC architecture would be a diminished need for centralised data collection and perhaps better data security due to the decentralised nature of record-keeping – aspects that have been discussed in several advanced economies.<sup>24</sup> By reducing the concentration of data, such designs could also enhance privacy (see next section). The downside is that additional safeguards and prudential standards would be necessary, as PSPs would need to be supervised to ensure at all times that the wholesale holdings they communicate to the central bank accurately reflect the retail holdings of their clients.

An important aspect of any technical system for a CBDC is that it embodies a digital ledger recording who has paid what to whom and when. The ledger effectively serves as the memory of all transactions in the economy.<sup>25</sup> The idea that money embodies the economy's memory means that a key design choice is whether a CBDC should rely on a trusted central authority to maintain the transactions ledger, or whether it is based on a decentralised governance system. In both a hybrid and an intermediated architecture, the central bank can choose to run the infrastructure to support record-keeping, messaging and related tasks, or delegate these tasks to a private sector provider.

Assessing the merits of each approach is an area of ongoing research. These studies also cover novel forms of decentralisation enabled via distributed ledger technology (DLT, see glossary). So-called permissioned DLT is envisioned in many current CBDC prototypes. In the process of updating the ledger of payment records, such permissioned DLT systems borrow concepts from decentralised cryptocurrencies, but remedy the problems due to illicit activity by allowing validation only by a network of vetted or permissioned validators.

Permissioned DLT designs may have economic potential in financial markets and payments due to enhanced robustness and the potentially lower cost of

achieving good governance, as compared with systems with a central intermediary. However, such resilience does not come for free, as an effective decentralised design that ensures the right incentives of the different validators is costly to maintain. On balance, a trusted centralised design may often be superior, as it depends less on aligning the incentives of multiple private parties.<sup>26</sup>

These design choices will also have a bearing on the industrial organisation of the market for payments. They will determine the requirements for data governance and privacy, as well as the resultant DNA loop and market structure.

In the hybrid CBDC model, the central bank would have access to the full record of CBDC transactions. This would lead to a competitive level playing field among private PSPs, but comes at the expense of a greater concentration of data in the hands of the central bank itself. Additional data governance requirements may be needed in such cases, as we discuss below.

An intermediated CBDC model would have economic consequences that are similar to those of today's retail FPS. These are based on an open architecture in which PSPs retain an important role in protecting customer data. In such systems, APIs ensure interoperability and data access between PSPs (see Box III.B above), thereby avoiding closed networks and walled gardens. Instead, PSPs would operate customer wallets as a custodian, rather than holding deposit liabilities vis-à-vis the users of the payment system. This would simplify the settlement process. Further, a level playing field ensures that network effects would facilitate a virtuous cycle of greater user participation and lower costs through competition and private sector innovation.

However, any CBDC architecture faces issues of data governance. The risks of data breaches would put an additional onus on the institutional and legal safeguards for data protection. This consideration also applies to today's conventional payment system, in which PSPs store customer data. Yet data privacy and cyber resilience take on added importance in a system with a CBDC, especially on the part of the issuing central bank. To address these concerns, CBDC designs can incorporate varying degrees of anonymity, as discussed in the next section.

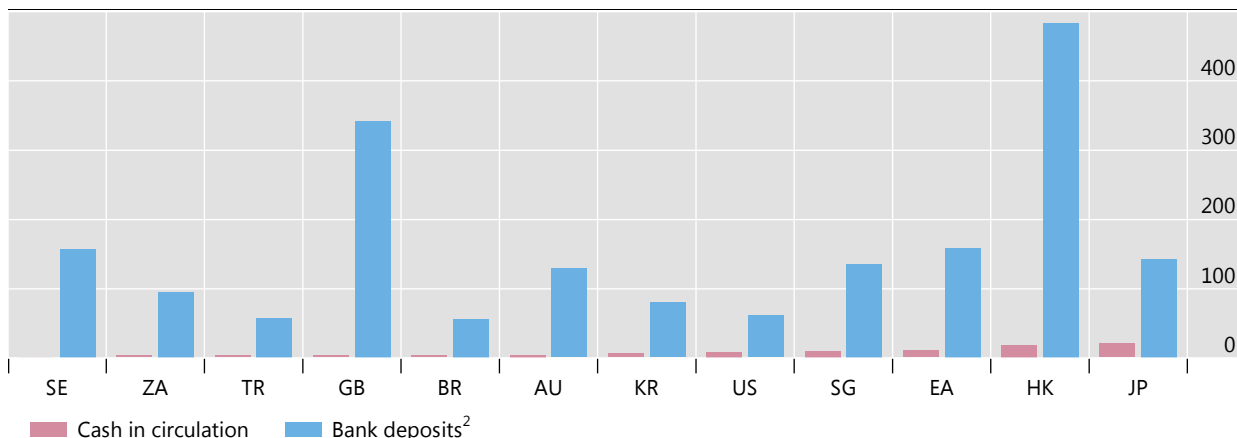
In addition to these operational considerations, the broader impact on financial intermediation activity is an important consideration in assessing the economic impact of CBDCs. Just like cash, CBDCs can be designed to maximise usefulness in payments, without giving rise to large inflows onto the central bank's balance sheet. The design of CBDCs should further mitigate the systemic implications for financial intermediation, by ensuring that commercial banks can continue to serve as intermediaries between savers and borrowers. While cash offers safety and convenience in payments, it is not widely used as store of value. Today, consumers' holdings of cash for payment purposes are in fact minimal in comparison with sight deposits at commercial banks (Graph III.8).

Central banks have ample scope to ensure the smooth functioning of intermediation activities and possess the tools to achieve this objective (Table III.2). One option is to remunerate CBDC holdings at a lower interest rate than that on commercial bank deposits.<sup>27</sup> Just as cash holdings offer no remuneration, a central bank could pay zero interest, or in principle a negative interest rate. For CBDCs tied to an identity scheme (ie account-based CBDCs), any potential encroachment on private intermediaries could be further mitigated via caps that restrict the amount of CBDC held by households and businesses. Another option might combine caps and an interest rate policy, with CBDC balances below a given level earning a zero or low interest rate and balances above that level earning a negative interest rate. One caveat with hard caps is that households or firms that have reached their cap could not accept incoming payments, resulting in a broken payment process. To ensure that households and firms can accept incoming payments at all times, any

## CBDCs can be designed to have a limited financial system footprint – like cash today<sup>1</sup>

As a percentage of GDP

Graph III.8



<sup>1</sup> Data for 2019. <sup>2</sup> Closest alternative where data are not available.

Source: R Auer and R Böhme, "Central bank digital currency: the quest for minimally invasive technology", *BIS Working Papers*, no 948, June 2021.

funds in excess of a cap could be transferred automatically to a linked commercial bank deposit account – the so-called overflow approach.<sup>28</sup> Caps, overflows and remuneration policies would not only limit the impact of a CBDC on credit intermediation in normal times, but they could also mitigate potential runs into the CBDC during market turmoil. Central banks might devise various ways of deterring "digital runs" from commercial banks to CBDCs in times of stress.<sup>29</sup>

On top of these considerations, an economic design which limits a CBDC's footprint would also ensure that its issuance does not impair the monetary policy transmission process. Instead, interest-bearing CBDCs would give central banks an additional instrument for steering real activity and inflation.<sup>30</sup> If changes to the policy rate were directly passed through to CBDC remuneration, monetary transmission could be strengthened. There has also been discussion about the use of CBDCs to stimulate aggregate demand through direct transfers to the public. Rather than the use of the CBDC per se, the key challenge for such transfers is to identify recipients and their accounts.<sup>31</sup> In any case, as CBDCs would coexist with cash, users would have access to either instrument, and it is unlikely that deeply negative interest rates would prevail, or that CBDC would materially change the effective lower bound on monetary policy rates.

Overall, a two-tiered architecture emerges as the most promising direction for the design of the overall payment system, in which central banks provide the foundations while leaving consumer-facing tasks to the private sector. In such a system, PSPs can continue to generate revenue from fees as well as benefiting from an expanded customer base through the provision of CBDC wallets and additional embedded digital services. A CBDC grounded in such a two-tiered system also ensures that commercial banks can maintain their vital function of intermediating funds in the economy. Both hybrid and intermediated models give central banks design options for sound data governance and high privacy standards. In either system, CBDCs could be supported by policy tools so that any unintended ramifications for the financial system and monetary policy could be mitigated.

## Store-of-value properties of cash, CBDCs and bank deposits

Table III.2

	Cash	CBDCs		Commercial bank sight deposits (current accounts)
		Token-based	Account-based	
Claim structure	Claim on central bank	Claim on central bank		Claim on a bank
Risks	Loss, theft & fraud	Loss, theft, fraud & cyber risk	Fraud & cyber risk	Fraud & cyber risk, illiquidity & insolvency
Backstop	Full	Full	Full	Deposit insurance (up to a limit and often with a lag for payout)
Are holdings anonymous?	Yes	Yes	No	No
Interest rate remuneration	No	Can be set by central bank <sup>1</sup>		Set by banks, market-based
Interest rate tiering depending on household-specific holdings	No	No	Yes	Set by banks
Caps on holdings per household possible?	No, as holdings are anonymous. However, safety and practical limits lead to de facto limits on holdings	No, as holdings are anonymous	Yes	Generally no caps or limits

<sup>1</sup> Not for offline use tokens.

Source: BIS.

## Identification and privacy in CBDC design

Effective identification is crucial to every payment system. It guarantees the system's safety and integrity, by preventing fraud and bolstering efforts to counter money laundering and other illicit activities. Sound identification is further required to ensure equal access for all users.

To ensure access and integrity in today's financial system, bank and non-bank PSPs verify identity. When customers open an account, PSPs often demand physical documents, eg passports or driving licenses. For cash, small transactions are anonymous and largely unregulated for practical reasons, but identity checks apply to high-value payments. Despite these measures, identity fraud is a key concern in the digital economy.<sup>32</sup> These considerations suggest that a token-based CBDC which comes with full anonymity could facilitate illegal activity, and is therefore unlikely to serve the public interest.<sup>33</sup>

Identification at some level is hence central in the design of CBDCs. This calls for a CBDC that is account-based and ultimately tied to a digital identity, but with safeguards on data privacy as additional features. A digital identity scheme, which could combine information from a variety of sources to circumvent the need for paper-based documentation, will thus play an important role in such an account-based design. By drawing on information from national registries and from other public and private sources, such as education certificates, tax and benefits records, property registries etc, a digital ID serves to establish individual identities online.<sup>34</sup> It opens up access to a range of digital services, for example when opening a transaction account or online shopping, and protects against fraud and identity theft.

Assuming that CBDCs are to be account-based, an important question is who should verify the identity of an individual seeking to join the network of CBDC

users, and how this verification should be done. Digital ID schemes have already emerged in several countries, but their specific designs and the relative roles of the public and private sector differ substantially (Graph III.9).

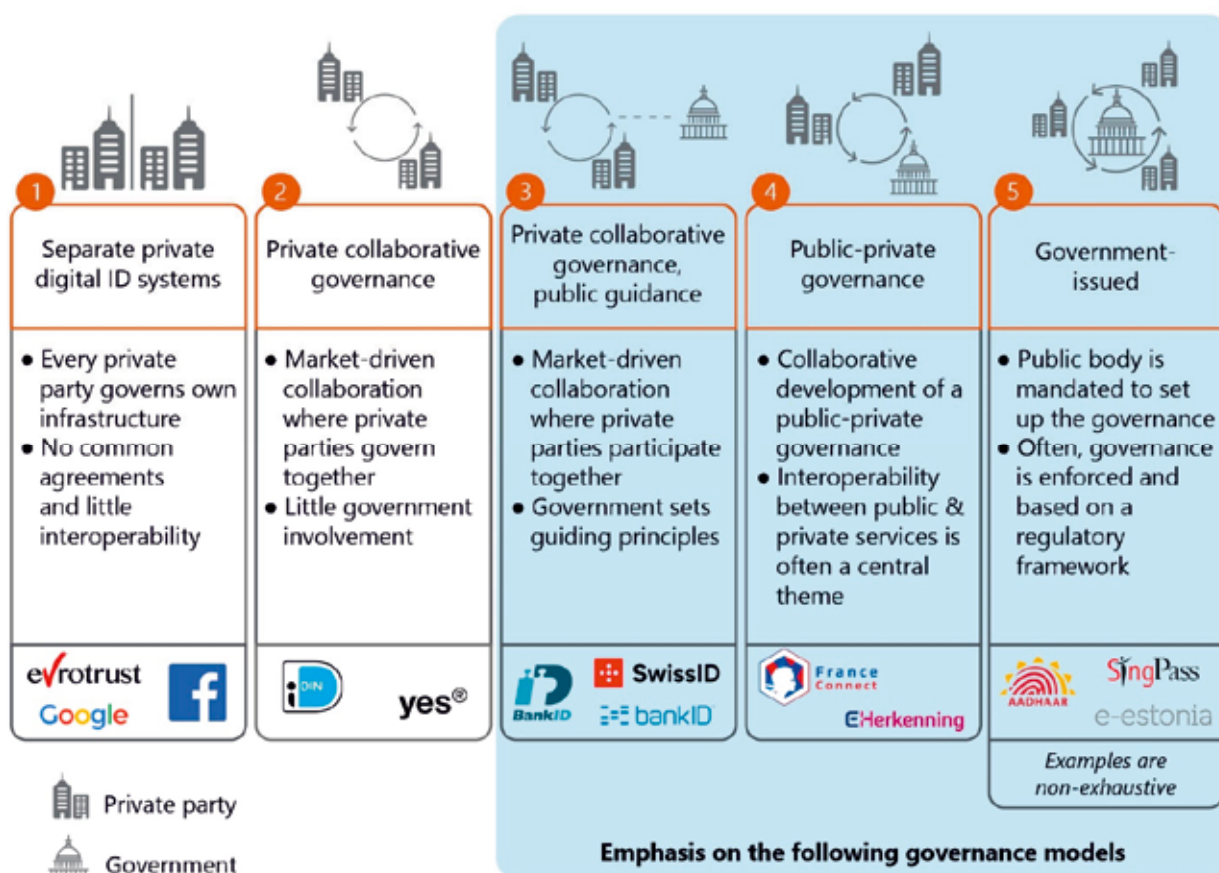
At one end of the spectrum are systems that rely exclusively on private parties to verify identity. Big techs such as Google or Facebook, and Alibaba or Tencent in China have developed their own digital IDs that are required for many of their services, including payment apps (panel 1). In some cases, consortiums of private firms provide a harmonised ID that works across multiple providers (panel 2). For example, yes® will allow customers of Germany’s savings and cooperative banks to use their online banking details as a digital ID. The main drawback of purely private IDs is that they are limited to the specific network for which they are designed, and hence may lead to silos and limited interoperability with other services.

Some countries follow models based on public-private partnership. In one variant, market-driven collaboration is guided by principles set out by the authorities (panel 3). For instance, a consortium of banks in Sweden developed the BankID solution, which allows users to authenticate themselves for payments and government services. Similar solutions are offered in Denmark, Finland and Norway.

Proceeding one step further are systems in which the private and official sector develop a common governance framework and strive for interoperability between their services, as seen in France or the Netherlands (panel 4). Government-led solutions represent the furthest-reaching model (panel 5). These allow administrative

A broad range of public and private solutions for a digital ID

Graph III.9



Source: Adapted from Monetary Authority of Singapore, “Digital identity: foundation for a digital infrastructure to enable the next evolution”, 2021.



databases to be linked up, further enhancing the functionality and usefulness of digital ID. For example, Estonia provides every citizen with a digital identity that allows access to all of the country's e-services. In Singapore, the SingPass platform provides a digital identity linked to individuals' biometrics (facial recognition and fingerprints). The Kenyan Huduma Namba system brings together information from various sources and allows access to a range of public services.

In an alternative, nascent model of digital ID, an individual has ownership and control over their credentials. These can be selectively shared with counterparties, who can verify that the credentials belong to a valid issuer. In such a "federated" model, different attributes of each person are recorded and issued by different entities. A federated digital ID (see glossary) could potentially allow for identification alongside decentralised storage of data.

Any identification framework requires a high standard of cyber security. PSPs have been frequently targeted by cyber attacks, both before and during the Covid-19 pandemic (Graph III.10, left-hand panel). The rising incidence of major data breaches in recent years, in particular at financial institutions (right-hand panel), underscores the possibility that data or funds may be stolen. Such risks would be similar for CBDC payment services.

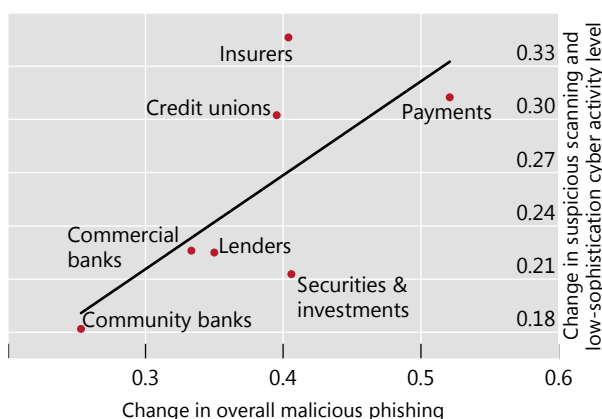
These risks underline that, while identification (based on a unique digital ID) is crucial for the safety of the payment system and transactions in a CBDC, there is a countervailing imperative to protect the privacy and safety of users. Beyond theft, the combination of transaction, geolocation, social media and search data raises concerns about data abuse and even personal safety. As such, protecting an individual's privacy from both commercial providers and governments has the attributes of a basic right. In this light, preventing the erosion of privacy warrants a cautious approach to digital identity.

Consequently, it is most useful to implement anonymity with respect to specific parties, such as PSPs, businesses or public agencies. CBDC designs can allow for

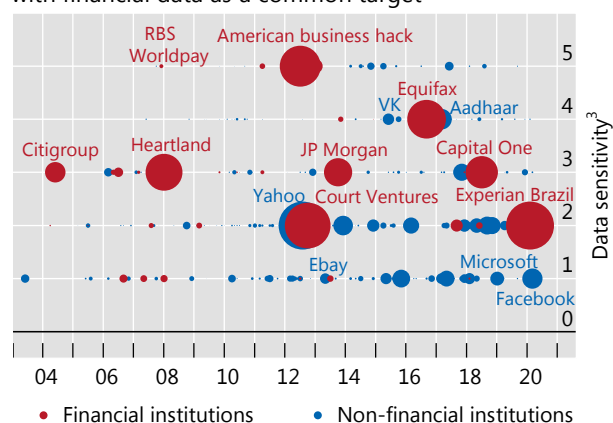
### Addressing cyber risks and data breaches is key for CBDC design

Graph III.10

Payment services are a frequent target of cyber attacks<sup>1</sup>



Large-scale data breaches have proliferated over time – with financial data as a common target<sup>2</sup>



<sup>1</sup> A positive value indicates an increase in cyber attacks. <sup>2</sup> The size of each bubble corresponds to the number of records compromised in the breach. Publicly available information on the largest reported data breaches globally. <sup>3</sup> Data sensitivity is based on the type of information compromised in the breach: 1 = only email addresses and/or online information; 2 = social security number and/or personal details; 3 = credit card information; 4 = health and other personal records; 5 = full details.

Sources: I Aldasoro, J Frost, L Gambacorta and D Whyte, "Covid-19 and cyber risk in the financial sector", *BIS Bulletins*, no 37, January 2021; Financial Services Information Sharing and Analysis Center (FS-ISAC), *COVID-19 effects on cybersecurity survey*, July 2020; D McCandless and T Evans, "World's Biggest Data Breaches & Hacks", April 2021; US Federal Trade Commission; UK Information Commissioner's Office.

privacy by separating payment services from control over the resulting data. Like some FPS, CBDCs could give users control over their payments data, which they need only share with PSPs or third parties as they decide (eg to support a credit application or other services). This can protect against data hoarding and abuse of personal data by commercial parties. Such designs can also prevent access by the central bank and other public authorities, while still allowing access by law enforcement authorities in exceptional cases – similar to today’s bank secrecy laws. In addition to the issue of who can access data, governance issues need to be addressed with respect to who holds the data. Concentration of data in the hands of a single entity puts an additional premium on the institutional and legal safeguards for data protection.

In recognition of these data governance issues, some CBDC designs aim to safeguard anonymity through additional overlays, even for account-based CBDCs. One proposal is to ensure the anonymity of small-value transactions by issuing vouchers which are maintained by a separate data registrar that issues them up to some limit in the user’s name. Another approach, considered in the case of China’s e-CNY, is to shield the identity of the user by designating the user’s public key, which is issued by the mobile phone operator, as the digital ID. The central bank would not have access to the underlying personal details.<sup>35</sup>

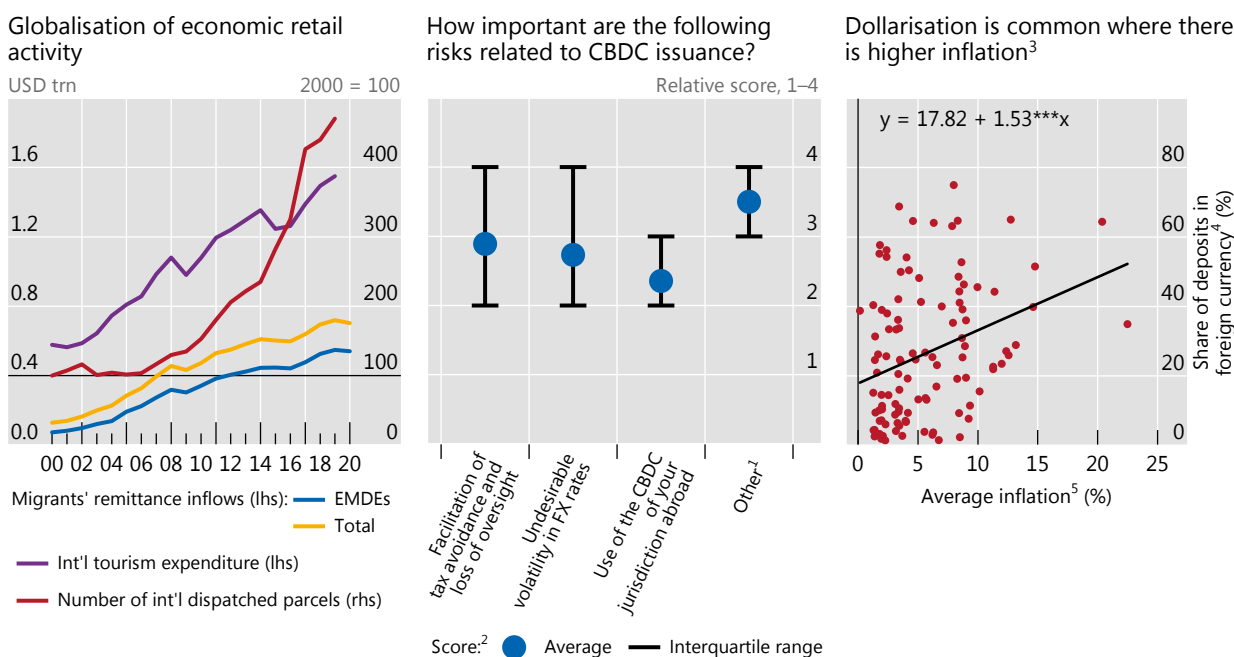
Overall, these developments suggest that the most promising way of providing central bank money in the digital age is an account-based CBDC built on digital ID with official sector involvement. Digital ID could prove more efficient than physical documents, opening up many ways of supporting digital services in general. One size would not fit all in the choice of digital identification systems, as different societies will have different needs and preferences. A recent referendum in Switzerland illustrates this. While voters did not object to a digital ID in general, they rejected the proposal for one provided by the private sector.<sup>36</sup> The foundational, public good nature of digital ID suggests that the public sector has an important role to play in providing or regulating such systems.

## The international dimension of CBDC issuance

The globalisation of economic activity has required a commensurate evolution of cross-border online services. The massive growth of travel and remittances has led to rising demand for cross-border retail payment services.<sup>37</sup> International tourism expenditures, for instance, have doubled over the past 15 years, while the number of parcels shipped across borders has more than tripled. In just one decade, global remittances rose by two thirds, to \$720 billion in 2019 (Graph III.11, left-hand panel). Yet payment services do not work seamlessly across borders, as they are at times slow, expensive, opaque and cumbersome to use.

CBDCs could pave the way for innovations that improve international payments. They can make use of the fact that retail users have direct claims on central bank money to simplify the monetary architecture.<sup>38</sup> However, design features matter for their overall impact in the cross-border context and whether CBDCs will serve the broader public interest. One potential concern is that the use of CBDCs across borders might exacerbate the risk of currency substitution, whereby a foreign digital currency displaces the domestic currency to the detriment of financial stability and monetary sovereignty. Indeed, a number of central banks see currency substitution – along with tax avoidance and more volatile exchange rates – as a key risk that they are addressing in their work on CBDCs (Graph III.11, centre panel).<sup>39</sup>

Such concerns around potential harmful spillovers associated with currency substitution are not new. So-called dollarisation refers to the domestic use of a



<sup>1</sup> Includes AML/CFT, cyber risk, ease of settlement, emergence of a foreign CBDC as a dominant vehicle in the domestic market, imbalance of capital outflows, monetary control and financial stability, significant non-domestic use due to lack of control, redundancy of payment systems, remittances, security and USD parity. <sup>2</sup> 4 = Very important; 3 = Important; 2 = Somewhat important; 1 = Not so important. <sup>3</sup> The sample includes 110 countries. \*\*\* indicates statistical significance at the 1% level. <sup>4</sup> Ratio of foreign currency deposits to total deposits from E Levy Yeyati (2021). Simple average for 2018 and 2019 or latest available. <sup>5</sup> Simple average of 2007–17 yoy changes in average consumer prices.

Sources: R Auer, C Boar, G Cornelli, J Frost, H Holden and A Wehrli, "CBDCs beyond borders: results from a survey of central banks", *BIS Papers*, no 116, June 2021; E Levy Yeyati, "Financial dollarization and de-dollarization in the new millennium", *FLAR Working Papers*, February 2021; IMF, *World Economic Outlook*; World Bank; Universal Postal Union; BIS calculations.

foreign currency in daily transactions and financial contracts, as well as the associated macroeconomic implications. Dollarisation, a long-running theme in international finance, is widespread in some economies.

However, the effective design of CBDCs based on digital ID and implemented as an account-based system can be expected to largely eliminate such risks. The potential for a foreign CBDC to make deep inroads into the domestic market, or to take off as a "dominant" global currency, is likely to be limited. For example, for China's account-based e-CNY to circulate widely in another jurisdiction, both the issuing central bank (the People's Bank of China), and to a large extent also the central bank of the receiving jurisdiction would need to accept this situation. The issuing central bank would need to recognise a foreign user's digital ID as that of a bona fide member of the CBDC network. The idea of paper currency circulating in the black market is thus an inaccurate analogy to how a CBDC would operate. In this sense, CBDCs have attributes that are very different to those of cash, even though both are direct claims on the central bank.

More broadly, it is important to bear in mind the dictum that the payment system does not exist in a vacuum. Payments mirror underlying economic transactions. The existence of a payment need reflects the economic transaction between the payer and the payee, for instance, a tourist from China who is shopping at a department store in a foreign holiday destination. Since issuing central banks would retain control over cross-border usage, they could restrict non-residents'

access to their currency to certain permitted transactions only. This might reduce the risk of volatile flows and currency substitution in recipient economies. Such restrictions would resemble existing rules governing how non-residents can open a bank account outside their home country.

Not only issuing, but also recipient economies have policy tools to address the concerns of digital currency substitution. In particular, robust legal tender provisions can ensure that the use of the national currency is favoured in domestic payments.

For these reasons, the risks of currency substitution from cross-border use of CBDCs may be limited and could be addressed largely through international monetary cooperation. The widespread international use of some currencies stems from other factors, such as the depth, efficiency and openness of a country's financial markets, trust in a currency's long-run value and confidence in the institutional and legal infrastructure. For instance, dollarisation is typically higher in countries with historically high inflation (Graph III.11, right-hand panel). A foreign currency is unlikely to gain a domestic foothold just because it is digital.

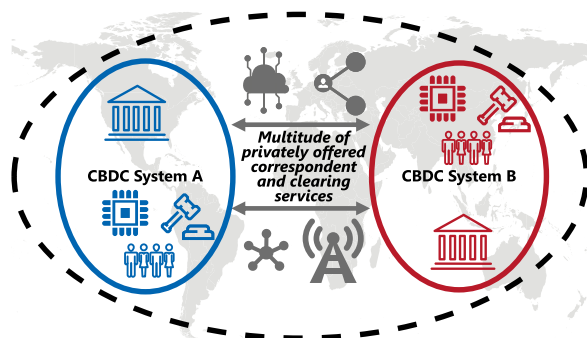
The cross-border use of account-based CBDCs will require international cooperation. One challenge relates to the use of digital ID information outside the originating country. The issuing authority or user may not be willing to provide this information to countries that may have different data protection regulations. ID systems may be not fully interoperable. Indeed, even within a jurisdiction, ID documents may be issued by several different public authorities, sometimes with limited coordination between them. As a supranational digital ID would require unprecedented concentration of an individual's information, it would be politically fraught. However, a supranational digital ID scheme would not be necessary for cross-border cooperation on CBDCs.

Instead, international efforts towards mutually recognising national ID credentials are a more promising approach. A G20 roadmap for cross-border payments has given impetus to cooperative efforts in several directions, complementing the standard-setting efforts among central banks in the BIS Committee for Payments and Market Infrastructures.<sup>40</sup> One building block involves fostering KYC and sharing information on identity across borders. Another involves reviewing the interaction between data frameworks and cross-border payments, and yet another involves factoring an international dimension into CBDC design.<sup>41</sup>

Such cooperation could form the basis for robust payment arrangements that tackle today's challenges head-on. Of particular promise are multi-CBDC (mCBDC) arrangements that join up CBDCs to interoperate across borders. These arrangements focus on coordinating national CBDC designs with consistent access frameworks and interlinkages to make cross-currency and cross-border payments more efficient. In this way, they represent an alternative to private sector global stablecoin projects.<sup>42</sup>

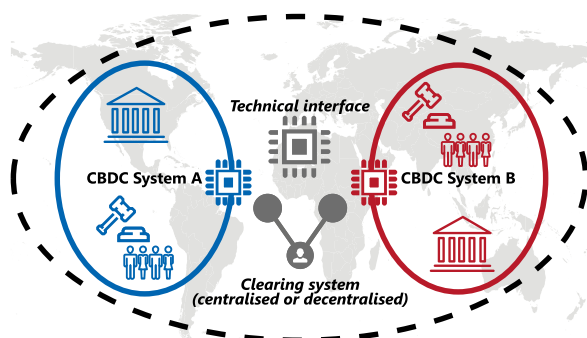
mCBDC arrangements would allow central banks to mitigate many of today's frictions by starting from a "clean slate", unburdened by legacy arrangements. There are three potential models. First, they could *enhance compatibility* for CBDCs via similar regulatory frameworks, market practices and messaging formats (Graph III.12, top panel). Second, they could *interlink* CBDC systems (middle panel), for example via technical interfaces that process end user-to-end user transactions across currency areas without going through any middlemen.

The greatest potential for improvement is offered by the third model, a *single mCBDC system* that features a jointly operated payment system hosting multiple CBDCs (bottom panel). FX settlements would be payment-versus-payment (PvP) by default, rather than requiring routing or settlement instructions through a specific entity acting as an interface. Facilitating access and compatibility through such a system could benefit users through improved efficiency, lower costs and wider use of cross-border payments.



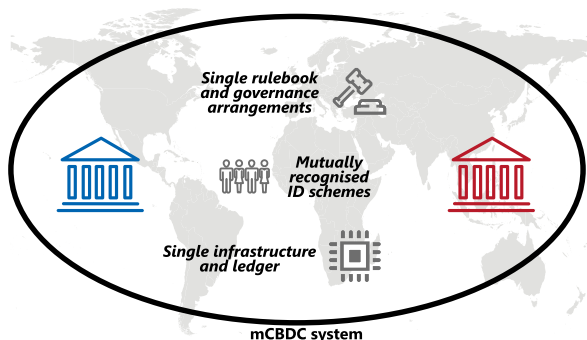
**mCBDC Model 1:  
Enhanced compatibility**

- Compatible technical and regulatory standards with overlapping participation
- Coordinated identification schemes



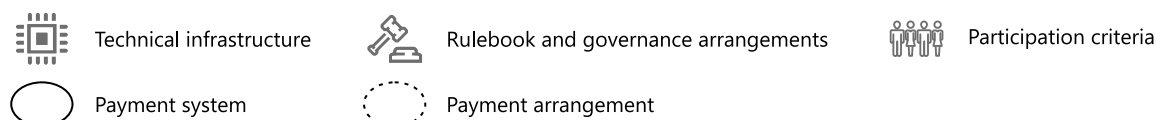
**mCBDC Model 2:  
Interlinking**

- Interlinking through shared technical interfaces or by use of a (centralised or decentralised) common clearing mechanism (eg Project Jasper-Ubin)
- Central banks mutually recognise ID schemes



**mCBDC Model 3:  
Integration into a single system**

- Multiple CBDCs can be run on a single platform (eg mCBDC Bridge or Project Dunbar)
- Central banks mutually recognise ID schemes



Model 1 enhances compatibility for CBDCs via similar regulatory frameworks, market practices, messaging formats and data requirements. Model 2 involves interlinked CBDC systems. This could build on enhanced compatibility while offering additional safety, via PvP settlement. Further, common clearing mechanisms – potentially operated by central banks acting as super-correspondents in cross-currency settings – could enhance efficiency, especially when they are linked with FX trading. Model 3 involves a jointly operated mCBDC payment system hosting multiple CBDCs. All FX settlements would be PvP by default, rather than requiring routing or settlement instructions through a specific entity acting as an interface. Trading venues could also be integrated into an mCBDC system, to reduce complexity, fragmentation and concentration.

Source: R Auer, P Haene and H Holden, “Multi-CBDC arrangements and the future of cross-border payments”, *BIS Papers*, no 115, March 2021.

The potential benefits of these arrangements increase with the degree of harmonisation and technical alignment. Each would require increasingly intertwined identification schemes, but in all cases, ID would remain at a national level. Enhanced compatibility (model 1) might require some coordination of digital ID

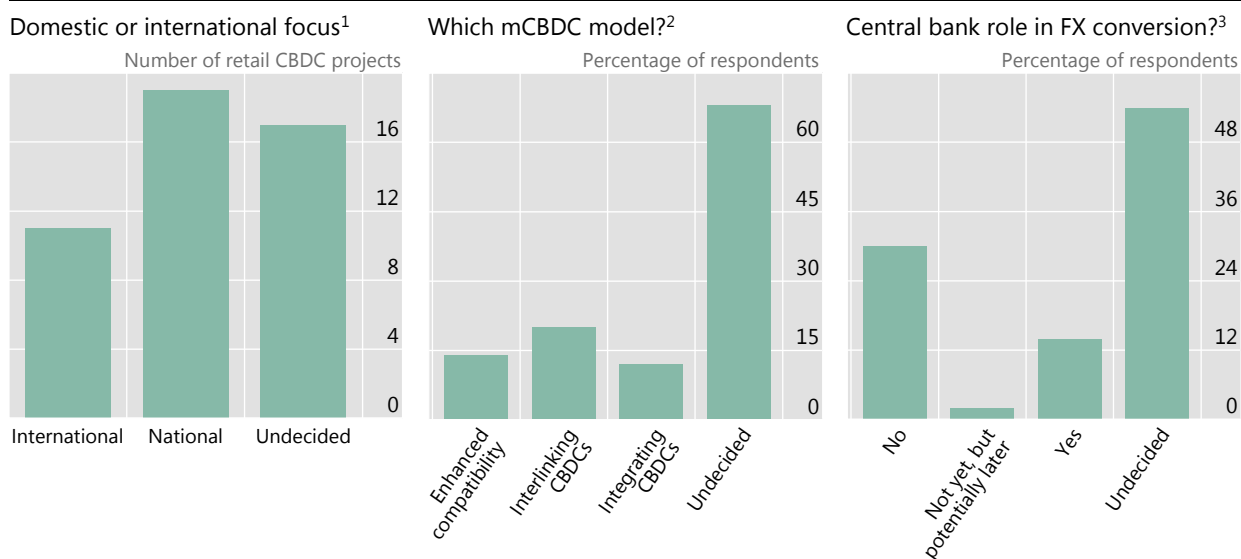
schemes across payment areas, such that the same necessary information could be used in each case to comply with AML/CFT requirements. Interlinked CBDCs (model 2) would have to rely on some common cross-border standard for identity schemes. An example is an approach that maps heterogeneous schemes to a shared template. Single mCBDC systems (model 3) could be built on similar standards. Yet even in this model, with a single, jointly operated mCBDC system, a single ID system would not be needed; it would be sufficient for participating jurisdictions to recognise one another's IDs. Making the most out of CBDCs in cross-currency transactions thus requires international cooperation.

Central banks around the world have embarked on developing mCBDC arrangements in close collaboration to foster more efficient cross-border payments. A prime example is the "mCBDC Bridge" project of the BIS Innovation Hub and its partner central banks in China, Hong Kong SAR, Thailand and the United Arab Emirates (model 3). This project explores how CBDCs could help to reduce costs, increase transparency and tackle regulatory complexities in payments.

A broader stocktake of central bank research and design efforts finds that, out of 47 public retail CBDC projects, 11 feature a cross-border dimension (Graph III.13, left-hand panel). Responses to a survey of major central banks highlight that about one in four is considering incorporating features to enhance cross-border and cross-currency settlement in future CBDC designs (centre panel). Among the central banks that do, all three mCBDC arrangements are being considered. While a single mCBDC (model 3) provides the most benefits from a technological perspective, the preferred choice at present is the interlinking mCBDC arrangement (model 2) – possibly reflecting the reduced need for cooperation. Additionally, some central banks are also considering taking on an operational role in FX conversion (right-hand panel).

mCBDC models offer an opportunity to improve cross-border payments

Graph III.13



<sup>1</sup> Based on the [April 2021 database update](#). <sup>2</sup> Central banks were asked to choose among mCBDC arrangement 1: Enhancing compatibility with international standards; mCBDC arrangement 2: Interlinking your CBDC system with a foreign system; or mCBDC arrangement 3: Integrating your CBDC into a single mCBDC system. More than one answer possible. For further details see Auer, Boar et al (2021). <sup>3</sup> The survey question reads "Would the central bank take on a novel role in the FX conversion process?".

Sources: R Auer, G Cornelli and J Frost, "Rise of the central bank digital currencies: drivers, approaches and technologies", *BIS Working Papers*, no 880, August 2020; R Auer, P Haene and H Holden, "Multi-CBDC arrangements and the future of cross-border payments", *BIS Papers*, no 115, March 2021; R Auer, C Boar, G Cornelli, J Frost, H Holden and A Wehrli, "CBDCs beyond borders: results from a survey of central banks", *BIS Papers*, no 116, June 2021.

Current and planned cross-border CBDC projects show that the future of the international financial system rests on upgrading it for the digital age. Different mCBDC arrangements might contribute towards this goal, but their detailed architecture will depend on the specific features of domestic CBDC systems. Even though payment system design is primarily a domestic choice, new technologies and models of cooperation will make it feasible to overcome the challenges faced by previous projects to interlink payment systems across borders.

## Conclusion

Central banks stand at the centre of a rapid transformation of the financial sector and the payment system. Innovations such as cryptocurrencies, stablecoins and the walled garden ecosystems of big techs all tend to work against the public good element that underpins the payment system. The DNA loop, which should encourage a virtuous circle of greater access, lower costs and better services, is also capable of fomenting a vicious circle of entrenched market power and data concentration. The eventual outcome will depend not only on technology but on the underlying market structure and data governance framework.

Central banks around the world are working to safeguard public trust in money and payments during this period of upheaval. To shape the payment system of the future, they are fully engaged in the development of retail and wholesale CBDCs, alongside other innovations to enhance conventional payment systems. The aim of all these efforts is to foster innovation that serves the public interest.

CBDCs represent a unique opportunity to design a technologically advanced representation of central bank money, one that offers the unique features of finality, liquidity and integrity. Such currencies could form the backbone of a highly efficient new digital payment system by enabling broad access and providing strong data governance and privacy standards based on digital ID. To realise the full potential of CBDCs for more efficient cross-border payments, international collaboration will be paramount. Cooperation on CBDC designs will also open up new ways for central banks to counter foreign currency substitution and strengthen monetary sovereignty.



## Glossary

**Access:** as used in this chapter, this means the access of households and businesses to payment services (see “financial inclusion”).

**Account-based CBDC:** a type of CBDC tied to an identification scheme, such that all users need to identify themselves to access it.

**Application programming interface (API):** a set of rules and specifications followed by software programmes to communicate with each other, and an interface between different software programmes that facilitates their interaction.

See [www.bis.org/bcbs/publ/d486.pdf](http://www.bis.org/bcbs/publ/d486.pdf).

**Central bank digital currency (CBDC):** a digital payment instrument, denominated in the national unit of account, that is a direct liability of the central bank.

See [www.bis.org/publ/othp33.pdf](http://www.bis.org/publ/othp33.pdf).

**Cross-border and cross-currency payments:** cross-border payments are those where the payer and payee reside in different jurisdictions. Many, but not all, of these are also cross-currency payments – that is, payments where the payer and payee are respectively debited and credited in different currencies. Payments within monetary unions or payments in a common invoice currency may be cross-border but not cross-currency.

See [www.bis.org/publ/qtrpdf/r\\_qt2003h.htm](http://www.bis.org/publ/qtrpdf/r_qt2003h.htm).

**Distributed ledger technology (DLT):** the processes and related technologies that enable nodes in a network (or arrangement) to securely propose, validate and record state changes (or updates) to a synchronised ledger that is distributed across the network’s nodes.

See [www.bis.org/cpmi/publ/d157.pdf](http://www.bis.org/cpmi/publ/d157.pdf).

**Data-Network-Activities (DNA) loop:** the self-reinforcing loop between **data**, **network externalities** and **activities**, as generated on big techs’ online platforms (social networks, e-commerce platforms and search engines), that allow different types of user to interact.

See <https://www.bis.org/publ/arpdf/ar2019e3.htm>.

**Efficiency:** the efficiency of payments refers to low costs, and in some cases also to the speed, quality and transparency of payments.

**Fast payment system (FPS):** a payment system in which the transmission of the payment message and the availability of final funds to the payee occur in real time or near-real time and on as near to a 24-hour and seven-day (24/7) basis as possible.

See [www.bis.org/cpmi/publ/d154.pdf](http://www.bis.org/cpmi/publ/d154.pdf).

**Federated digital ID:** a digital identity system in which an individual’s personal identity is stored in several distinct identity systems, while allowing for interoperability and authentication across systems and external applications.

**Financial inclusion:** universal access to, and frequent use of, a wide range of reasonably priced financial services, in particular transaction accounts.

See [www.worldbank.org/en/topic/financialinclusion/brief/achieving-universal-financial-access-by-2020](http://www.worldbank.org/en/topic/financialinclusion/brief/achieving-universal-financial-access-by-2020) and [www.bis.org/cpmi/publ/d191.pdf](http://www.bis.org/cpmi/publ/d191.pdf).

**Integrity:** compliance with rules against unlawful action, including the adherence to rules against bribery and corruption, anti-money laundering and combating the financing of terrorism; as well as consistent and complete reporting.  
See [www.imf.org/external/pubs/ft/fsa/eng/pdf/ch08.pdf](http://www.imf.org/external/pubs/ft/fsa/eng/pdf/ch08.pdf).

**Payment service provider (PSP):** an entity that may issue payment instruments or provide retail payment services. This can include commercial banks and non-bank financial institutions.

**Retail (or general-purpose) CBDC:** a CBDC for use by the general public.

**Safety:** the “safety” of different forms of money, in the context of their use as settlement assets, means the likelihood of the asset retaining its value to the holder, and hence its acceptability to others as a means of payment.  
See [www.bis.org/cpmi/publ/d55.pdf](http://www.bis.org/cpmi/publ/d55.pdf).

**Token-based CBDC:** a type of CBDC secured via passwords such as digital signatures that can be accessed anonymously.

**Ultimate finality:** final settlement in central bank money. Finality is achieved when settlement of an obligation is legally irrevocable and unconditional. The choice of settlement asset is important as, even when the original payment obligation is fully extinguished (ie paid with finality), there can be both credit and liquidity risks for the payee associated with holding the resulting settlement asset. The related term “ultimate settlement” combines the concept of settlement being final with the concept of the settlement asset being the least risky possible.  
See [www.bis.org/cpmi/publ/d55.pdf](http://www.bis.org/cpmi/publ/d55.pdf).

**Wholesale CBDC:** a CBDC for use by financial institutions (wholesale transactions) that is different from balances in traditional bank reserves or settlement accounts.  
See [www.bis.org/cpmi/publ/d174.pdf](http://www.bis.org/cpmi/publ/d174.pdf).

## Endnotes

- <sup>1</sup> See Group of central banks, *Central bank digital currencies: foundational principles and core features*, October 2020.
- <sup>2</sup> See Committee on Payments and Market Infrastructures (CPMI), *Fast payments – enhancing the speed and availability of retail payments*, November 2016.
- <sup>3</sup> See M Bech, J Hancock and W Zhang, “Fast retail payment systems”, *BIS Quarterly Review*, March 2020, p 28.
- <sup>4</sup> See S Foley, J Karlsen and T Putniņš, “Sex, drugs, and bitcoin: how much illegal activity is financed through cryptocurrencies?”, *The Review of Financial Studies*, vol 32, no 5, May 2019, pp 1798–853; M Paquet-Clouston, B Haslhofer and B Dupont, “Ransomware payments in the Bitcoin ecosystem”, *Journal of Cybersecurity*, May 2019, pp 1–11.
- <sup>5</sup> In early June 2021 the estimated annualised electricity consumption of the Bitcoin network was roughly the same as that of the Netherlands. See Cambridge Bitcoin Energy Consumption Index, [www.cbeci.org](http://www.cbeci.org).
- <sup>6</sup> For a discussion of the risks to stablecoins’ value backing, and potential use cases, see D Arner, R Auer and J Frost, “Stablecoins: risks, potential and regulation”, Bank of Spain, *Financial Stability Review*, November 2020.
- <sup>7</sup> See J Frost, L Gambacorta, Y Huang, H S Shin and P Zbinden, “BigTech and the changing structure of financial intermediation”, *Economic Policy*, vol 34, no 100, October 2019, pp 761–99.
- <sup>8</sup> See R McMorrow, “China tech groups given a month to fix antitrust practices”, *Financial Times*, 13 April 2021.
- <sup>9</sup> See F Restoy, “Fintech regulation: how to achieve a level playing field”, *FSI Occasional Papers*, no 17, February 2021.
- <sup>10</sup> See J Stiglitz and J Rosengard, *Economics of the Public Sector*, fourth edition, New York, W W Norton & Company, 2015.
- <sup>11</sup> See Reuters, “Brazil antitrust watchdog questions Facebook’s WhatsApp payment fees”, 28 July 2020.
- <sup>12</sup> See CPMI and World Bank, *Payment aspects of financial inclusion in the fintech era*, April 2020.
- <sup>13</sup> See M Kutzbach, A Lloro, J Weinstein and K Chu, “How America banks: household use of banking and financial services”, FDIC Survey, October 2020; R Auer, J Frost, T Lammer, T Rice and A Wadsworth, “Inclusive payments for the post-pandemic world”, *SUERF Policy Notes*, September 2020; World Bank, Findex.
- <sup>14</sup> See A Carstens, “The future of money and the payment system: what role for central banks”, lecture at Princeton University, Princeton, 5 December 2019.
- <sup>15</sup> See C Kahn, “How are payment accounts special?”, Payments Innovation Symposium, Federal Reserve Bank of Chicago, October 2016.
- <sup>16</sup> See BIS, “Central banks and payments in the digital era”, *Annual Economic Report*, June 2020, Chapter III.
- <sup>17</sup> See A Carstens, “Central bank digital currencies: putting a big idea into practice”, speech at the Peterson Institute for International Economics, 31 March 2021.
- <sup>18</sup> In today’s payment systems, both real-time and deferred net settlement are used. Examples of the latter include SNCE in Spain, IBPS in China and FPS in the United Kingdom, while examples of the former include TIPS in the euro area and BiR in Sweden. Among the CPMI members, 12 FPS use deferred net settlement while 15 use real-time settlement.
- <sup>19</sup> See C Boar and A Wehrli, “Ready, steady, go? – Results of the third BIS survey on central bank digital currency”, *BIS Papers*, no 114, January 2021.

- <sup>20</sup> See A Carstens, “The future of money and payments”, Bank of Ireland Whitaker Lecture, Dublin, 22 March 2019.
- <sup>21</sup> The various CBDC architectures are described in R Auer and R Böhme, “The technology of retail central bank digital currency”, *BIS Quarterly Review*, March 2020, pp 85–100; R Auer and R Böhme, “Central bank digital currency: the quest for minimally invasive technology”, *BIS Working Papers*, no 948, June 2021.
- <sup>22</sup> Banks must know or estimate borrowers’ solvency to price the associated risk. Public sector institutions may not have the same degree of relevant knowledge as local and specialised private lenders do. This is the core case for free markets, as presented in F Hayek, “The use of knowledge in society”, *American Economic Review*, vol 35, no 4, 1945, pp 519–30.
- <sup>23</sup> See the discussion of the e-CNY project in R Auer, G Cornelli and J Frost, “Rise of the central bank digital currencies: drivers, approaches and technologies”, *BIS Working Papers*, no 880, August 2020.
- <sup>24</sup> See eg J Powell, “Letter to Congressman French Hill”, 19 November 2019.
- <sup>25</sup> See BIS (2020), op cit; N Kocherlakota and N Wallace, “Incomplete record-keeping and optimal payment arrangements”, *Journal of Economic Theory*, vol 81, no 2, 1998, pp 272–89; C Kahn and W Roberds, “Why pay? An introduction to payments economics”, *Journal of Financial Intermediation*, vol 18, no 1, January 2009, pp 1–23.
- <sup>26</sup> See R Auer, C Monnet and H S Shin, “Permissioned distributed ledgers and the governance of money”, *BIS Working Papers*, no 924, January 2021.
- <sup>27</sup> See eg D Andolfatto, “Assessing the impact of central bank digital currency on private banks”, *The Economic Journal*, vol 131, no 634, February 2021, pp 525–40; and J Fernandez-Villaverde, D Sanches, L Schilling and H Uhlig, “Central bank digital currency: central banking for all?”, *NBER Working Papers*, no 26753, February 2020.
- <sup>28</sup> See U Bindseil, “Tiered CBDC and the financial system”, *ECB Working Paper Series*, no 2351, January 2020.
- <sup>29</sup> See Bindseil (2020), op cit.
- <sup>30</sup> See M Bordo and R Levine, “Central bank digital currency and the future of monetary policy”, *Hoover Institution Working Papers*, 2017. The authors advocate the introduction of CBDCs so that central banks can implement negative interest rate policies more effectively.
- <sup>31</sup> See CPMI and Markets Committee, *Central bank digital currencies*, March 2018.
- <sup>32</sup> US data show that reports of identity theft have risen steadily over the last years. See Federal Trade Commission, “Consumer Sentinel Network Data Book 2020”, February 2021.
- <sup>33</sup> Because of their digital, borderless nature, fully anonymous CBDCs could become a vehicle for illicit activity. Even with transaction limits, there is the potential for “smurfing”, or laundering the proceeds of illicit transactions into many smaller transactions or accounts.
- <sup>34</sup> For a relevant discussion, see UK Department for Digital, Culture, Media and Sport, “The UK digital identity and attributes trust framework”, February 2021.
- <sup>35</sup> See, for proposals of such semi-anonymous designs, Auer, Cornelli and Frost (2020), op cit; ECB, “Exploring anonymity in central bank digital currencies”, *In Focus*, no 4, December 2019; Reuters, *Technology News*, “China’s digital currency not seeking ‘full control’ of individuals’ details – central bank official”, 12 November 2019.
- <sup>36</sup> Switzerland’s “E-ID Referendum” took place on 7 March 2021. The referendum was on the introduction of a digital ID for Swiss citizens, which would be provided by private companies. While 36% of voters backed the proposal, 64% rejected it. See [www.ejpd.admin.ch/ejpd/de/home/themen/abstimmungen/bgeid.html](http://www.ejpd.admin.ch/ejpd/de/home/themen/abstimmungen/bgeid.html).
- <sup>37</sup> See B Cœuré, “Digital challenges to the international monetary and financial system”, speech at a conference on “The future of the international monetary system”, Luxembourg, 17 September 2019.

- <sup>38</sup> See R Auer, C Boar, G Cornelli, J Frost, H Holden and A Wehri, "CBDCs beyond borders: results from a survey of central banks", *BIS Papers*, no 116, June 2021.
- <sup>39</sup> See M Ferrari, A Mehl and L Stracca, "Central bank digital currency in an open economy", *ECB Working Paper Series*, no 2488, November 2020.
- <sup>40</sup> See G20 Finance Ministers and Central Bank Governors, Communiqué, Riyadh, 23 February 2020.
- <sup>41</sup> See CPMI, *Enhancing cross-border payments: building blocks of a global roadmap*, July 2020.
- <sup>42</sup> As argued by Carstens (2021), op cit.







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