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Special Column on China's Financial Development

Economic Development in Emerging Markets/Global South

CHINA & USA Collaboration a Necessity

By YASEEN ANWAR [*]

In 2020, on the cusp of the Pandemic, I was spotlighted in the Wharton Business School magazine on risks to the global economy. While 2020 was consumed by the coronavirus global pandemic and added a new dimension of risk that policy makers had not experienced, China and its leading global economic role and resiliency, was able to take decisive measures to stimulate its economy and restore its growth trajectory. That Impacted positively on the Asian economies. In the late 20th century, the old saying was when America sneezes, Europe catches a cold. Today when China sneezes, Asia and most of the world catches a cold.

Let us fast forward to 2024 and we find that many of the risks in 2020 remain not only unchecked but have been exacerbated. Much of what I had addressed in 2020 needs to be repeated as the underlying basis of the current uncertainties plaguing the global economy remain the same. Unilateral actions taken by the two leading economies are not consistent with collaboration and have led to trust deficits. While Coronavirus in 2020 created supply chain disruptions to the economy, today Geopolitical tensions have added more fuel to supply chain disruptions again.

Given the shocks to the global economy that we are facing—and will continue to face going forward, it is incumbent on China and the U.S. as well as the central banks to ensure inclusive and sustainable growth isn't stifled. The two leading economies must take proactive measures to provide sorely needed capital and appropriate macro-prudential regulations to stimulate growth that will spur employment and urbanization in emerging market economies. The key priority that has gathered global attention and where I see shifts and opportunities is Climate Change. Climate Change, a key priority of the U.S. and China, is an important common denominator that mandates collaboration.

Later I will cite other common denominators the two leading economies can leverage off to derive economic dividends for themselves and at the same time provide the emerging market economies the sorely needed capital to stimulate growth rates necessary to spur employment and drive down poverty. In other words, a win-win for all. This is only possible with Collaboration and without mixing ideological issues into the equation.

The two key ingredients for economic growth are infrastructure and access to finance, both critical for emerging market economies.

Harking back to my Alma Mater and in an earlier article I wrote, the Wharton Business School alum Michael Milken created the "junk bond" market in the 1980s to enable smaller non-rated companies to access capital. Besides triggering new opportunities for investors, this stimulated overall economic growth through new jobs and increased consumer purchasing power. Analogous to Milken's strategy, China's multitrillion-dollar Belt and Road Initiative for infrastructure financing gives access to capital to many emerging-market economies that have not been able to tap international bond markets. These economies have never had the opportunity to attract offshore investors who require ratings dictated by their corporate policies.

Infrastructure is and has been the engine of growth for most economies. The 19th century industrial revolution transformed agrarian-based economies into technological and manufacturing-based ones. In the case of the US, this shift, accelerated again in the 1930s by President Franklin Roosevelt's New Deal and

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the expansion of the domestic transportation network made the country the leading global economy in the 20th century.

The lack of quality infrastructure has hampered the economic development that many countries sorely need. For example, the shortage of power in Pakistan has impaired GDP growth rates of up to 3%. The absence of a developed transportation network for refrigerated trucks for distribution of agricultural products results in a 50% loss of perishable products.

Numerous countries have already felt the benefits of new employment opportunities and improved productivity thanks to BRI projects. In 2017, the Greek port of Piraeus handled more than 4m containers for onward distribution to Europe, Germany's Duisburg Inner Harbor has become one of the world's largest inland ports, and more than 10,000 companies are now operating across Africa through an expanding transportation network of rail and roads.

More than USD 60bn of new business has been generated across a range of operations, including increased investment and tourism into Africa; new housing in Indonesia; Power projects in Bangladesh; roads in Pakistan and Kazakhstan; and rising global and intraregional trade in the Association of Southeast Asian Nations (ASEAN).

It is apparent from the above that both countries have achieved successes in its history, the U.S. under the New Deal and China with its remarkable industrial economic development over the past 50 years in becoming one of the two largest economies. In addition, over the past 30 years, 750 million Chinese were taken out of poverty that took the U.S. 200 years to achieve. Lessons certainly need to be learned by all.

As highlighted earlier, a key common priority to both China and the US and to the world is Climate change. Climate Change has become an existential challenge of our time. Its importance has become even more elevated with Covid-19 as it has sensitized the world to how vulnerable we are to the forces of nature. An important step undertaken was evident on the development, issuance, and usage of the Belt & Road Inter-Bank Regular Cooperation Bonds (BRBR), proceeds of which are applied by the issuer to finance eligible Green Assets along the 'Belt & Road' countries and regions. The assets being financed comprise Eligible Green Asset Categories and qualify under the Center for International Research (CICERO) established by the U.N.

This also fits in well with Green Investment Principles (GIP) launched in 2018 by the UK and China Governments as a finance first initiative to Green the Belt & Road. The infrastructure investment under BRI will have a significant impact on the implementation of the Paris Agreement and UN sustainable goals (SDGs). The aim of GIP is to ensure that environmental friendliness, climate resilience, and social inclusiveness are built into new Investment projects.

Climate control has sensitized the world where financial risks need to be carefully assessed in the financial sector. Accounting firms can play an important role in assessing and providing expertise to Financial Institutions on how to adopt sound methodologies and tools to identify environmental risks to their loan portfolios and review their Audit reports accordingly. Most Central Banks have begun to review and adopt such Risk Mitigant measures with an emphasis on Disclosure.

As a matter of fact, with the help of IFC, Pakistan's Central Bank officially launched the ESRM (Environmental & Social Responsibility Manual) in November 2022 whereby all banks must monitor and comply with climate associated Risk in their loan portfolios and price them accordingly. A reporting process with Board level involvement has also been implemented.

As China announced carbon neutrality by 2060, it translates into trillions of dollars of new investment opportunities for green finance in both China and along the Belt and Road, as China's pledge will encourage other developing countries to come up with more ambitious goals and NDCs (Nationally Determined Contributions-Heart of Paris Agreement). For example, a recent study by GIP for one province in China found that new green investments between now and 2030 are estimated to exceed 13 trillion RMB (app. USD 2 trillion) and the magnitude for all over China will amount to hundreds of USD trillions.

It is interesting to note President Biden has made similar statements in support of Climate Risk and how new jobs can be created. Senator Kerry was appointed to be his Climate czar and has spoken at COP 26, 27, and 28.

I have noted USD Trillions will be required between now and 2030 in support of Climate Change. How will this massive requirement be fulfilled. One possibility is 'collaboration' between China and the US. The following are some historical examples of collaborative successes, pre-China's rise as an economic power.

1. Post WW 2, the US was a leading financier to the Global South under its USDA, USAID, EXIMBANK, OPIC, programs. Recipient countries including Indonesia, Pakistan, Egypt, Morocco, Sudan, Latin America, etc, not only benefitted, but also the US exporters that included farmers, Boeing Aircraft, etc. In collaboration with China's EXIMBANK and the Silk Road Fund, both countries could join forces in providing support to the recipient countries as well as to their own exporters. A win-win for all.

2. Export Credit Agencies of the US and Europe provided Aircraft financing in the '60s, 70's, & '80s to Egypt, Pakistan, Afghanistan, Jordan, and others that needed concessional financing/guarantees to connect with the rest of the world and a boon to its own exports.

3. In the 1980s, the US Exim bank/FCIA provided 100% insurance coverage for US exports to Iraq.

4. In 1978 a Bank of America led syndicate provided USD 1.2 Billion financing for the Jeddah Stage 4 Desalination plant to contractors from Italy, Japan, and Lebanon, a collaborative effort.

5. In 1976 a Bank of America led syndicate of global banks provided significant financing to Sonatrach, Algeria to upgrade its LNG energy sector. US banks were dominant globally due to their size.

6. In the 1980's, Bank of America provided over USD 1 Billion financing for the construction of the Basra, Iraq Petrochemical plant in support of US companies Lummus Corp. & Combustion Engineering.

While the above list is not exhaustive, it is clearly illustrative of the collaborative and huge historical precedent setting financing support provided by the US and Western financiers post WW 2. The question is how can the huge transition finance gap today amounting to USD Trillions required for climate change be raised. The answer is quite simple and can be replicated as follows:

1. Climate Change is a common denominator for both China and the US. China has already established Green Investment Principles (GIP) in support of BRI projects. The US could set an example of collaboration by joining forces on projects with China to accelerate achieving carbon neutrality.

2. Converging the huge resources of the US, European, and China Export Credit Agencies represents a significant pool of USD Billions. (US Exim, China Exim, Hermes, Coface, ECGD, etc.).

3. Collaboration among the Multilaterals represents another significant pool of USD Billions. (World Bank, Asian Development Bank, AIIB, IADB, EBRD, Africa Development Bank, KFAED, etc.).

4. The ten largest commercial banks globally are comprised mostly of US & Chinese institutions. Leveraging their combined balance sheets would provide hundreds of USD Billions in support of infrastructure finance and climate change.

5. Combining 2, 3, & 4 above, would unleash and attract the additional huge liquidity from the Private sector whose risk mitigant requirements would be satisfied with Co-Financing with the Multilaterals and export credit agencies. Asset managers like Brookfield, Blackrock, HSBC, etc. would follow their client's priorities that are shifting to more socially responsible investments.

6. An example of successful collaboration is Mongolia where 90% of its energy needs are derived from Coal fired plants. In 2023, the country launched its first Green Bond of USD60 Million with IFC as one its key investors. The financing will fund green projects to move away from coal.

From the above, it is abundantly clear that resources are available in support of a globally important priority of Climate Change. In fact, the most recent step taken was on January 8, 2024 by a Hong Kong green finance steering group whose members include the city's de facto central bank, securities regulator and stock exchange. It's first plan is to adopt International Financial Reporting Standards (IFRS) disclosure rules to help tap into low-carbon transition opportunities in Asia Pacific.

According to Asia Asset Management news, it is one of three key initiatives agreed at a meeting of the Green and Sustainable Finance Cross-Agency Steering Group meeting for 2024.

The second is to leverage technology to support sustainable reporting and data analysis, and the third is to support development of transition finance in order to consolidate Hong Kong's role as a leading sustainable finance hub. The initiative is to capture financing and investment opportunities from the Asia-Pacific region's low carbon transition.

Hong Kong's initiative is consistent with steps already taken by China's Green Investment Principles (GIP). As a former Central Banker involved in promoting sustainable banking, I can attest to the importance of the financial regulators in encouraging the flow of capital towards sustainable investments by enforcing standardized ESG reporting requirements to enable meaningful comparisons and risk assessment across organisations, while intensifying their focus on climate-related systemic risks and providing necessary guidance and practical tools for the regulated community.

Many countries and their regulators are adopting IFRS so that all financial institutions take these priorities seriously and in uniformity. Thus, it is incumbent for the two leading economies to adopt them and lead by example.

The financial sector plays a key role in addressing climate change and if undertaken in a global collaborative effort, we can harness the synergy for inclusiveness and sustainability towards greater economic growth for all and a better planet for our future generations.

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The Central Financial Work Conference and Flow of Funds Analysis to Ensure Better Alignment between the Real Economy and Financial Flows

By HERBERT POENISCH [*]

The Central Financial Commission was set up in March 2023 with the explicit mandate to supervise the financial sector and to ensure the implementation of the CPC's policy objectives.

This article will first outline why the CPC is not satisfied with the performance of the financial sector, in particular with regard to China's economic performance. As China's economy is different from existing models, finance should have Chinese characteristics in line with this. Secondly, the standard role of the financial system and the role of supervision in Western economies will be compared with China's reality. Finally, it is suggested to monitor finance in step with real economic developments by conducting a China flow-of-funds analysis to monitor financial flows between sectors.

1. The view of the CPC on finance

Setting up the new Central Financial Commission in the first place was a sign that the previous supervisory structure, central bank, bank and insurance supervision, and securities supervision did not fulfil the guidelines of the CPC to subordinate finance to the needs of society. Under the CPC's overall leadership, the Commission is responsible for top-level planning, coordination, overall advancement of financial stability and development and for supervising the work's implementation. This year's meeting addressed challenges and risks the financial industry faces such as the real estate crisis and local government debts.

President Xi has reiterated his concern with Western style of finance. A distaste for 'monopolistic predatory and vulnerable' financial industry appears to be motive for strengthened oversight and CPC control. Finance which creates risks and inequality needs stronger regulatory overhaul. It not only creates a huge gap between rich and poor but also triggers recurring economic and financial crises.

The conference stressed that finance is the lifeblood of the national economy and an important component of core national competitiveness. It called for building a financial powerhouse, strengthened supervision, an improved financial system, optimised financial services and the prevention of risk.

The economic and financial system with Chinese characteristics seeks not only greater equality and financial stability but also a prevention of financial risks. The operations of Chinese financial institutions under the guidance of the CPC should be driven by different imperatives compared to their Western counterparts. In a Western context, profitability, maximising returns for shareholders and adhering to regulatory requirements are the prime objectives. In contrast, Chinese institutions should hold as their prime directive the faithful execution of tasks assigned by the CPC. China should create its own high quality financial system, including digital innovation in line with CPC principles.

It was also mentioned that finance should follow Marxist principles. In planned economies finance was completely passive, following the real economic plans without any other role. Financial intermediation was done by the planning authorities, checking the contribution of finance was just a book keeping exercise. In addition, the financial sector had no justification to be rewarded for channelling savings to investment, ie real interest rates should be close to zero. In this context it is amazing that recent real interest rates in 2022 are positive at 2.1% in China while they are negative at -1.9% in the USA. The Chinese banks seems to be highly profitable for performing basic functions.

This surprising result is the outcome of higher inflation in the USA compared with China. In response, US banks should have raised interest rates more, whereas Chinese banks should have drastically lowered interest rates when deflation appeared on the horizon. The CPC also stipulated that finance with Chinese characteristics should prevent risks emerging. The recent financial risks in China, such as the crisis in the real estate sector as well as in local governments should be avoided in future.

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Market functioning was mentioned as an organisational force of financial markets, notably the bond market. However, allowing them to function requires stricter supervision.

In order to avoid present distortions, the performance of finance should be measured keeping close to real economic developments. There should not be an imbalance in supply and demand of real estate as well as balanced finance of local governments. A flow of funds analysis to monitor this will be suggested in part 3 below.

2. China compared with the international financial landscape

The size and value added of the Chinese financial industry approaches the levels of the most advanced financial systems such as the US and the UK. Their contribution to the value added GDP at 8% in China, is already close to that of around 10% in advanced financial systems. From a theoretical point, whether Marxist or Socialist, such contributions are excessive as channelling savings into investments should be a public good and not generate high returns. Only purely capitalist theories justify high returns on capital as a reward for providing savings for investment.

Although financial intermediation generates high returns in China, nominally a socialist economy, their structures are quite different.

The size of the banking sector at 288% of GDP in China is much larger than that in the USA at 74% of GDP, where banks play a subordinated role compared with the direct intermediation through financial markets. This is also reflected in a much higher M2 ratio at some 226% of GDP in China than the modest 78% of GDP in the USA, even after rounds of quantitative easing. Comparing the overall assets of the financial sector in the USA at 510% of GDP with some 344% of GDP in China suggests a more diversified financial intermediation in the USA. However, the latter excludes the shadow banking sector and digital finance which have not been fully captured in the statistics. A sophisticated financial system as in the USA demands a different supervisory approach than a system dominated by banks as in China.

The emphasis of supervision in China is on the banking system, with the major players owned by the state and thus subject to direct control by the CPC. The only important non-bank financial players posing risks to the financial system are the payment giants Alipay and Wechat Pay which will be strictly supervised as from 1 May 2024.

It is somewhat puzzling that the present supervisory structure, the Peoples' Bank of China responsible for financial stability and the Banking and Insurance Regulatory Commission (CBIRC) responsible for solid banking and insurance business have not yielded satisfactory results, as from now on all financial agents will be supervised by the new Central Financial Commission.

In contrast, the US supervisory structure has a number of authorities at the federal level. The Financial Industry Regulatory Authority (FINRA), the Financial Stability Oversight Council under the US Treasury. The regulators controlling the banking sector, different for federal and state institutions, are the Fed, the FDIC and the OCC. The financial markets are supervised by federal bodies, such as the Securities Commission, but mainly by self regulatory financial market bodies such as the stock market and bond market as well as the derivatives associations. They are guided by the ethics of the participants to prevent misuse of their regulations and thus damage the high quality and integrity of financial services. However, adherence to regulations and maximising profits are not subject to challenges in the Western system.

The CPC demand of preventing financial risks is completely different from Western views which focuses on managing risks. Any economic activity will create risks as there a different actors involved which act within their parameters. The main risks in finance are credit risk, market risk, maturity risk, operational risk and others such as cyber risk.

Credit risk is inevitable as various parties have different financial possibilities, and bankruptcies have occurred as long as finance exists. Lenders will have to assess the borrowers' risk and hold capital according to historical default losses. In acknowledgement of the Western supervisory practices, China will introduce new rules for China's banks to determine their credit risk exposures and capital requirements in line with the latest international standards as from the beginning of 2024.

In a market economy prices are fluctuating and creating market risks. It is the job of each agent to assess the risks incurred by value-at-risk calculations. How much will I lose if prices change by a certain percentage. Maturity risk is the basic risk of banking, borrowing short, lending long. Eliminating this risk would deprive banking of its prime function of maturity transformation.

Operational risk exists in any organisation and is multiplied as required by a sophisticated financial system. Can compliance be enforced by disciplinary commissions or will risks remain? Cyber risks multiply by the day and cyber commissions have to keep up with identifying and plugging these risks.

China's rush into digital finance such as P2P platforms caused enhanced risks. China's reaction has been to outlaw such platforms as well as cryptocurrencies.

Within the Western supervisory framework each economic agent is compelled to enforce risk management under institutional supervision or self enforced discipline within professional associations. Disregard for proper risk management can cause financial losses, loss of reputation, exclusion from professional associations and finally bankruptcy.

The multi-layered supervisory framework for the financial sector has been developed over the years enforcing discipline on financial agents to play by the rules. This should be accepted with some modifications even by a financial system with Chinese characteristics.

3. Flow of funds analysis to monitor financial flows in real time

In order to ensure that finance follows real economic developments, a flow of funds analysis will record the lending and borrowing by economic agents in real time. Thus flows of funds will be contained in a closed system like blood circulation. Leakages in risky areas will show up.

The flow of funds analysis allows to obtain a clear picture on the financial intermediation and financial imbalances, a main concern for Chinese leaders. The main principle is that the overall resources and uses of finance have to balance. The accounts are useful in documenting central economic trends. They show, for example, the growth of debt for each sector, changes in sources of credit for households, businesses and government and the development of new financial instruments for providing credit.

The economy will be divided into various sectors, such as government, enterprises, households and external sector. Each sector provides and receives inputs from other sectors. The finance sector provides credit and receives the deposits in various forms and maturities. In essence the financial sector is neutral as it balances receipts with outflows. If all financial flows are captured correctly, the flow of funds analysis should mirror real economic transactions. The net positions of each sector are the net creditor or debtor positions. In an ideal setting, the households and enterprises are the main creditors, and enterprises and government the main debtors as they invest in future projects.

The domestic balance is matched by the external balance. Only if there are sufficient domestic savings can an external surplus be achieved. If the domestic economy is living beyond its means the result will be an external current account deficit. The analysis thus follows the basic macroeconomic equation S=I+(X-M). In a domestic context these flows are recorded by the statistical offices. In international statistics, the balance is captured by the IMF in the International Investment Position (IIP),

Starting from this angle, China has accumulated a positive IIP position over the years by running current account surpluses. This was financed domestically by high household and enterprise savings, and a modest government deficit. This has enabled China to sustain a high investment ratio as well as an external surplus. Applying a flow of funds analysis, the economic sectors in China could be broken down further into central government and local governments. Enterprises could be broken down into SOE as well as private enterprises. The financing flows should be easy to capture as credit is mainly provided by banks. Their balance sheets should provide a breakdown into lending to the various sectors. Additional financial flows are provided by the stock market and the bond market.

All these flows should be captured in real time and plotted on a sectoral graph, showing which sectors received lending and which ones received deposits, or retained profits in case of the enterprise sector. At that stage there should be no leaks as any flows generated have to be received by any one of the sectors. Once the flows to/from each sector are known a net position can be calculated.

Only once the external sector is broken down into current account and financial account some leaks can occur. The first one would be through capital flows, ie forex reserves or renminbi can flow in/out without underlying real transactions which are recorded in the current account.

The second leak would be the internationalisation of renminbi. As long as renminbi is only used for currenct account transactions they would mirror real economic transactions. However, once renminbi balances are held outside the domestic financial system, ie not reinvested in the onshore financial market, they could pose a leak to the financial circle. Thus they would create a subsystem to the financial circle. In case of the USA this has already been happening in the eurodollar market, where eurodollar deposits are onlent to borrowers, such as issuers of eurodollar bonds or direct eurodollar lending by offshore banks, owned by US or non US owned.

4. Conclusion

While oversight of the financial system by the CPC is a logical step to avoid the excesses of finance serving only its own purposes, it needs to be clarified what needs to be done to align the financial system with the needs of the real economy. The financial players in China are mainly the indirect intermediaries,

such as banks and insurances which are already under CPC guidance through various channels, approval of activities at the board level as well as personnel appointments.

China's experience with non-bank financial activities has been limited to private payment systems as well as digital finance. The shadow banking system, including wealth management and LGFV has grown due to distortions in the financial sector rather than lack of oversight. The experience with non-banks has been mixed, the payment services provided for the majority of the population has been extremely successful without major risks, such as liquidity crunches. The experience with digital finance, such as P2P platforms and crypto currencies has not been successful.

China needs to diversify its financial system, with greater emphasis given to non-bank financial intermediation which calls for greater oversight by the authorities as the intermediaries are not directly controlled by the CPC. The same is true if digital finance was to play a bigger role in financial intermediation. In all these cases, the Western supervisory regulation of these types of financial intermediation as well as a flow-of-funds analysis should be consulted by China in the process of diversifying.

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The Future of China's Financial System*

By ANDREW SHENG AND XIAO GENG *

Last month, China held its first Central Financial Work Conference – the highest-level review of the financial sector that the Communist Party of China (CPC) conducts – since 2017. Given that China's financial sector includes the world's largest banking system by assets ($53.1 trillion) – and the second-largest (after the United States) by stock-market capitalization – and that the full Politburo Standing Committee attends the conference, the decisions made, and even the tone struck, have global implications.

The report released after the conference confirmed that the CPC's fundamental view of the financial sector has not changed. For China's leaders, the fundamental function of finance is to serve the real economy, and the government is responsible for maintaining stability, managing risks, and promoting homegrown innovation and high-quality development.

But the focus of the discussions shifted significantly since 2017, when the main priority was managing the imbalances arising from shadow banking, local-government spending, and real-estate excesses. All of the risks in these domains had been exacerbated by the massive monetary and fiscal stimulus that China's government implemented in the wake of the 2008 global financial crisis.

Last month, monetary and fiscal policy were again at the top of the agenda, but the circumstances – and associated challenges – were very different. After all, China tightened its macroeconomic-policy stance years ago. The key question now is: How should monetary and fiscal policy be adapted and deployed to support quality growth and structural reform in the face of changing internal and external conditions?

Among the most important external factors China's leaders must consider is the enduring looseness of monetary and fiscal policy in OECD countries. According to Federal Reserve data, the one-year real interest rate in the US has been mostly negative since 2009. This was true even last year: though the Fed consistently raised rates in an effort to rein in surging inflation, the one-year real interest rate amounted to -1.9%.

One finds similar rates in the eurozone, Japan, and the United Kingdom. But in China, real interest rates are much higher, even though the nominal interest rate is low. According to World Bank data, China's real interest rate in 2022 reached 2.1%, compared to just 0.2% in India.

This monetary-policy divergence has had far-reaching implications for China's financial sector and foreign-exchange markets. In the four quarters ending in June 2023, China's portfolio investment deficit (net outflow) reached $186 billion, compared to just $96 billion in the previous four quarters. And in the first nine months of 2023, China's real effective exchange rate fell by 5.4%, because its inflation rate was below that of its major trading partners.

Internally, China faces the momentous challenge of decarbonizing its economy. Achieving peak carbon emissions by 2030 and net-zero emissions by 2060 – per China's "30-60" commitment – is essential to enable high-quality, sustainable development. But, in the short term, decarbonization puts considerable downward pressure on growth. After all, China's manufacturing value-added still accounts for some 28% of GDP – far higher than the 13% average for OECD countries.

This tension between short-term considerations and long-term goals extends far beyond decarbonization; in fact, it defined last month's conference. To get to the long term, China must overcome short-term liquidity issues caused by recent shifts and shocks, including developed-economy interest-rate hikes, the COVID-19 pandemic, geopolitically motivated changes to supply chains, and falling asset prices.

Only with abundant liquidity can China counter deflationary pressures and weakening consumer and investor confidence; restore local-government balance sheets (which were severely damaged by the COVID-19 pandemic); and finance innovation (crucial to China's long-term prosperity). Massive amounts of funding will also be needed to meet China's decarbonization goals.

Mobilizing the necessary resources will require a lower real interest rate, which would also help China to address short-term issues like asset-price deflation and overcome medium- and long-term challenges,

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* This article first appeared on Project-Syndicate on November 29, 2023.

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from stabilizing the real-estate sector to coping with population aging. Fortunately, China built up considerable financial assets and reserves during its decades of rapid growth, so it has the monetary and fiscal space it needs to meet short-term liquidity needs and support long-term structural reforms.

While the conference report underscored areas where the central government will intervene to strengthen and stabilize the economy – from restoring corporate and local-government balance sheets to supporting investment in innovation – it would be a mistake to assume that China is embracing greater economic centralization. On the contrary, the conference report reaffirmed the need for the financial sector to support high-quality, sustainable development, by financing innovation, improving efficiency, and continuing to open up.

To this end, the report endorsed a major upgrading of the equity market, including diversifying channels for equity financing. Chinese leaders recognize the crucial role of such funding in sharing and managing risk in areas ranging from innovation and advanced manufacturing to food and energy security.

Moreover, the conference report highlighted China's need for private firms to contribute to economic growth and upgrading. This includes foreign companies and investors, whose interest in the Chinese market remains robust, despite geopolitical tensions. At the recent Shanghai China International Import Expo – one of the world's largest trade fairs – US firms comprised the largest foreign delegation.

China's massive and complex economy is defined by tensions between the central and local governments, the public and private sectors, various regions, and internal and external conditions. In such a system, a central authority must take responsibility for maintaining overall stability and defining the policy direction.

But just as unbridled liberalization would lead to chaos, excessive centralization would impede growth and development. That is why, even as it reaffirms the government's role in ensuring macroeconomic stability, the conference report reflects an enduring commitment to opening up the Chinese economy gradually to foreign investment and private competition. Add to that the thawing of US-China relations augured by Chinese President Xi Jinping's recent meeting with his American counterpart, Joe Biden, and there is plenty of reason to believe that the China of tomorrow will be more innovative, open, and dynamic than ever.

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Stable RMB Conducive to High Quality Development*

By LI JIANJUN *

The rules and transparency of the renminbi's exchange rate formation mechanism have become an important guarantee for promoting high-quality development and high-level opening-up, as well as a key tool for China to promote the reform of the global governance system, uphold economic globalization and improve the well-being of the people.

To push for the foreign exchange system reform, China has made significant strides including helping improve the market-oriented mechanism of the renminbi's exchange rate and making the process even more transparent. The transformation from a dual-track system to a single-rate system in 1994, and milestone events such as the "July 21 Exchange Rate Reform" in 2005 and the "Aug 11 Exchange Rate Reform" in 2015, are all crucial steps in market-driven reforms.

In addition, dynamic policy adjustments and the nurturing of market mechanisms have led to a clear and transparent regulatory framework for the renminbi's mid-point rate against the US dollar.

Making the renminbi's exchange rate more transparent has facilitated the coordinated development of both domestic and global factors, and will promote high-level openness, which will be chiefly reflected in the following:

Making the renminbi's exchange rate more transparent has boosted the confidence of market participants. When market participants have a clear understanding of the factors influencing the exchange rate causing fluctuations in the rate, they are better equipped to assess risks and make informed investment and trading decisions.

For instance, in the face of significant challenges such as the China-US trade tensions, the three-year-long COVID-19 pandemic, and the turbulent international political and economic environments, the flexibility of the renminbi's exchange rate has allowed market participants to swiftly adapt to the changes. They can make timely adjustments and stabilize their expectations, underscoring the renminbi's resilience in the face of shocks and maintaining its fundamental stability.

The priorities of security and development are balanced. A transparent exchange rate mechanism helps in the early detection of potential financial risks. For micro-level participants such as businesses and investors, having access to accurate and timely exchange rate information allows for better evaluation of currency risks. This enables them to make informed decisions on cross-border transactions, investments, and risk mitigation measures. Simultaneously, it facilitates international trade and capital flows, while reducing vulnerabilities in the financial system.

For macro-level stakeholders, including the government and central bank, a transparent exchange rate mechanism paves the way for a more accurate assessment of the economic impact of exchange rate fluctuations. This, in turn, enables the adjustment of monetary policies and macroeconomic measures, which helps maintain economic stability and sustainable development.

A more transparent renminbi exchange rate supports China's cooperation and engagement with other countries and international organizations, further propelling financial openness and the internationalization of the renminbi. For instance, against the backdrop of a flawed international monetary system based on the USD and ongoing efforts to reshape the international financial landscape, the enhanced transparency of the renminbi's exchange rate can boost China's involvement in global governance reform.

Transparency of the renminbi's exchange rate also boosts China's international reputation and helps it counter a series of unfounded Western allegations.

The transparency and clarity of the renminbi's exchange rate have been instrumental in facilitating China's high-quality development and high-level opening-up. Through sustained and deepening reforms, China's foreign exchange market mechanisms have significantly improved. But certain international entities continue to turn blind to the achievements of China's foreign exchange system reform and market-driven development, while occasionally disparaging the transparency of the renminbi's exchange rate.

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China's foreign exchange market has undergone progressive reforms, with the supply and demand factors increasingly influencing the determination of the exchange rate, with the fluctuations in the renminbi's exchange rate being primarily shaped by market dynamics, rather than government manipulation.

China possesses substantial foreign exchange reserves, which allows the People's Bank of China to maintain the stability of the renminbi's exchange rate. This makes market investors more confident about the Chinese currency's stability.

The renminbi's exchange rate is affected also by the global economic environment, including international trade dynamics and interest rate differentials. Thus, the fluctuations of the renminbi's exchange rate are mainly caused by the demand and supply in the market, and so-called "manipulation" by the Chinese government is a baseless accusation.

The renminbi's exchange rate serves as a vital link connecting domestic and international entities across the economic and financial sectors, making the foreign exchange market a critical domain for achieving a high-level of openness. In recent years, China's central bank has bolstered international communication efforts, disseminating information about the reforms and achievements of China's foreign exchange market.

These initiatives have enhanced global understanding of the transparency of the renminbi's exchange rate, elucidated China's commitment to reforming the foreign exchange market rules and regulations, and promoted high-level of openness. These efforts have dispelled misconceptions about China's exchange rate policies.

Moreover, through strengthened cooperation with other countries and regions, China's central bank has been instrumental in driving reforms and facilitating the improvement of the international monetary system.

The PBOC has also intensified collaboration with other countries, international organizations, and market regulatory bodies in the foreign exchange market. This cooperative approach facilitates information sharing and collectively promotes greater transparency and stability in the global foreign exchange market.

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Warranted Endeavor to Open Up*

By ZHANG YUYAN *

China's 45-year reform and opening up has seen the country progressively open up its coastal, inland, and border regions and embark on a path of positive interactions with the world, which serves as an outstanding example of warranted openness.

Is it always better for an economy to be more open? The answer depends on how warranted the openness is. This in turn is closely related to the economy's capacity to open up to the outside world.

For a country, its capacity for openness is the fundamental factor for the degree to which it opens to the outside world. The term "warranted openness" refers to the level of openness supported by the economy's capacity. As long as an economy stays within the range of warranted openness, the more it can open, the more it develops and the more secure it becomes. A country's openness capacity can be evaluated by its view on openness, systems for openness, and available resources.

Warranted openness and openness capacity imply the need to evaluate the openness of a country based on its development stage, avoiding being excessively conservative or blindly bold. As a country develops and its openness capacity builds up, warranted openness also grows progressively.

A country's capacity to open and its actual level of openness are mutually supportive and reinforcing. Only by focusing on nurturing its openness capacity can a country shoulder greater openness and gain higher benefits from it. On the other hand, high-level openness is an important guarantee for cultivating openness capacity, which develops only through global competition and cooperation, rather than standing still.

In today's global economic and trade landscape, cultivating openness capacity is particularly relevant to resisting the headwinds of rising protectionism, and encouraging countries to continue opening up.

According to the World Openness Report 2023, the World Openness Index 2022 was down by 0.4 percent from 2021 and 5.4 percent from 2008, continuing the downward trend over the past 15 years, with no signs of a stable foundation for recovery.

Despite sluggish indexes in openness policies and performance, there is still hope. According to the World Bank's classification, five out of the seven regions, including North America and Europe, saw openness declining, with only South Asia as well as East Asia and the Pacific showing an uptick.

It is noteworthy that emerging markets and developing economies are playing an increasingly important role in promoting global openness. From 2008 to 2022, the BRICS countries, countries involved in the Belt and Road Initiative, emerging markets and developing countries, and economies in East Asia and the Pacific have all seen rising openness indexes. The capacity cultivated by these economies will make the tailwinds of openness even stronger.

China is a prominent promoter of global openness and a remarkable fosterer of the openness capacity of developing countries.

For instance, the BRI is playing a major role in advancing the United Nations Sustainable Development Goals and nurturing development and the openness capacity of partner countries. Through infrastructure connectivity, unimpeded trade, and financial integration, the initiative is helping partner countries grow resource-related openness capacity. Through policy coordination and connecting people, it helps countries build systems for openness. Embedded with China's development and openness philosophy, the initiative supports partner countries to foster favorable views on openness.

China's modernization offers invaluable insights and references for the development and opening of developing countries. With high-level openness embedded throughout the country's modernization journey, the key takeaways are: how it balances opening and development, and how it ensures that the outcomes of openness are shared by the entire population. Its experiences and achievements provide a valuable reference for developing countries in constructing systems and views for openness.

In recent years, the cause of global openness has been facing daunting challenges. Fostering fresh momentum to expand openness is key to breaking through the obstacles. China will continue to uphold

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economic globalization, support countries worldwide, especially developing ones, to build capacity and expand openness, share the benefits of openness, and consistently promote the building of an open world economy and a community of shared future for mankind.

FDI Conducive to Forming Virtuous Cycle*

By LIU QING *

Just as Chinese leaders have repeatedly emphasized China always insists on reform and opening-up. Since the 20th National Congress of the Communist Party of China, the country has steadfastly pursued high-level opening-up to the world, achieving significant milestones in attracting and utilizing foreign capital.

In the first three quarters of 2023, China has maintained its position at the forefront of global foreign investment, with actual utilization showing a stable and positive trend, marking a promising start for economic development.

To better absorb and utilize foreign capital, China needs to enhance the appeal of its huge market and adjust the structure of foreign investment.

It is crucial to attract and utilize foreign capital from developed Western countries, balance the overall structure of foreign investment, diversify the investment risks, and strengthen links with the global supply chains.

The share of foreign direct investment from Western developed nations in China's total has been declining. Although the investment from the European Union in China increased by 92.2 percent in 2022, the newly established enterprises by EU countries in China only accounted for 7.6 percent of the total in the same year, with utilized foreign capital making up 6.2 percent. Therefore it is imperative to attract and utilize capital from Europe and the United States.

What's more, it is imperative to facilitate gradual shift of foreign investment to central, western, and northeastern China, optimizing regional layout and promoting coordinated regional development.

Currently, foreign investments in China are heavily concentrated in the economically advanced eastern coastal areas. The transfer of foreign investment to inland regions faces multiple challenges. This situation weakens the contributions of foreign investment to economic growth in China's central, western, and northeastern areas, exacerbating regional wealth disparities, and hindering the coordinated development of China's regional economies.

Efforts to guide foreign investment towards inland regions should focus on three key areas:

Implementing the 2022 Catalogue of Encouraged Industries for Foreign Investment to incentivize foreign investment in environmentally friendly industries in central, western, and northeastern regions, as well as Hainan province;

Leveraging international transportation channels such as the New International Land-Sea Trade Corridor and the China-Europe Railway Express, while advancing infrastructure in the aforementioned regions, so as to reduce the trade and logistics costs;

Encouraging collaborations between foreign-invested enterprises in China's eastern and inland regions, through mechanisms such as value and benefit sharing, to foster cooperative industrial transfer.

Foreign investment not only propels direct economic growth in China, it also sparks a ripple effect, driving technological advancements and innovation. This, in turn, boosts domestic product and process innovations, fostering growth in both consumption and product quality. As the scale of foreign investment in China continues to expand, it becomes crucial to blend the strategies of "attracting investment" and "attracting intelligence". This dual approach aims to enhance the quality of foreign capital utilization, maximize learning effects, and strengthen the processes of introduction, cooperation, digestion, absorption and re-innovation.

China should incentivize foreign-invested enterprises to set up R&D centers in the country. These centers, integral to China's technological innovation ecosystem, can leverage the spillover effects of foreign investment, promoting deeper technological collaboration and openness.

It should also seek to foster collaborations between foreign-invested enterprises and domestic companies in joint technological research, development, and industrial applications. Aligned with domestic consumer demand, this would promote synergy in innovation, accelerating the iterative evolution of traditional

* This article first appeared on China Daily on December 4, 2023.
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consumer goods and advancing forward-looking functional research to meet diverse domestic market needs.

Foreign-invested enterprises should also be encouraged to boost the quality and capacity of service offerings.

Data from the Ministry of Commerce reveal that in 2022, China attracted a substantial USD131.59 billion in foreign investment in the services sector, constituting nearly 70 percent of the total foreign investment in the country. Of this, newly established foreign-invested enterprises in high-tech services reached 10,019, with an investment of USD50.14 billion, accounting for 26.5 percent of the total foreign investment. As China's economy rapidly expands and urbanization progresses, the demand for services continues to soar, attracting significant foreign investment into this sector. It is imperative to encourage foreign-invested enterprises to enhance the quality and expand the capacity of their services, creating more domestic market demand through high-quality service offerings.

Reforms should be accelerated in the existing free trade zones and lead pilot projects in the free trade ports. Comprehensive trials should be carried out aimed at expanding the openness of the service industry and aligning it with international trade rules, so as to actively construct an open service system compatible with high international standards.

Market access restrictions for foreign investment in the service industry should be further relaxed, and the role of foreign investment as a bridge connecting China with international markets should be strengthened to ensure smooth dual-circulation.

Revising and expanding the Catalogue of Encouraged Industries for Foreign Investment can be considered to sensibly reduce the negative list for foreign investment in the service industry; channel foreign investment into key modern services with higher market access restrictions, addressing the gaps in the supply of quality goods and services in the domestic market, and promoting effective alignment of supply and demand in the service industry to better cater to market needs.

Looking ahead, despite the ongoing complexities of the global investment landscape, it is believed that as the international economic environment stabilizes, the scale and structure of foreign investment in China will continue to optimize as China's business environment further improves, and the advantages of the country's market size and complete industry chains become more pronounced. This optimization will not only drive market demand through superior supply but also fuel consumption growth and upgrades, unlocking the potential of the domestic market.

Economists' Take on China's Economic Outlook in 2024*

A Slower, but Healthier Dragon Year*

China heads into 2024 with relatively loose policy settings, but private sector sentiment constrained by property pessimism. Stimulus will reduce tail risks but we don't expect it will be sufficient to prevent the downtrend in growth to persist. We think three key themes will shape the macro outlook in 2024.

First, the economy will muddle through a tightly managed, multi-year clean-up process. The old "pre-sales" commodity housing model no more exists. Transitioning to a new model that boosts the role of State-directed public and social housing could prompt further consolidation among onshore property developers. There may be bouts of credit stress, but they're unlikely to be systemic.

Recent policy signals suggest that the real estate sector is pivoting toward a new model of increased social housing, in which the government takes a more active role in housing provision through land development, upgrading and renovation, and potentially, price subsidies. In this new "normal", the pace of housing sales will not revert to the pre-tightening (2021) trend in 2024.

At the same time, write-downs on housing inventories will weigh heavily on the balance sheets of property developers, who, faced with liquidity challenges and still-tentative demand, will likely experience increased credit stress. Episodic credit events will persist so long as the "stock" problem of the sector remains unresolved, and we think authorities' policy response will be similar to that in 2023 — at arm's length when it comes to single-name default risks, but deploying a range of monetary support and credit provisions to mitigate a collapse in the sector's "flow" activity, such as the recently-reported "white list" of developers eligible for additional funding.

However, the uncertainty around this assumption is admittedly high; there is no clear precedent for a housing downturn where property easing comes with stringent macroprudential guardrails for developers. On balance, we think the sector will continue to tread a long "staircase-shaped" recovery path — reflecting periods of idiosyncratic risk punctuated by periods of reactive stabilization efforts.

For households, the negative wealth effects of a continued housing correction will undermine consumer spending, which we think will slow to 5.2 percent in 2024 from 8.7 percent this year and continue to underperform the average pre-pandemic growth pace over the next five years. In 2024, this spending will to some extent be bolstered by a recovering labor market and wage growth.

Second, China is no longer the spender of last resort for the global economy, so don't expect robust reflation. Accelerating efforts to resolve local government debt issues will put increasing onus on centrally funded tools for countercyclical policies, while top-down pressure to deliver on growth in 2024 will likely be less acute. A more disciplined approach to capital allocation will drive only a small uptick in the overall fiscal impulse. Inflation should stage an unspectacular ascent as supply-side disinflationary pressures fade.

Local governments are no longer the engines of growth. Next year will also feature a continued cleanup in local government debt, in turn pushing the onus of countercyclical policymaking onto the central government authorities. Official central government debt was only 21 percent of GDP(end-2022), while the People's Bank of China's total assets were only around 35 percent of GDP(end-Oct), suggesting good headroom for further stimulus.

In our view, the steady focus on financial stability means the State Council's hawkish tone on local government finances during 2023 is set to stay. Cleaning up local government financing vehicle debt is a balancing act between introducing moral hazard and managing systemic risk, possibly leading to an uninspiring stream of mild corrective policies in 2024, focused initially on identifying and stabilizing the level of implicit debt in the system. Further steps that encourage debt swaps of local governments' implicit liabilities, the rollover of these debts by State banks, and the commercialization of some local government financing vehicle operations are also likely.

Our assessment of next year's growth target — and hence stimulus — is a benign one. Where the total government debt trend goes from here depends crucially on how much of a slowdown the authorities are prepared to tolerate. Our view is that the top-down pressure to deliver on growth is still elevated but has

* This article is first published on China Daily on December 18, 2023. It is based on perspectives of Louise Loo, Xiong Yi and Asian Development Bank's Asian Economic Development Outlook.

* By Louise Loo, lead economist at Oxford Economics.

receded somewhat, and an increasingly disciplined approach to capital allocation will constrain the overall fiscal impulse in 2024 to only a very small uptick. This is a conservative take relative to the prevailing market view of a possible "close to 5 percent" growth target in 2024.

Our judgment is that it is indeed possible, though not likely, that the authorities ultimately choose to stimulate their way to a high growth target for 2024.

Third, the investment recovery will be very sector-specific. The persistence of domestic regulatory uncertainties will temper the investment recovery, excluding property, in 2024. Sectors that benefit from policy tailwinds, plus high value-added manufacturing such as consumer electronics and autos, are likely to outperform.

Within manufacturing, emerging new industries — such as the ones authorities dub "the three new": batteries, renewables, and EVs, as well as high-technology manufacturing segments — will continue to expand rapidly in 2024, driven by policy tailwinds and still-resilient external and domestic demand in these areas.

Domestically, a top-down re-emphasis of the "Common Prosperity" framework across policymaking organs means that sectors such as consumer durables (e.g., high-tech goods), green technology and social and welfare segments such as pharmaceuticals and accommodation, are likely to emerge as longer-term winners.

Investments will be skewed toward strategic industries. Against a likely backdrop of stabilizing, though uninspiring, external demand, a bottoming out in industrial profits in 2023, and policy support for high-end manufacturing, investments outside of property are likely to gain further ground in 2024, to 4.2 percent from 3.4 percent this year. Private and public investments will continue to diverge, with the latter driven by ongoing fiscal stimulus.

Our 2024 forecast is: GDP growth to decelerate to 4.4 percent (consensus, 4.6 percent); inflation at 1.2 percent (consensus, 1.7 percent); nominal total social financing growth at 9.7 percent (down from 9.9 percent). With domestic fundamentals stabilizing and narrowing rate differentials with the US, the dollar-renminbi ratio should strengthen toward the 7.0-band by end-2024.

Our forecast also assumes that geopolitical tensions, including friction with the US over technological supremacy, and export controls, remain sufficiently well-contained to prevent a sharp collapse in investment in 2024. Still, the latent risk from ongoing China-US tensions will continue to drive firms' "friend-shoring" considerations, leading to further global economic fragmentation in the longer run.

China: Waiting for Policy Tailwind*

A year after the restrictions imposed because of the COVID-19 pandemic were lifted, China's economic recovery still lacks enough momentum. One thing is clear: China's economy as of today is operating at below potential. We believe a sizable negative output gap emerged in 2022 that has persisted in 2023, judging from the low capacity utilization rates, labor market slack, weak credit demand and, most importantly, negative consumer and producer prices inflation. Therefore, China's potential for growth should be higher than the 4.1 percent average growth in 2022-23. In our view, it should be in the 4.5-5 percent range. Growth could be even higher for a short period, if the economy can enter a cyclical rebound to close the negative output gap.

That cyclical rebound hasn't happened yet, primarily because after a prolonged property sector downturn and a sharp drop in inflation, a vicious loop has emerged among consumer spending, business profits and forward expectations for income and prices. A positive shock is required to break the loop. Unfortunately, both external demand and public spending have contracted for most of 2023, thus reinforcing rather than breaking this vicious circle.

Only the government can jump-start the economy through forceful and coordinated policy responses. The most important policy variable is the government's 2024 growth target. Our base case is the government will likely commit to boost growth by setting a growth target at "above 4.5 percent" for 2024, moderately higher than the 4.1 percent average growth in 2022-23. This will be consistent with our 4.7 percent real GDP growth and 1 percent inflation forecasts in 2024.

* By Xiong Yi, China chief economist at Deutsche Bank.

While the People's Bank of China will continue to ease lending conditions, to bring about recovery in the property market, more decisive fiscal policy support is necessary to see China's growth stabilizing at 4.7 percent in 2024, as per our forecast.

Fiscal expansion is the most effective policy tool to stimulate demand and boost prices in today's low-growth, low-inflation environment. The government finally changed its fiscal stance in Q3 by accelerating spending, helping local governments with their debt problems and, more recently, announcing stimulus packages for infrastructure investment and housing construction. It has also broken the long-standing 3 percent of GDP "glass ceiling" on budgetary deficits. We expect the fiscal stance will be 1.5-2 percent of GDP more expansionary in 2024, assuming the government will set a 3.8 percent of GDP fiscal deficit target, fully implement the RMB1 trillion (USD140.69 billion) infrastructure stimulus, and tap the PBOC's pledged supplementary lending facility for public housing projects.

Additional monetary easing is also warranted in 2024. We expect the PBOC to cut the medium-term lending facility rate by another 45 basis points before mid-2024 to bring bank interest rates below the natural rate. It will likely also cut the reserve requirement ratio by another 50 basis points, and inject liquidity through pledged supplementary lending and other long-term lending facilities, to make sure there's sufficient liquidity in the financial system to accommodate the upcoming fiscal expansion.

US/China growth dynamics and interest rate differentials will likely turn more favorable for the RMB. The US economy is expected to enter a mild recession in the first half of 2024. The Fed is expected to cut interest rates by a total of 150 bps before year-end, 100 bps more than the expected cut by the PBOC. The RMB will be supported by a sustained current account surplus and a reduction of capital outflows. We therefore expect the yuan will appreciate modestly by the end of 2024.

Consumption and Investment Fuel Growth Amid Challenges *

The Chinese economy grew by 4.9 percent in Q3 from the same quarter in 2022, bringing the growth for the first three quarters of 2023 to 5.2 percent.

East Asia's growth forecast for 2023 has revised up to 4.7 percent on higher-than-expected third quarter growth in China. The forecast for 2024 is maintained at 4.2 percent.

The Q3's growth was primarily driven by household consumption and public investment. Weak demand for exports and the real estate crisis continued to weigh on growth. To offset softer external demand and a prolonged property downturn, policy support is expected to continue.

In October, the Chinese authorities announced to issue treasury bonds of RMB1 trillion (USD140.69 billion) in Q4 to finance local government disaster prevention and recovery spending. The bonds will be split into two tranches, with RMB 500 billion(equivalent to 0.4 percent of GDP) to be used this year and the rest in 2024. The bond issue will cause the budget deficit to increase to 3.8 percent of GDP from 3.0 percent, and shows the government's determination to stabilize the economy.

Consumption and private investment are still regaining their footing, and the property sector remains contractionary. Although the growth momentum in services continues, latest PMI readings point to relatively weak manufacturing demand. The growth forecast for 2023 is revised up to 5.2 percent; the forecast for 2024 is unchanged.

* This is a report based on Asian Development Bank's Asian Economic Development Outlook released in December 2023.

IMI International Monetary Review

Global Economy

The Future Monetary System: From Vision to Reality*

By AGUSTÍN CARSTENS [*]

I would like to thank the Bank of Korea for inviting me.* I will use my time to talk about the financial system of the future: what we want from it, what would comprise it and how we will go about building it.

Before I do so, however, let me first say a few words about a totally different topic, artificial intelligence.

Two years ago, this was not at the top of the mind for many people. Today, we seem to talk of nothing else. Rapid advances in computing power and new algorithms on top of large reservoirs of data have led to systems so powerful, and so life-like, that they raise fundamental questions about how we will work and even function as a society in the future.

Who would have imagined a few years ago that we would soon have computer programs capable of absorbing practically all the accumulated knowledge of humanity? Or that we could use them to automate complex tasks, perform mundane activities and even solve previously unanswerable questions? Who can say with confidence how much further these systems will have advanced in one or two years' time?

Now I would like to contrast the progress made in AI with the speed and depth of adoption of digital innovation in financial systems.

In AI, advances today are measured in months, even weeks. In the financial system, it is in years, even decades.

To be sure, there have been some breakthroughs. Many countries have introduced fast payment systems. And we can now access basic banking services via apps, instead of visiting a bank branch. But flaws and roadblocks persist. Many of these are simply unacceptable given the technology we have at our disposal.

The fundamental problems we still face in financial systems, in advanced economies as well as emerging and developing ones, include the following:

- Many parts of society remain unbanked, without adequate payment, savings or credit services;
- Under-use of financial services due to slow and costly transactions;
- Low customer satisfaction; and
- Feeble connectivity, particularly for cross-border transactions.

These problems affect the economy and our daily lives in many ways; they put a drag on economic growth and hinder credit allocation, while aggravating income inequality and encouraging financial activity to migrate to unregulated "shadow" intermediaries.

Why do these problems persist?

Much of the blame rests on the way financial systems have evolved in separate silos and in a piecemeal way through minor tweaks of existing systems and processes. Legacy systems and outdated products abound. Many were adopted at a time when computing power and fast, affordable communications were scarce. Even today, money and assets reside at the edges of communication networks in separate proprietary databases or ledgers. These databases are patched together via third-party messaging systems, so that messages have to be sent back and forth in a complex web of bilateral links, all following a separate path from the one corresponding to money or other financial assets. This means that almost all transactions need to be reconciled before ultimately being settled with finality, often with significant delays. All of this makes transactions in our current system slow and costly. Cross-border transactions are even worse, as

* Keynote speech by Mr Agustín Carstens, at the CBDC & Future Monetary System Seminar, Seoul, Korea, 23 November 2023.

[*] Agustín Carstens, General Manager of the BIS.

systems need to be connected through international messaging networks on top of domestic ones, involving a raft of different legal and governance frameworks.

The cost of these settlement inefficiencies don't just burden existing transactions. There are also immense hidden costs. Many potentially worthwhile transactions never happen because they are too costly or complex. This represents a significant loss of economic opportunity. We don't know what we are missing because these transactions can't be made.

History teaches us that incremental fixes, while tempting and expedient in the short term, ultimately fall short. This is particularly true when incremental fixes accumulate on top of legacy systems. Each innovation may have a sound purpose, but the need to remain compatible with legacy systems holds it back.

This is why I am convinced that we need a quantum leap. And luckily, recent advances in technology make such a leap possible. Let me highlight the most significant of these advancements:

- Massive computing power;
- Cheap, instantaneous communication systems;
- Near universal internet connectivity and smartphone access;
- Available trusted computing, indispensable for security and privacy;
- The possibility of representing assets digitally, through tokens that encompass all of the information about an asset and what can be done with it; and, in the not so distant future;
- Rapid advances in artificial intelligence and quantum computing.

Exploiting these technological advances would allow us to build a financial system centred on the individual. This would enable a far-reaching democratisation of finance where each person has access to a digital representation of any asset for financial purposes, regardless of its value. And they would be able to send or receive such assets in any unit or amount, to anyone, anywhere, anytime, using any device.

In other words, individuals could experience the same level of ease, immediacy, privacy, security and reliability from the monetary and financial system that they find in other parts of their lives, such as when they make a long-distance call to anywhere practically for free, or make an e-commerce purchase from their smartphone. Society rightly expects nothing less. Yet the sad truth is that these growing expectations have outpaced the ability of our segmented financial systems to deliver.

The best way to knit together transactions and operations among markets and financial services is to bring them onto shared programmable platforms. This is what we have labelled a unified ledger.

A unified ledger would be a network of networks that would allow various components of the financial system to work seamlessly together. In particular, it would have the potential to combine the monetary system (that is, central bank money and commercial bank money) with other assets, making possible the instantaneous payment, clearing and settlement of any transaction.

Such a ledger would allow for the use of smart contracts and composability. A smart contract is a computer program that executes conditional "if/then" and "while" commands. Composability means that many smart contracts, covering a huge variety of transactions and situations, can be bundled together, like "money lego".

With these new functionalities, any sequence of transactions in programmable money and digital assets could be automated and seamlessly integrated. This would eliminate the need for manual interventions that delay transactions. It also would also enable simultaneous instant payments and atomic settlement across a whole range of assets.

From the above it is clear that the three main components of the unified ledger are digital and programmable money, digital assets and the digital infrastructure that supports their operation and integrity. And for all these three components to work together, the key step is tokenisation.

Tokenisation is a means of recording money and assets in a digital form on a programmable ledger. These tokens integrate the records of an asset normally found in a traditional database with the rules and logic governing their transfer. In practical terms, this means that users could transfer assets directly through programming instructions, rather than through intermediaries such as account managers who act on behalf of the user.

This transformation could unlock numerous benefits.

For one, it would enhance automation and facilitate faster, cheaper and more convenient transactions, alongside more efficient settlement processes. This could help overcome the settlement risks associated with delivery-versus-payment and payment-versus-payment arrangements – which are currently imperfectly dealt with through specialised institutions or work-arounds such as escrow.

Programmability could also enable the contingent performance of multiple transactions through smart contracts and composability. This opens the door to novel types of economic arrangement that are currently not feasible due to incentive and information frictions, even though they make perfect sense from an economic point of view.

So how do we implement effective, forward-looking tokenisation in the financial system?

A logical first step is to tokenise money. After all, money is the cornerstone of the financial system, underpinning every transaction. And in most transactions, in most countries, it has already gone digital.

Our fundamental trust in money stems from monetary systems built around central banks. The central bank issues the economy's currency that serves as the key unit of account and ensures the ultimate finality of payments through settlement on its balance sheet. Building on this trust, commercial banks then issue money in the form of deposits, which serve as the primary means of payment in our current two-tier monetary system.

This two-tier system with central bank and commercial bank money ensures that a dollar, euro or won deposited in one bank equals the exact amount of the same currency in another bank, or in the form of cash at any ATM. This crucial feature, termed the "singleness of money", was highlighted by Tommaso Padoa-Schioppa in a speech right here in Seoul almost 20 years ago.

The financial system of the future should keep what works in the current system, and build on it. This calls for a tokenised form of central bank money – in other words, a wholesale CBDC for use among financial institutions – and a tokenised version of commercial bank deposits. The CBDC would serve as the core of the system, while tokenised deposits would preserve the benefits of commercial bank money as the primary means of payment but with the added benefit of programmability and composability. Tokenised deposits would also ensure that banks can continue to provide the financial intermediation function that the economy requires. Finally, by preserving the current two-tiered monetary system, tokenised deposits preserve the singleness of money, unlike alternatives such as stablecoins.

For individuals, a monetary system based on wholesale CBDCs and tokenised deposits would feel similar to the current one. Indeed the introduction of wholesale CBDCs would not affect their customer experience at all. Users of tokenised deposits would still have bank accounts, which they could use for saving or transaction purposes. But these bank accounts would have greater functionality. For example, users could buy shares or other financial assets without the delays and costs associated with third-party intermediaries. As soon as they make a transaction, the trade will settle and the change in their money and asset holdings will show up in their digital wallets.

But tokenising the monetary system would be only a start. We need to cast the net wider and more boldly if we are to capture the full benefits of technology for everyday financial transactions.

Specifically, we should aim to tokenise claims on other financial and real assets, such as government securities, equities or property registrations.

To harness the full benefits of tokenisation, we need all the components to work together seamlessly. The key here is to guarantee that all the digital assets networks are interconnected and interoperable. The technology is already there to achieve this. The real challenge is to work out the legal and regulatory frameworks, the governance and the communication protocols needed for such a network of networks to operate. In short, we need to build the digital infrastructure. We need to be practical: it is hard to imagine that we will unify markets and transactions in every relevant jurisdiction. But we should aim for protocols that unify or interconnect systems, to make them interoperable.

As the envisaged financial market infrastructure will be a public good, public authorities need to take the lead here. Central banks should move fast to develop programmable wholesale CBDCs, as they are currently doing in many jurisdictions worldwide. Some may also consider issuing retail CBDCs, to further expand society's payment options. Financial authorities should facilitate the tokenisation of deposits, that is, the digitalisation of commercial bank money. Governments have a role to play by promoting the tokenisation of as many asset classes as possible. In addition, we need to solve sizeable governance and legal challenges. And we must put the right institutional structures in place.

To take one example, CBDCs are currently enmeshed in legal ambiguities in some jurisdictions. In most countries, the law constrains what central banks can issue as money, and evidence suggests current legal frameworks either do not allow CBDC issuance, or at best are unclear about it. This is why we need to get the legal framework right for CBDCs, and for tokenised systems more broadly.

No less important is the governance question of how to bring money and non-money claims onto a single programmable platform. Ideally, different assets should reside on the same unified ledger, so that they can be embedded in smart contracts that execute complex transactions.

Once again, technology is not the main impediment. Instead, it is the fact that most institutional ecosystems have grown up separately, and now need to be brought together. This will most likely require intermediate steps as we move towards the ideal of unified ledgers.

There will be many paths to the future monetary system. It is hard to say which will be the smoothest or easiest to navigate. The only way to find out is to take the first, tentative steps forward, to see what works and then recalibrate as needed. Already, many central banks are doing so. And the BIS is supporting them in these efforts.

Our Innovation Hub has been working on numerous projects, such as Projects Jura and Mariana, that address the specific technical questions that need to be resolved to speed the development and adoption of CBDCs and other tokenised assets, including commercial bank deposits. Meanwhile, we are exploring and experimenting with a unified ledger project, building on the findings of these projects as well as the New York Innovation Centre's Regulated Liability Network (RLN) proof-of-concept. If the scoping work is successful, we hope that this project will feature both tokenised central bank money and commercial bank deposits from multiple jurisdictions. And, with time, tokenised securities.

As well as these initiatives, we are providing advice and support to our central bank colleagues, including the Bank of Korea, on their own experiments.

This brings me to the Bank of Korea's CBDC project – which I will refer to as the digital won.

This important initiative aligns well with the vision of the future monetary system I have laid out today. It embeds a wholesale CBDC at the heart of the system and brings the regulated banking system on board through tokenised deposits on a shared ledger.

But while the monetary core of the digital won project has a familiar – if technologically enhanced – feel to it, other aspects of the project architecture are entirely new. These include the use of satellite platforms that interact with the monetary ledger, providing functionality for a wide variety of use cases, making the platform more flexible and open to market developments. In principle, I see the existence of such satellite platforms as being entirely consistent with the unified ledger concept, as long as they communicate with each other seamlessly. How they work in practice remains to be seen. Answering such questions is precisely what makes experiments like the digital won project so valuable.

There is another aspect of the digital won project that I would like to highlight, besides its architectural design and technical sophistication.

It is a partnership. The project brings together the Bank of Korea with the other key regulatory bodies in Korea, the Financial Services Commission and the Financial Supervisory Service. Other government agencies have been consulted and are on board. Legal questions have been, or are being, addressed. The banking sector is involved. As are other financial intermediaries.

This type of cooperative approach is crucial if a vision like a unified ledger is to be realised. Without this, I fear that we would end up with a fragmented, siloed system with many of the flaws we see in today's financial system still unresolved. Whatever its technical sophistication, that would be a big missed opportunity.

Let me conclude. The future monetary system needs wholesale central bank money at its core, complemented by tokenised commercial bank money and potentially other tokenised assets. And these need to be combined on a common digital infrastructure. The concept of a unified ledger is the vision, the "north star" in designing the future monetary system.

Turning this vision into reality requires us to go out and experiment. Only then can we learn about the challenges and how to overcome them. We must travel this road with determination and foresight, because it will be worth it. And as we do, let us be guided by our collective experience, wisdom, and the shared vision of a more efficient, transparent and inclusive financial future.

Above all, we urgently need a Neil Armstrong moment in our quest towards the unified ledger. We need to take that "one small step for a man, one giant leap for mankind". In our case, this could be the successful and complete tokenisation of wholesale CBDCs and commercial bank deposits.

IMI International Monetary Review

Global Linkages: Supply, Spillovers, and Common Challenges*

By LISA D. COOK *

It is fitting and timely that today we are gathered here to talk about global linkages. It is fitting not only because we are beside the Golden Gate—where, just a few blocks away, one can marvel at the massive cargo ships making their way to port—but also because this conference has once again brought together scholars and friends from as far away as Shanghai, Atlanta, and Fontainebleau. And it is timely because the discussion of the ties that bind us is as important as ever.

To start off this conference on global linkages, I am going to discuss supply shocks, policy spillovers, and common challenges faced by monetary policymakers in recent years and going forward. When the global pandemic hit in the spring of 2020, economies around the world shut down or sharply limited activity, especially for in-person services. Also, it quickly became apparent that shutdowns in any one economy were exacerbated by reduced availability of supplies from other economies.

Policymakers around the world faced the common challenge of supporting incomes and limiting the scarring from temporary shutdowns in activity. The response was similar across countries: fiscal support, particularly to help those most in need, although the magnitude differed, in part because of differences in fiscal space. Initially aimed at preventing sharp financial and economic deterioration, monetary policy easing was later extended to support the nascent economic recovery. Policy rates were cut to or held near zero in both advanced and emerging market economies. A wide range of central banks also bought assets to support market functioning and provide stimulus once overnight policy rates hit their effective lower bounds.

As economies gradually reopened, demand surged, especially for goods. But supply chains were slower to recover, leading to a global surge in inflation. That surge was followed by a further upswing in inflation after February 2022, when Russia's invasion of Ukraine caused a shock to global supplies of commodities, including oil and natural gas, food and fertilizers, and numerous manufacturing inputs.

With inflation unacceptably high, monetary policy turned toward tightening. Central banks in several emerging market economies began to tighten first, seeking to prevent a de-anchoring of inflation expectations that could cause elevated inflation to become entrenched. Starting in March 2022, the Federal Reserve raised its policy rate 5 1/4 percentage points, and it has been shrinking the size of its balance sheet since June of that year. Those actions have tightened U.S. financial conditions, acting to dampen U.S. aggregate demand. Activity in the housing sector has slowed significantly, with 30-year mortgage rates rising to more than 7 percent, and business spending has been constrained by high interest rates and reduced credit availability.

Over the past year, amid tightening financial conditions globally, inflation has come down from its peak in most economies. In the U.S., inflation (as measured by the 12-month change in the personal consumption expenditures price index) has fallen from 7.1 percent in June 2022 to 3.4 percent in September of this year. Core inflation has declined from a peak of 5.6 percent in February 2022 to 3.7 percent in September. I believe the Federal Reserve's actions contributed to this fall in inflation both by restraining aggregate demand and by keeping longer-term inflation expectations well anchored.

The fall in headline inflation was helped by declines in global commodity prices from their 2022 peaks. The spot price of Brent crude oil dropped from about USD115 per barrel in April 2022 to just over USD80 most recently. Global agricultural prices also have retreated from their peaks, though they remain elevated. These price declines occurred partly because the supply of energy and other commodities has been less disrupted than feared in mid-2022. In addition, the U.S. has become an increasingly important supplier of energy on the global market, with U.S. production of crude oil and natural gas reaching all-time high levels.

Importantly, global supply chains have largely recovered from their disruptions, with a return to pre-pandemic levels of indicators such as the share of manufacturing inputs in short supply. This recovery

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has occurred both because of supply responses motivated by high prices for transportation and key inputs and because of a shift of demand from goods back toward services. One big open question we will discuss at this conference is how global supply chains have changed since the pandemic.

Supply is also a significant part of the deceleration in U.S. shelter prices. A surge in completions of multifamily housing has contributed to the sharp slowing of rent increases on new leases this year. That slowing will feed over time into a continued decline of inflation in rents and owners' equivalent rents (the rents that homeowners forgo by living in their own homes rather than renting them out), thus contributing importantly to the expected further reduction in overall U.S. inflation.

In the U.S., labor supply, which fell because of the effects of the pandemic, has recovered significantly over the past two years, boosted by rebounds in labor force participation and immigration. The labor force participation rate, at 62.7 percent in October, has increased by 0.5 percentage point over the past 12 months, while participation of prime-age workers (those 25 to 54 years of age) has increased nearly twice as much. As a result, the prime-age participation rate is now above its pre-pandemic level and is near its highest point since 2002. The rise has been especially strong for prime-age women, whose participation recently reached a record-high level.

Over this year, payroll growth has slowed but remained strong. And a broad set of indicators show labor demand and labor supply coming into better balance. Currently, there are 1.5 job openings per unemployed worker. While still a high level historically, it is down from its peak of 2.0 early last year and is much closer to the pre-pandemic ratio of 1.2. Quits, which soared during the pandemic, have fallen since early 2022 and were close to their 2019 average in July, an indication that workers are less certain of finding another job in a cooling labor market. The workweek, which rose to very high levels during the pandemic when firms could not find enough workers, has returned to pre-pandemic levels. And surveys of employers suggest that hiring and retention are not as difficult as they were last year.

To be sure, it is a good thing that the easing in supply–demand imbalances in the labor market and the disinflation we are seeing thus far have taken place with only a modest increase in the unemployment rate, which was 3.9 percent in October. As I have discussed, that favorable combination likely reflected an easing of supply constraints, including in the labor market. I am also encouraged by the strong growth in labor productivity over the past two quarters, which, if sustained, could contribute to further progress toward price stability. I believe that a soft landing is possible, with continued disinflation and a strong labor market, but it is not assured.

In setting monetary policy, we need to seek a policy stance that is sufficiently restrictive to bring inflation back to 2 percent over time. I see risks as two sided, requiring us to balance the risk of not tightening enough against the risk of tightening too much. We have seen continued momentum in economic growth and consumer spending, even in the face of monetary policy tightening over the past year and a half. There is a risk that such continued momentum in demand could keep the economy and labor market tight and slow the pace of disinflation.

But I am also attuned to the risk of an unnecessarily sharp decline in economic activity and employment. Some parts of the economy are showing strain from tighter financial conditions. Households at the lower end of the income and wealth distributions have largely exhausted their excess savings, while delinquencies on auto loans and credit cards have risen to pre-pandemic levels or higher. Small businesses generally borrow for shorter terms than larger businesses, and they are facing tighter credit conditions and higher rates as they roll over those short-term loans. Homebuilders have done surprisingly well over the past year and a half, but they see the current level of mortgage rates as substantially slowing demand.

As we try to identify the full, lagged effects of monetary policy tightening, I am considering whether small businesses, the housing sector, and low- and moderate-income households could be warning of broader stress ahead.

The linkages we are talking about today connect us in ways that are economically beneficial but also have the potential to transmit stress. For that reason, I am also attentive to the risk of renewed global economic shocks. In recent weeks, oil prices have been volatile but are down from their September peaks. Amid highly elevated geopolitical tensions, however, the risk of a sharp rise in global energy prices remains salient. I also see signs of subdued economic growth in our major trading partners, whose health affects U.S. economic conditions related to our dual mandate. China's economic growth has remained below pre-pandemic rates, and activity in its property sector has been extremely weak. In Europe, recent data point to muted growth as the region deals with tightened financial conditions and the effects of past energy price shocks.

The Federal Open Market Committee is, of course, focused on our dual mandate of maximum employment and stable prices in the U.S. But I recognize that we act in a world of global markets and strong economic linkages. I pay close attention to the spillovers of our policies abroad and spillovers to our economy from monetary policy in other countries. And Federal Reserve staff have done considerable work over the years to understand and quantify these two-way spillovers. I will draw on some of that work in the discussion that follows.

We would expect the monetary policy of one country to have spillovers to other economies through three main channels.

The first channel works through domestic demand. Taking the U.S. as an example, when U.S. monetary policy tightens, U.S. aggregate demand slows, lowering U.S. imports of foreign products and dampening foreign gross domestic product (GDP) and foreign inflation. The second channel, the financial channel, captures the effects of the rise in U.S. longer-term yields that typically accompanies a tightening of U.S. monetary policy. Higher U.S. longer-term yields lead international investors to rebalance their portfolios from foreign to U.S. assets, tightening foreign financial conditions and reducing GDP and inflation in foreign economies. The fact that the bulk of international transactions are denominated in USD gives U.S. monetary policy an especially salient role through the financial channel.

The third channel is the exchange rate channel. A surprise increase in U.S. interest rates relative to foreign rates usually leads to dollar appreciation. This currency movement lowers the prices of foreign goods and services relative to those of the U.S., thereby restraining U.S. GDP and strengthening foreign GDP. The weaker currency and the resulting higher activity abroad tend to push up foreign inflation. But for economies that rely heavily on dollar-denominated debt and have less well-anchored inflation expectations, exchange rate depreciation can increase balance sheet mismatches and increase risk premia, with adverse consequences for GDP. So in the end, while currency depreciation unambiguously raises inflation, its effect on GDP can be ambiguous for some countries.

All told, the relative strength of the three channels determines the overall sign and magnitude of the foreign effects of domestic monetary policy tightening. However, quantifying spillovers is challenging, as the magnitudes (and even the signs) through the different channels depend on a multitude of structural features of the global economy.

Moreover, the size of spillover effects also depends on the drivers of the monetary policy tightening. For instance, when the tightening occurs in the context of high growth, the positive spillovers of that growth can partially offset the adverse spillovers from the tightening of financial conditions. The importance of the context in which monetary policy is changing is increasingly being emphasized in the literature, such as the paper to be presented in session 4 of this conference. The staff at the Federal Reserve also have looked at these differences using both event-study and model-based approaches.

An additional concern, very relevant to the current situation, is what happens when monetary policy is being tightened simultaneously across a wide set of economies. When this concurrent tightening happens, cross-border financial spillovers could amplify the effects of our respective tightening. Of course, when others are also tightening, each respective central bank may need to do a bit less to achieve the same outcomes because of these spillover effects. But in a world of uncertainty, it is hard to judge the exact size of these spillovers.

Given the extent of monetary tightening globally over the past two years, it is striking that emerging market economies have fared relatively well compared with what might have been expected. A number of factors may be at play. Several emerging market central banks undertook preemptive rate hikes that helped limit capital outflows, perhaps avoiding worse outcomes. Effective communication by advanced-economy central banks may also have prevented greater financial market volatility. In addition, in these recent stress episodes, commodity prices were rising rather than falling, which benefited some vulnerable emerging market economies that are commodity exporters. Of course, many other (commodity-importing) economies did not have such an advantage. And some emerging market and developing economies, especially those with high dollar-denominated debt, have struggled amid high commodity prices and food security issues as well as the resulting global rise in interest rates following the inflationary shocks from Russia's war against Ukraine.

In sum, U.S. monetary policy actions can produce spillovers abroad and create tradeoffs for foreign monetary policy. Spillovers from foreign economies can be sizable for the U.S. as well, especially in the current environment, in which many central banks have tightened policy rapidly to fight inflation.

In a world of spillovers and global linkages, all of us have our unique responsibilities. At the Federal Reserve, we are responsible for getting U.S. inflation down to our target. And in doing so, we are aware that we are affected by and have effects on the world around us. Conferences like this one help to explore and understand our common interests and common connections and to spark ideas for addressing the challenges that confront all of us.

IMI International Monetary Review

Macroprudential Policy

The Role of Macroprudential Policy in the Stabilisation of Macro-Financial Fluctuations *

By PABLO HERNÁNDEZ DE COS *

I would like to use this opportunity to consider the role of macroprudential policy in the stabilisation of macro-financial fluctuations and ways to enhance this role.

Macroprudential policy objectives

The global financial crisis taught us some important lessons from a financial stability perspective. Firstly, that individual financial institutions needed greater and higher quality capital and liquidity buffers. Second, that an exclusively microprudential approach to capital requirements cannot take into account how the actions of individual banks impact the financial system as a whole, interacting with those of other banks and of the rest of the players in the system, and influencing the probability of future crises.

As a consequence, and focusing on the banking sector, the Basel Committee on Banking Supervision (BCBS) undertook an ambitious overhaul of the prudential regulatory framework, known as Basel III, which is now very close to being fully transposed into the legislation of the main jurisdictions.

Together with a strengthening of microprudential requirements to boost individual bank resilience, a significant aspect of this reform was the introduction of macroprudential policy, with the specific goal of mitigating the accumulation of systemic risk in the financial system, both over financial cycles (time dimension) and across financial market participants (cross- sectional dimension). The reasoning behind this goal is that the materialisation of systemic risk can impair the financial system and disrupt the provision of financial services, with serious negative effects for the real economy.

Importantly, macroprudential policy is designed not only to improve the resilience of the financial system against the materialisation of these two dimensions of systemic risk, but also to lean against the root causes of systemic threats and vulnerabilities and their accumulation over time.

Indeed, even if macroprudential policy does not fully eliminate systemic risk, empirical evidence suggests that it can significantly reduce it. Moreover, limiting the aggregate risk assumed during financial expansions reduces the severity of systemic risk materialisation. And the accumulation of capital buffers to absorb losses during bust periods allows a speedier recovery in the provision of financial services to the real economy .

Moreover, bearing in mind that, through a number of different channels, financial conditions can be a major driver of the business cycle, the conduct of an active macroprudential policy will also generally help to temper the growth of nominal and real activity in boom phases and also their decline during downturns, which should moreover become less frequent.

Hence, macroprudential policy can be conducive to a less volatile growth path and less hysteresis during crises.

In this regard, macroprudential policy can be seen as a complement to monetary and fiscal policies with regard to their macroeconomic stability objective.

* Speech by Mr Pablo Hernández de Cos, at the Conference on Financial Stability, organised by the Banco de Portugal, Lisbon, 2 October 2023.

* Pablo Hernández de Cos, Governor of the Bank of Spain.

The role of macroprudential policies in stabilising the economy might be particularly relevant in the European Monetary Union (EMU), where a common monetary policy is shared by countries whose economic and financial cycles are still heterogeneous and where, in the absence of a common permanent fiscal capacity, national fiscal policy is left alone to counteract the negative consequences of idiosyncratic shocks or common shocks that generate different heterogeneous effects across member countries .

Looking ahead, this potential stabilisation role of macroprudential policy could be particularly relevant given the presence of high levels of structural public deficits and debt in many countries, which has significantly reduced the space available for fiscal policy to play its stabilisation role.

The outbreak of the COVID-19 pandemic, when fiscal, monetary and macroprudential policies acted jointly to support the real economy, illustrates this stabilization role. However, macroprudential policy was constrained by the fact that the accumulated macroprudential buffers existing at its onset were small or non-existent in many jurisdictions, given the pre- crisis context of very limited signs of any build-up of financial systemic risk.

A stronger role of macroprudential policy to effectively address adverse shocks that occur independently of the financial cycle – as the COVID crisis - will require, therefore, increasing the policy space generated by macroprudential buffers.

Capital buffers and buffer usability

In the case of the banking sector –that part of the financial system for which macroprudential policy is most developed – capital buffer requirements and limits on lending standards are the main macroprudential tools.

Let me focus on capital buffers. In Europe, for example, the combined buffer requirements (CBR), which are placed on top of minimum capital requirements, comprise the capital conservation buffer, the systemic risk buffer, buffers for global and other systemically important institutions and the countercyclical capital buffer (CcyB). Importantly, some of these buffers are releasable by authorities, in particular the CcyB.

This distinction between releasable a non-releasable buffers is key. When banks experience losses, they can decide on their own to dip into the macroprudential buffers to absorb them. This would not involve a breach of minimum capital requirements, but banks would still have to face restrictions on their profit distributions via dividend and bonus pay -outs and share buybacks. Or macroprudential authorities may decide to release the CcyB, which would automatically increase banks' available voluntary buffers. In this second case, dipping into the enlarged voluntary buffer would not involve profit distribution restrictions for banks.

The CCyB has the primary objective of ensuring that the banking sector as a whole has an additional capital buffer, beyond microprudential requirements, which could be used to absorb losses in a downturn that is preceded by a period of excessive credit growth associated with the build-up of systemic risks. During business cycle downturns and financial crises, banks would be allowed to use this additional capital headroom instead of deleveraging. In this manner, the CCyB would help to sustain the supply of credit to the economy in bad times. The initial regulatory focus for the CCyB is, therefore, the credit cycle and bank resilience.

What makes the CCyB different from non-releasable macroprudential buffers is, therefore, that it can be reduced (released) by the authorities (if necessary, all the way down to zero) when risk materialises. For a given level of an institution's CET1 ratio, the release of all or part of the CCyB requirement means that the management buffer of the bank automatically increases.

What do we know about the effectiveness of this framework?

In contrast to microprudential policy, the effectiveness of macroprudential policy cannot be analysed simply by assessing whether a certain increase in the level of capital allows a given bank to absorb a systemic shock of a given intensity. This is certainly relevant, but the goal of macroprudential policy is also to induce banks to absorb losses while continuing to provide credit to the real economy in times of stress and therefore to smooth financial cycles.

In this regard, the effectiveness of macroprudential buffers depends on their usability, which can be defined precisely as the willingness of banks to dip into the buffers in order to maintain the flow of credit to the real economy. If buffer usability is low, banks will have greater incentives to deleverage in response to adverse macro -financial shocks.

The usability of voluntary buffers should not be taken for granted . Market pressure and profitability considerations could provide incentives to banks to conserve these resources, and deleverage instead. Uncertainty about the cost and time path for rebuilding these buffers could also disincentivise their use.

The academic literature generally shows that higher capital ratios allow banks to satisfy loan demand more easily, in particular in periods of stress. However, there is more limited agreement on whether the relevant factor is the total level of capital or the voluntary buffer, that is to say the gap between the actual level of capital and the capital requirements. This issue is highly relevant to the design of the macroprudential framework.

If the only relevant factor for smoothing financial cycles is the absolute level of capital, then macroprudential policy should concentrate its efforts on the accumulation of non-releasable buffers, assuming that banks will make use of them if they incur losses.

In contrast, if the relevant factor is not only the absolute level of capital, but the distance from capital requirements, then the availability of releasable macroprudential buffers could play a key role in mitigating the impact of systemic shocks, as their release would automatically increase voluntary buffers and thus contribute to a stable provision of credit during periods of materialisation of losses.

The empirical evidence gathered in the euro area and the United States during the pandemic shows the unwillingness of banks to dip into regulatory buffers and that the size of voluntary buffers was the main factor determining the propensity of banks to keep lending to non- financial corporations (NFCs). In particular, banks with low capital headroom lent less during the pandemic than those banks with large voluntary buffers.

This is precisely the main reason behind the benefits of releasing buffers such as the CCyB during systemic events. The empirical studies assessing the role of released buffers in Europe during the pandemic show that they helped support the provision of credit to companies and households.

In particular, recent evidence from the United Kingdom shows that banks that benefitted more from the release of the CCyB, because they had either a higher share of credit within their risk-weighted assets or lower capital headroom, granted mortgages for higher amounts with lower interest rates during COVID-19.

Research under way at the Banco de España seemingly corroborates these benefits, by identifying, in particular, that banks increased lending in jurisdictions where the CCyB was released in response to the pandemic, and that these positive effects were mainly significant for the most capital constrained banks, which are precisely those banks found to cut lending more in the absence of measures.

For the particular case of the Spanish banking system, there is also evidence that voluntary buffers, not absolute capital levels, were more relevant determinants of the willingness of banks to continue lending during the COVID-19 crisis. Specifically, for banks with smaller voluntary buffers, it is possible to identify a significant negative (differential) variation in the supply of loans to NFCs with which they had more recent, and hence weaker, banking relationships.

Furthermore, when loans with COVID-19 public guarantees (which introduced a significant positive credit supply shock) are excluded from the analysis, institutions with lower voluntary buffers are found to have granted significantly less overall credit to NFCs during the pandemic. This shows that the COVID-19 public guarantees compensated for the higher propensity of banks with lower voluntary buffers to reduce their loan supply. Hence, this finding adds up to the evidence that the interaction of fiscal policy and financial stability proved fundamental in the pandemic, in a context in which there were no releasable capital buffers, as was the case for Spain.

Increasing releasable macroprudential buffers

Two main conclusions can be drawn from the available evidence summarised above. First, banks seem to be unwilling to dip into their unreleased buffers when losses materialise, which means that buffers may not fulfil their role as shock absorbers. Second, releasable buffers (the CCyB, mainly) seem to be used by banks when released. The main corollary of this evidence should be that there might be a need to increase releasable buffers that can be released during crises, in particular the CCyB.

In addition, as discussed in the first part of my address, there might be reasons to defend a more flexible and active use of the CCyB.

Under the current framework, the activation of the CCyB is linked only to signals of systemic credit imbalances. The experience during the outbreak of the COVID-19 pandemic, and, to some extent, also from the Russian invasion of Ukraine and the subsequent high level of geopolitical tensions, has shown, however, that a systemic crisis can and does arise for reasons exogenous to the economic and financial

systems. As these exogenous shocks are unpredictable and may not be preceded by a financial boom that warrants the activation of the CCyB, under the original framework we cannot guarantee that the CCyB will be at a positive level when they arise.

Moreover, if we would like to use the CCyB as a complement to the traditional macroeconomic stabilising policies, its activation would also be required even if signals of credit imbalances are neutral, for example in the presence of a positive output gap.

This flexible and more active use would also mitigate the inaction bias, which is another common concern in the area of macroprudential policies.

However, the practical implementation of higher releasable buffers poses several important questions.

In particular, when evaluating the introduction of more releasable macroprudential capital buffers, it is necessary to consider whether it can be neutral in terms of total capital levels, both at inception and at different points of the financial cycle. In fact, higher capital ratios in a steady state could have a dampening effect on credit provision and, therefore, on potential GDP, so it is crucial to evaluate whether these costs are offset by the benefits in terms of lower probabilities of financial crises and, should they arise, of them being shallower.

If the overall capital levels are to be preserved in periods of stress, total capital requirements must increase during booms or even normal and intermediate times. This approach would be capital neutral in periods of stress, but entail an overall capital increase in other periods, and hence through the cycle. Otherwise, the greater release and use of capital buffers during busts could leave banks, and indeed the whole financial system, more vulnerable to further losses in periods of stress. The alternative, increasing releasable buffers while maintaining current capital levels, would be capital neutral at inception, but it would plausibly entail lower capital through the cycle.

This debate has given rise to the concept of a positive neutral CCyB in normal times, first introduced by the Bank of England in 2016. This term refers to the introduction of a positive CCyB requirement level even in the absence of financial imbalances. Since the outbreak of the pandemic, the debate has naturally gained ground in many institutions. Indeed, the Basel Committee published last year a newsletter clarifying that the Basel framework leaves open the possibility of introducing a positive neutral CCyB.13 The ECB and the ESRB have also reiterated their support for this approach. Indeed, many European countries have gradually adopted this new CCyB calibration approach in recent years, including Croatia, Cyprus, Estonia, Ireland, Lithuania, the Netherlands, Norway and Sweden.

Let me illustrate how a positive neutral CCyB can be set throughout the financial cycle. To this end, I will take as a reference the analytical framework described by De Nederlandsche Bank, where four different phases associated with the degree of systemic risk are distinguished. First, the recovery phase, which is the one that follows a crisis, is a period of recovery of deteriorated balance sheets, both in the financial system and among households and businesses. In this phase, the CCyB is maintained at zero. Second, in the normality phase, the balance sheet recovery is well under way and the CCyB is built up to reach the neutral level. Third, in the phase of increased risk, when excessive developments in lending or asset prices lead to higher systemic risk, the CCyB should be raised above the neutral level. Finally, in the materialisation phase, risk materialises and the CCyB is fully or partly released.

Obviously, not all these phases need to happen in the aforementioned stylised order. For example, the phase of increased risk could be curbed as a consequence of the increase in the CCyB above neutral levels or the use of other macroprudential tools. If that is the case, the CCyB could be progressively released to the neutral level. Or, after reaching the neutral level, the economy could enter a recession abruptly, before vulnerability signals accumulate, thus entailing losses for the banking system. Depending on the circumstances, a total or partial release of the buffer could be advisable to smooth the business cycle, thus helping monetary and fiscal policy to close the output gap.

A decision on introducing a positive neutral CCyB should weigh up the different pros and cons of such an approach.

Regarding the costs and benefits, the estimations of the elasticity of credit and GDP to changes in capital requirements during recessions and expansions could be useful. In the Spanish case, for example, the available evidence shows that an increase in an expansionary period of 1 percentage point (pp) in the capital-to-risk-weighted assets ratio, consistent with a tightening of credit requirements, would not have negative effects on total credit to the corporate sector, while it would lead to a reduction of 0.5 pp in credit to households and of 0.2 pp in GDP.16 By contrast, the same amount of capital being released during a

crisis would lead to an increase of up to 3.5 pp in credit to households and the corporate sector and of 1.6 pp in GDP.

This evidence supports the existence of an asymmetry between the costs of activating the CCyB in normal times, even in the absence of significant systemic imbalances, and the benefits of its release during downturns. The gradual activation of the buffer at an early stage makes capital planning easier for banks when conditions are good, reducing potential negative credit supply effects of the activation. It allows also to take into account uncertainty in the identification of risks, which can result in a delay and a more rapid activation later in the cycle.

But the analysis of the pros and cons is more complex. In this regard, a key problem for a macroprudential policymaker is to decide whether we are in "normal times" at a particular time. In this regard, authorities can employ a broad range of indicators, including the credit- to-GDP gap and other financial and macroeconomic metrics , such as the output gap.

Furthermore, it is also necessary to assess the appropriate neutral level of the CCyB in normal times. This may depend on:

- The (cyclical and structural) characteristics of the domestic economy that can affect the estimated intensity of systemic crises.
- The desired level of macroeconomic stabilisation capacity afforded to national macroprudential policies in light of the available buffers in other policy instruments.
- The (cyclical and structural) characteristics of the banking system, such as the intensity of competition and sectoral composition of assets and liabilities, which can affect the capacity to withstand potential shocks, under both baseline and adverse scenarios.
- Other factors, such as the degree of domestic and cross -border interconnectedness of the financial system and the overall economy, also need to be considered. These factors have a significant impact on the vulnerability of the economy to internal and external shocks.

Authorities that have moved to a positive neutral CCyB have used different approach to calibrate the positive neutral rate, including analyses of historical losses, stress test models, assessments of the impact of buffer releases during the pandemic and expert judgement18.

All these considerations, which may vary among jurisdictions and therefore could condition the desirability of moving to a positive neutral CCyB, justify the position of the BCBS, which supports and sees the benefits of the authorities' ability to set a positive cycle-neutral CCyB rate voluntarily.

In particular, the Committee noted that circumstances indeed vary across jurisdictions, including the macroeconomic conditions and the range of macroprudential tools available, for example sectoral buffers, and their use to generate sufficient capital for banks to absorb unpredictable shocks. As a result, not all authorities consider a positive cycle-neutral CCyB rate to be appropriate in their jurisdictions.

In any case, it was considered important to stress that in the event authorities implement such an approach, they should continue to comply with the existing Basel standards, including the agreed calibration of the minimum requirements and other regulatory buffers.

Conclusions

Macroprudential policy emerged as a new policy domain only after the global financial crisis. Ever since, we have witnessed and suffered fresh systemic crises and turmoil stemming from exogenous shocks, such as the COVID-19 pandemic and the Russian invasion of Ukraine, while macroprudential policy was designed to address events of systemic stress that are fundamentally endogenous to the financial system. We have also found some indications of a positive relationship between lending and the capital headroom of banks (i.e. the surplus of a bank's capital above all minimum regulatory requirements and regulatory buffers). As a result, there might be a case for increasing releasable buffers, in particular the CCyB, and for defending a more flexible use of this tool considering its potential for helping other policies in macroeconomic stabilisation.

In this regard, an increasing number of jurisdictions have chosen to implement positive cycle-neutral CCyB rates. Under this approach, authorities aim for a positive CCyB rate when risks are judged to be neither subdued nor elevated.

Authorities that have introduced positive cycle-neutral CCyB rates have found it helpful for banks in their jurisdictions to have capital buffers in place that can be released in the event of sudden shocks, including those unrelated to the credit cycle, such as the impact of the COVID-19 pandemic. This

approach can help address concerns that banks in some jurisdictions may be reluctant to cross regulatory buffer thresholds in times of stress, but may be more willing to use their capital to support lending when buffers are explicitly released by authorities.

Looking ahead, rigorous analytical research will be essential to improve our understanding of the recent experience with systemic events and refine macroprudential policy so that we can enhance its effectiveness and thereby release monetary and fiscal policy space to confront these challenges. I am glad to see that this conference is gathering some prominent contributors to this important effort.

IMI International Monetary Review

Macroprudential Policy: Taking Stock and Looking Forward *

By GASTON GELOS *

I am going to speak about macroprudential policies: what we have learned so far about their effectiveness, ways of assessing their impact, challenges and the pending agenda. I will conclude with some brief thoughts on the current conjuncture.

Let me highlight upfront the three messages I would like to convey. First, macroprudential policy works and is under-utilised. Second, we have new ways of measuring its overall impact. And third, international cooperation to tackle pending non-bank regulation is key.

It may be useful to start with some definitions.

Macroprudential policy is the use of primarily prudential tools to limit systemic risk. Systemic risk, in turn, according to the BIS-Financial Stability Board (FSB)-IMF definition, is "a risk of disruption to financial services that is caused by an impairment of all or parts of the financial system and has the potential to have serious negative consequences for the real economy". Note that this does not necessarily involve the failure of a financial institution.

The term "macroprudential" is about as old as the CEPR – it was first used by Peter Cooke in 1979. Andrew Crockett laid out key elements of macroprudential policy in a speech in 2000

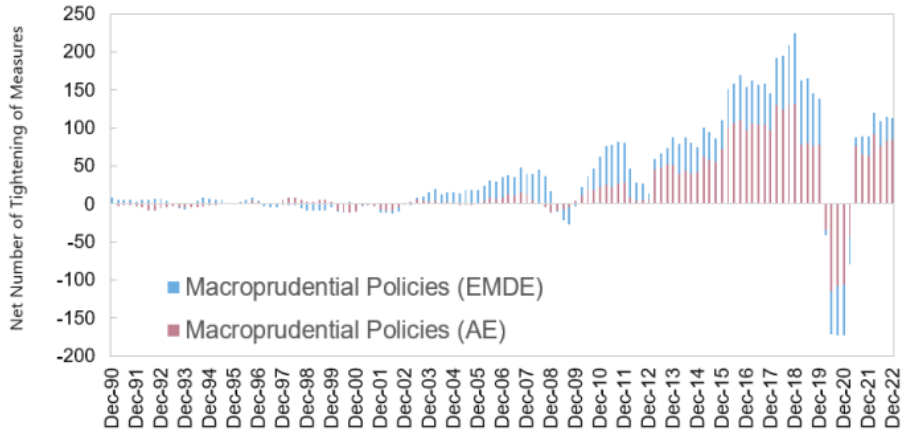
(Crockett 2000), and a conceptual framework was put forward by Claudio Borio in 2003

(Borio 2003)). In a recent stock-taking paper (Biljanovska et al (2023)) we assess the evidence so far, and point to open questions.

Emerging market economies (EMEs) were early adopters of macroprudential policies – often implementing currency mismatch-related measures. After the Great Financial Crisis, advanced economies (AEs) implemented a range of macroprudential tools in the context of the Basel III reforms. These include the countercyclical capital buffer (CCyB), a capital surcharge for global systemically important banks (G-SIBs), and the total loss-absorbing capacity (TLAC) requirement. Many countries also adopted borrower-based tools, such as loan-to-value ratios (LTVs) and debt service-to-income ratios (DSTIs).

After years of tightening, the Covid-19 shock was a test of countries' readiness to relax tools in stress periods. Currently, rising interest rates pose a new resilience test for the financial system (Graph 1).

Graph 1. Use of macroprudential policy through time



Sources: iMaPP database, BIS, and the authors' calculations.

Based on 27 advanced economies and 15 emerging market and developing economies for which quarterly data on household credit are available from the BIS. The bars indicate the cumulative sum of the net number of tightening actions of any macroprudential policy instrument over the current and past three quarters, and the lines indicate the average household credit growth. AE = advanced economy; and EMDE = emerging market and developing economy.

* Published on CEPR Paris Symposium Paris, at 8 December 2023

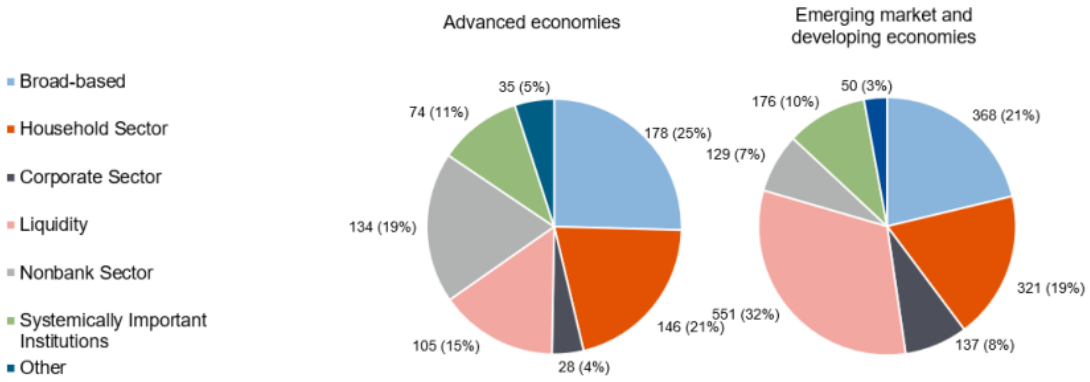
* Gaston Gelos, Deputy Head, Monetary and Economic Department of BIS

Macroprudential tools vary a lot in their specific design, and are tailored to countries' specific institutional, legal and other structural characteristics. As of mid-2022, the IMF counted 2,432

tools in place across 183 jurisdictions. Broad-based tools and measures for systemically important institutions were somewhat more popular in AEs. Liquidity measures were more important in EMEs, and they are often aimed at limiting FX risk (Graph 2).

Graph 2. Range of macroprudential tools in use

Total number of tools: 2,432, in use in 183 countries, as of June 2022



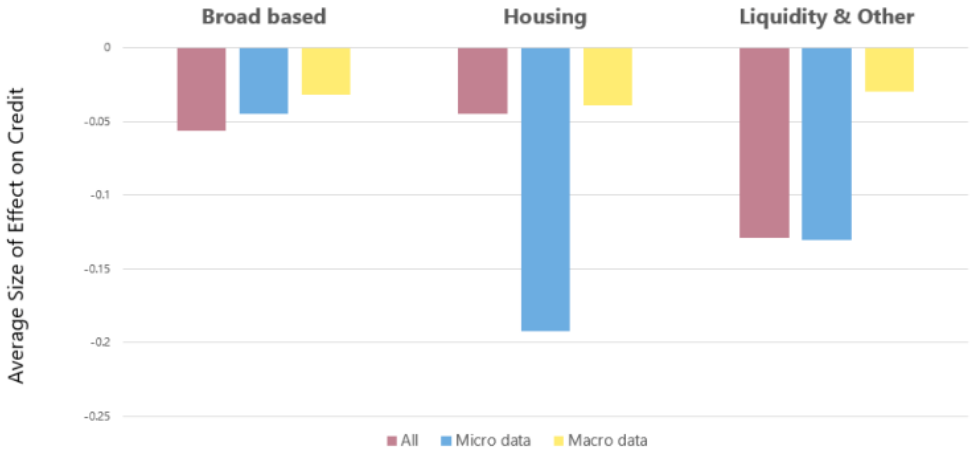
Source: Biljanovska et al. (2023). Numbers denote the frequency of measures reported. Percentages denote the share among total measures reported. Data is as of at least end June 2022: 117 countries reported data through June 2022, and 66 beyond 2022 Q2.

Estimating the effects of macroprudential policies is difficult. A key reason is an endogeneity problem. Since macroprudential policy tends to respond to increases in credit and asset prices, it is often difficult to disentangle cause and effect. Recent studies use micro data or policy surprises to address this problem, and generally find large and highly significant effects, especially for borrower-based tools. Overall, we can say that macroprudential policy succeeds in reducing the build-up of vulnerabilities.

Let me give you a few more specific takeaways from the evidence:

- For household credit, the strongest effects come from LTVs, DSTIs, loan loss provisions (LLPs) and loan restrictions.
- The effects of macroprudential measures on house prices are weaker, but strongest from LTVs and LLPs.
- Capital requirements have weaker direct effects on house prices and credit.

Graph 3. Macroprudential tightening – effects on credit (meta-analysis)



Source: Biljanovska et al. (2023) , Araujo et al. (2020)

Note: Shows average effects of tightening macroprudential measures on credit obtained through weighted least squares regressions; weights are proportional to the precision of each result.

A meta-analysis of many empirical studies shows average effects of tightening macroprudential measures on credit obtained through weighted least squares regressions; weights are proportional to the precision of each result (Graph 3). The quantitative results are not

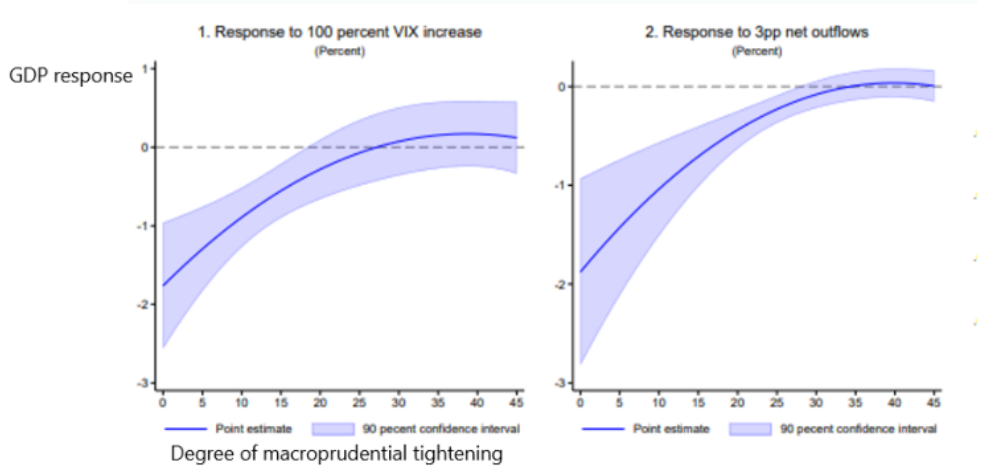
straightforward to interpret, but it is interesting to see that the estimates based on micro data are generally larger, particularly for housing, liquidity and other measures. This reflects two effects: on the one hand, the fact that the micro studies are better able to overcome endogeneity problems (which typically lead to underestimating the impact), and, on the other hand, that aggregate data capture leakage and aggregate effects not measured with the micro data.

In our stocktaking exercise, we also conclude that the evidence strongly suggests that macroprudential policy can reduce adverse macro-financial feedback from shocks.

Let me give you a few specific examples:

- The release of countercyclical capital buffers can support credit through stress periods (Couaillier et al (2022)).
- Borrower-based tools can increase borrower resilience. Having DSTIs in place reduces households' propensity to default around shocks (Nier et al (2019)).
- Macroprudential policy can reduce tail risks to output (Brandao-Marques et al (2020), Galan (2020)).
- In emerging market and developing economies (EMDEs), tighter regulation reduces the sensitivity of GDP to global financial conditions (Bergant et al (2020)).

Graph 4. Small open economies: macropru helps dampen impact of external shocks



Source: Bergant, Grigoli, Hansen and Sandri (2020)

Here is an illustration of this last point (Graph 4). A tighter level of regulation reduces the sensitivity of GDP growth to VIX movements and capital flow shocks. A broad set of macroprudential tools contribute to this result. This study by colleagues at the BIS and the IMF also finds that tighter macroprudential regulation allows monetary policy to respond more countercyclically to global financial shocks.

Overall, the effects of macroprudential policies are non-linear, but appear to hold up over time. Again, a few examples to illustrate the point:

- If the release of capital buffers generates additional "headroom" over and above minimum requirements, this can support lending.
- Tightening of borrower-based tools has diminishing marginal returns.
  - DSTI ratio caps reduce default probability, but there is no additional benefit when tightening beyond certain thresholds (Nier et al (2019)).
  - Resilience-building effects appear to hold up and strengthen over time. This is particularly true for borrower-based tools.

One important piece of good news is that the undesired side effects on consumption and output of a macroprudential tightening appear to be weak. This is true even for borrower- based tools (Alam et al (2019)). This means that macroprudential policy can often serve as a "surgical tool" to tackle specific vulnerabilities without broader adverse effects on the economy.

However, the news is not all good – there are sizeable "leakage" effects, with strong evidence of shifts to non-banks and foreign borrowing in response to macroprudential tightening of bank regulation (see eg Cizel et al (2019)). This underscores the benefits of expanding the perimeter of macroprudential action.

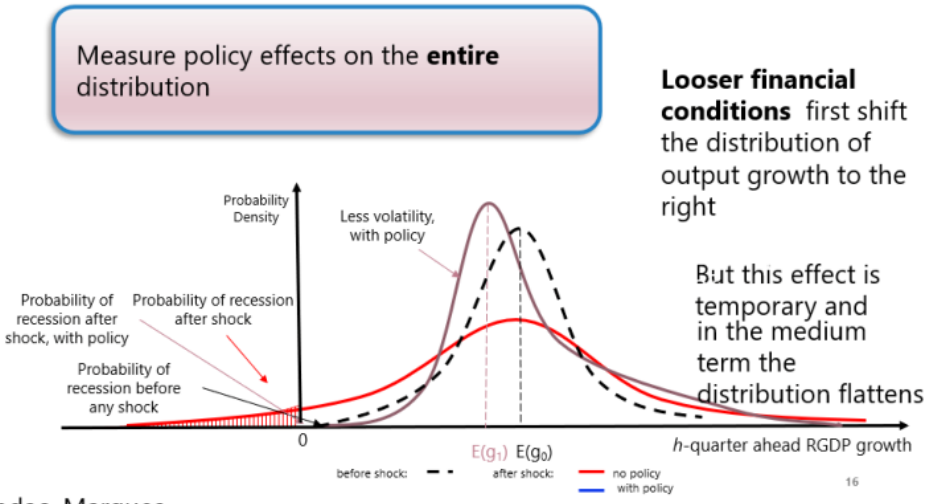
The Covid-19 shock was the first instance where macroprudential buffers were put to the test. What were the results? It became clear that banks were reluctant to breach regulatory capital ratios, even when this merely would have meant eating into usable buffers, with regulators encouraging them to do so. By contrast, the explicit release of CCyB and systemic buffers did support credit, especially for banks that would otherwise have been close to their regulatory thresholds. Of course, this means that you need a meaningful buffer space to release.

Overall, macroprudential policy clearly has a range of complex effects on borrowers, lenders and the economy as a whole. It has a "leaning against the wind" aspect, in the sense that it can stem excessive price and credit developments. But it can also build resilience, by building buffers that make the system more able to absorb adverse shocks.

But what are the overall effects, not only in terms of reducing tail risks but, more generally, on the expected probability distribution of GDP over the medium term? This is obviously a difficult question. A paper I co-authored with Luis Brandao Marques, Erlend Nier and Machiko Narita develops a new approach to answer it, based on quantile regressions.

Let me explain the conceptual approach with some visuals, without going into details.

Graph 5. A new way of assessing overall effects



Source: Brandao-Marques, Gelos, Narita and Nier (2020)

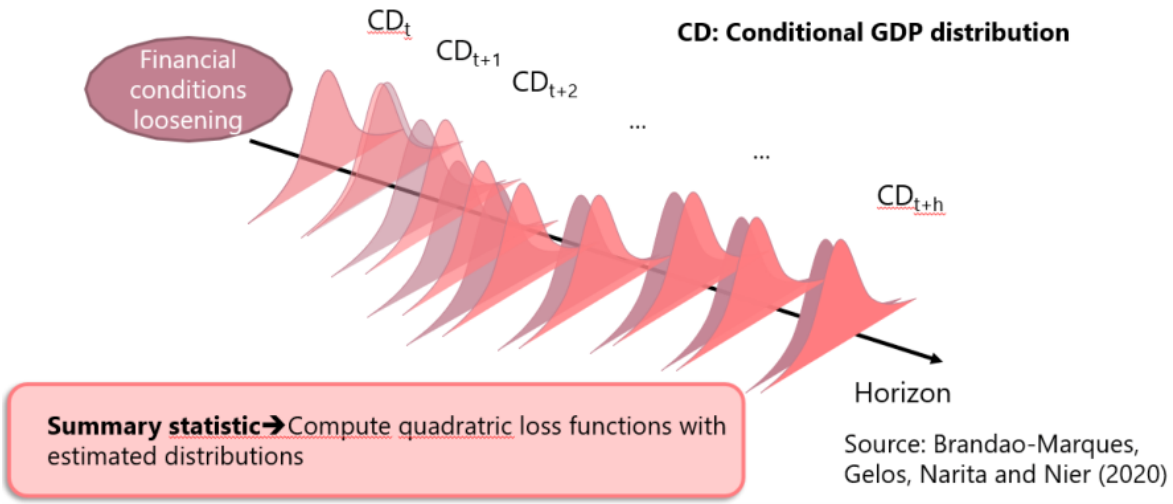
Here you see a stylised probability density of real GDP growth. Now, let's consider a sudden easing in financial conditions (Graph 5). This easing initially improves expected output growth in the near term, and shifts the distribution to the right.

However, this positive effect is temporary. In the medium term, the distribution typically shifts to the left, increasing the tail risks. Our question is how domestic policies can mitigate the impact on the entire distribution. Therefore, in a second step, we use loss functions to summarise the policy effects on the entire distribution.

Let me explain why we need a loss function using a dynamic chart.

We estimate a path of estimated conditional distributions of real GDP growth in response to a loosening of financial conditions based on quantile regressions. We also have the estimated response with policy.

Graph 6. A new way of assessing overall effects

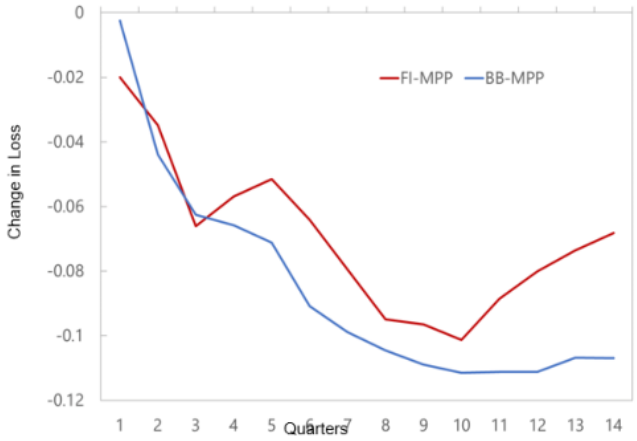


Source: Brandao-Marques, Gelos, Narita and Nier (2020)

The next question is, how do we compare these paths of estimated distributions of future GDP growth with and without policies?

Graph 7. A new way of assessing overall effects

Reduction in "losses" (based on output variability) from use of MPP



FI- Financial Institutions-based tools

BB-Broad-based tools

Source: Brandao-Marques, Gelos, Narita and Nier (2020).

In our study, we use a quadratic loss function, penalising the variance of output and inflation. On the x-axis, we have time (quarters). On the y-axis, we show the change in the losses compared with a situation where there was a loosening of financial conditions but no policy action. You can see that there is a considerable reduction in losses when macroprudential policies are tightened at the outset – and the effect builds up gradually and persists over time. The red line shows the effects of financial institution-based measures, the blue line that of broad-based measures.

Overall, what are the main takeaways on the evidence?

We have evidence of strong macroprudential policy benefits. Macroprudential policies can often be used as surgical tool without broader unintended side effects. Macroprudential policy also creates more room for monetary policy to focus on price stability. And it reduces the need to use FX intervention and capital controls in EMDEs.

In the light of the benefits, macroprudential policy may still be underused. Many jurisdictions have not yet built up countercyclical capital buffers. And the toolkit in many jurisdictions is still incomplete. For example, borrower-based tools are not in place everywhere.

So far, so good. But the use of macroprudential policies also entails many challenges. For one, further research is needed to help policymakers better calibrate tools. In addition, the assessment of risks is often difficult. Moreover, there is typically an inaction bias in the use of these policies – that is, a tendency to wait and see (CGFS (2023)).

The use of macroprudential policies also entails institutional and governance challenges. This is partly due to the often clear distributional consequences these policies may have on specific groups. Relatedly, the use of macroprudential policies often also entails political sensitivities – for example, when housing-related measures make it more difficult to purchase a home.

Moreover, cross-border activities and spillovers make international cooperation indispensable, which complicates matters. And lastly, targeting financial stability is more complicated in various ways than monetary policy – the target is not clearly visible, and the successes not obvious. It is not like targeting 2% inflation.

Let me now turn to the pending agenda.

The non-bank financial intermediary (NBFI) sector has grown considerably since the Great Financial Crisis – in particular, bond mutual funds. While a strong NBFI sector entails many benefits for the financial system, it also has its own vulnerabilities. I won't go into all the different NBFI sectors and discuss risks and potential mitigants. In some cases, for example when it comes to open-ended mutual funds, these risks have been discussed widely for some years now. In other cases, they are newer and less obvious.

Let me just underscore that the March 2020 episode, when the NBFI sector amplified stress and required central bank support to calm markets, underlining the need for fundamental adjustments to the regulatory framework for NBFIs.

In this context, I'd like to now turn to the importance of international cooperation, highlighting the case of investment funds.

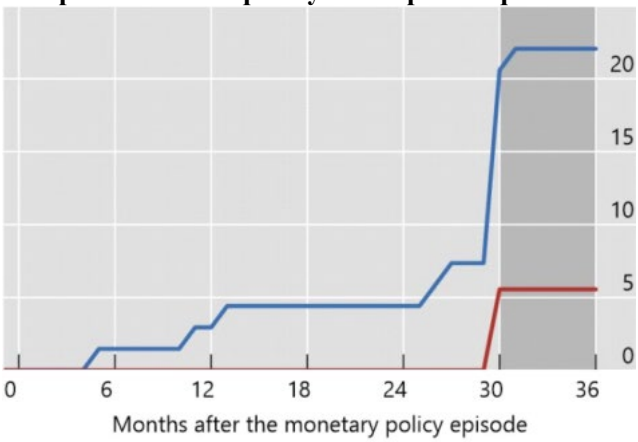
Mutual and other investment funds often entail significant cross-border activities (eg AE bond funds investing in EMEs, or AE commercial real estate funds investing across borders (ECB (2023), ESRB (2023)). But domestic regulators and supervisors do not generally internalise cross-border spillovers. The regulators of, say, a mutual fund industry in an AE or an offshore financial centre do not have the mandate to consider the impact funds' activities may have, say, in an EME, where these funds may have a large footprint. Similarly, we have seen increased activity of cross-border commercial real estate funds influencing real estate dynamics in the countries in which they are investing, and potentially contributing to the build-up of vulnerabilities there. By contrast, domestically aimed macroprudential measures have international spillovers (Claessens et al (2021a)). Another reason that internationally coordinated action is needed in this area is that fund domiciles can change quickly, evading the regulatory perimeter of any individual jurisdiction.

Therefore, international collaboration is key, and the Financial Stability Board (FSB) is taking the lead in many areas.

New frontiers in macroprudential policy include risks stemming from crypto/decentralised finance (DeFi), big tech/fintech and climate risks. I don't have time to cover these areas today.

Turning to the current conjuncture, the full effects of higher yields yet remain to be seen in a context of widespread vulnerabilities, particularly related to high debt levels. Evidence shows that prudential tightening helps reduce the likelihood of financial stress and leaves monetary policy more space to fight inflation (Graph 8). Consequently, macroprudential policy needs to be kept tight for as long as possible, or even tightened further where appropriate. In addition, we need to implement Basel III in full, without delay, and strengthen supervision.

Graph 8. Crisis frequency and capital requirements



Source: Boissay, Borio, Leonte and Shim (2023)

Let me conclude. As the cumulative evidence has shown, macroprudential policy is effective – and overall, it is underutilised. It can alleviate the burden for monetary policy, allowing more headroom to respond to economic shocks.

While it is difficult to identify the effects of macroprudential policy with precision, a new way of assessing its overall effects over a longer time horizon and comparing policies gives us a clearer picture of the benefits as well as the undesired consequences. International spillovers pose a challenge for regulation, particularly for the NBFI sector. In the light of existing vulnerabilities, at this point, it is still important to keep macroprudential policies tight.

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IMI International Monetary Review

Financial Risk and Stability

New Look at Global Banks Highlights Risks From Higher-for-Longer Interest Rates *

By CHARLES COHEN, SROBONA MITRA AND FABIO NATALUCCI*

Central banks could keep interest rates higher for longer as they fight to curb inflation that remains stubbornly high in many countries—and slow their economies by doing so.

Such an environment hasn't confronted the world's financial markets in a generation. That means financial supervisors must sharpen their analytical tools and regulatory responses to address emerging threats. And the new risks gathering in the banking system and beyond mean it's time to redouble efforts to identify the weakest lenders.

Accordingly, we enhanced our stress-testing tools to focus on risks from rising interest rates and incorporate the kind of funding pressures that toppled some banks in March. We also developed a new surveillance tool for tracking emergent banking fragilities using analyst forecasts and traditional bank metrics. These monitoring tools, based on public data, aim to complement stress tests by supervisory authorities and by IMF-World Bank teams in Financial Sector Assessment Programs, which use more granular confidential supervisory data.

Rising rates are a risk for banks, even though many benefit by collecting higher interest rates from borrowers while keeping deposit rates low. Loan losses may also increase as both consumers and businesses now face higher borrowing costs—especially if they lose jobs or business revenues. Besides loans, banks also invest in bonds and other debt securities, which lose value when interest rates rise. Banks may be forced to sell these at a loss if faced with sudden deposit withdrawals or other funding pressures. The failure ofSilicon Valley Bank was a dramatic example of this bond-loss channel.

Stress testing

The banking system appears broadly resilient, according to our new global stress test of almost 900 lenders across 29 countries, outlined in a chapter of our latest Global Financial Stability Report. Our exercise, which shows how lenders would fare under the baseline scenario we project in the latest IMF World Economic Outlook, identified 30 banking groups with low capital levels, together accounting for about 3 percent of global bank assets.

But if beset by severe stagflation—high inflation with a 2 percent global economic contraction—coupled with even higher central bank interest rates, the losses would be much greater. The number of weak institutions would rise to 153 and account for more than a third of global bank assets. Excluding China, there are many more weak banks in advanced economies than in emerging markets.

* This article first appeared on IMF Blog on October 16, 2023

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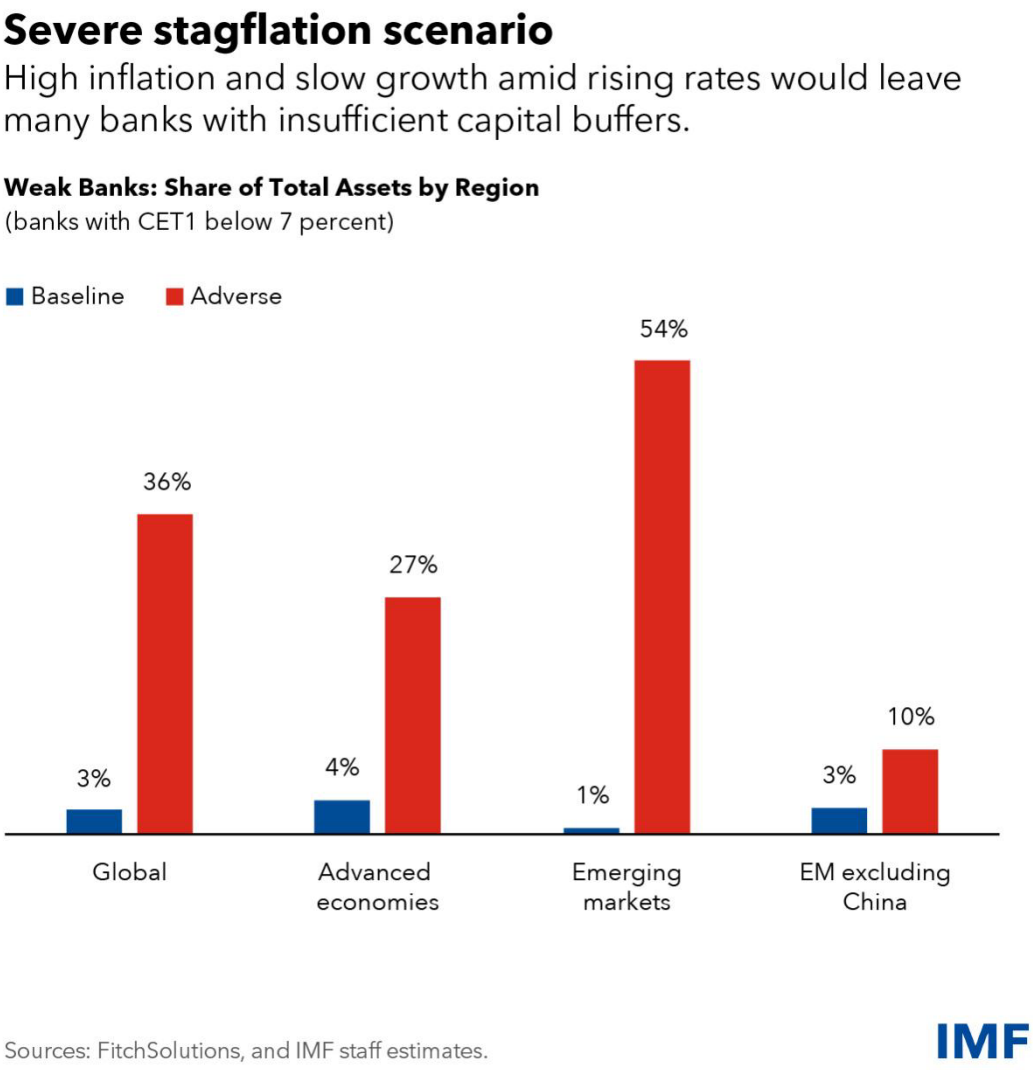
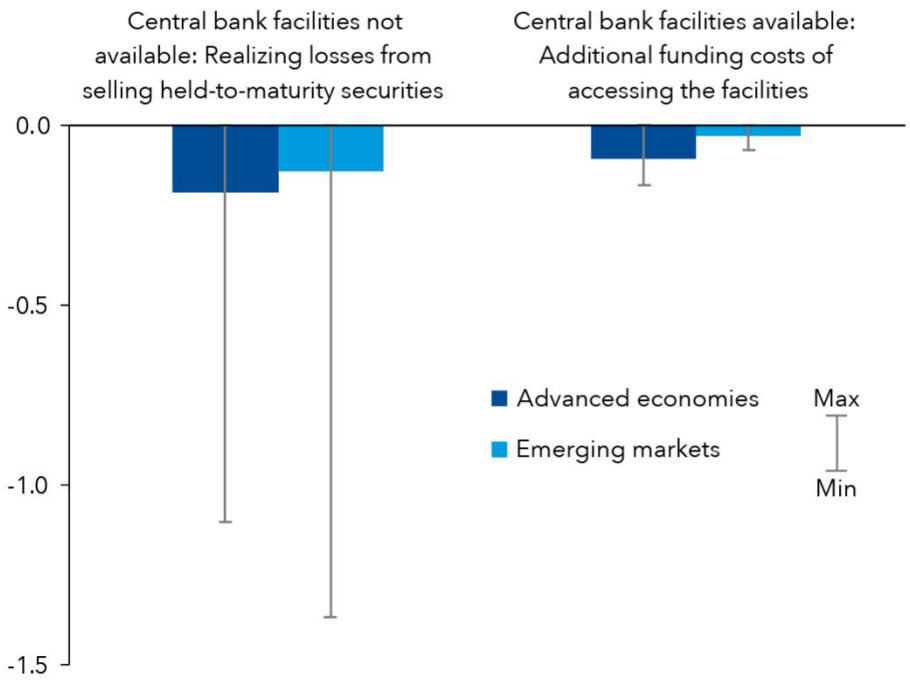


This group of weak banks suffer from rising interest rates, rising loan defaults, and falling securities prices. Importantly, additional analysis shows that losses from selling securities under deposit run scenarios are less painful when banks have access to central bank lending facilities, such as the Federal Reserve's discount window.

Backstops matter

Central bank facilities like the Federal Reserve's discount window can help banks avoid excessive capital losses.

Impact of a 25% deposit run on bank capital
(percentage points)



Sources: FitchSolutions, ; and IMF staff estimates.
Note: Capital refers to Common Equity Tier 1 capital ratio (%). Whiskers show maximum and the minimum impact on banking systems.

IMF

To complement the global stress test, our new surveillance tool incorporates traditional supervisory metrics, such as the ratio of capital to assets, as well as market indicators, like the ratio of the market price to the book value of bank equity. These have historically proven important predictors of lost confidence during banking stress events. It flags banks for further review if they appear to be outliers across three or more of the five risk metrics we consider: capital adequacy, asset quality, earnings, liquidity, and market valuation.

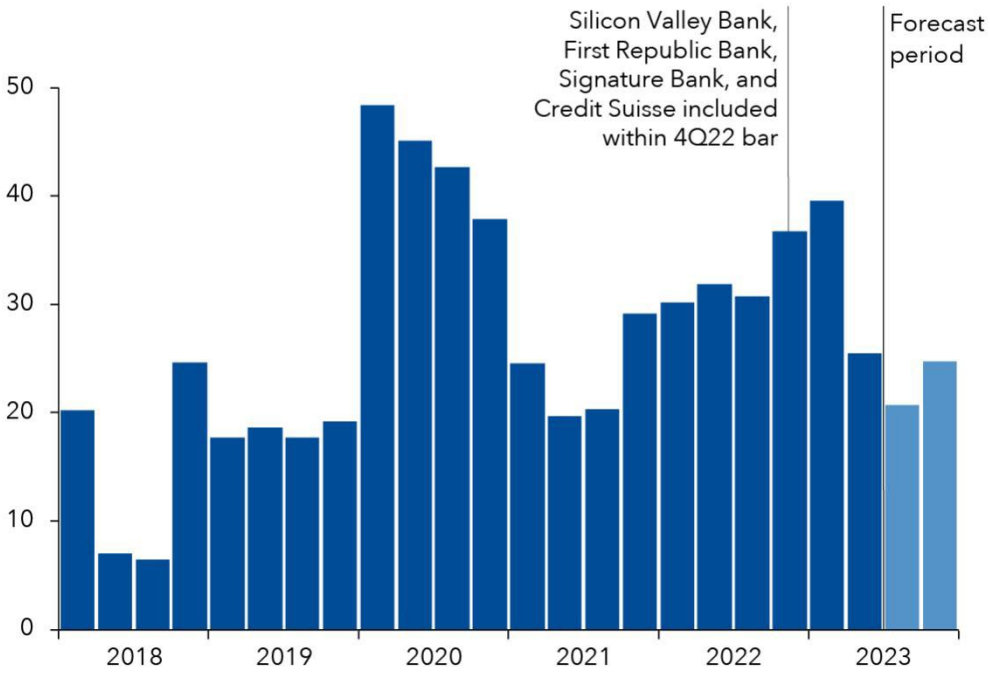
During periods of stress, many banks may show up as potentially vulnerable, while few ever do experience significant distress. Back testing this tool shows a surge of potentially vulnerable institutions at the onset of the pandemic, as well as a sustained rise in late 2022 as higher interest rates began to bite. This latter group included the four banks that either failed or were taken over in March.

Based on current market data and consensus analyst forecasts, these indicators point to a substantial group of smaller banks at risk in the United States, and concern for some lenders in Asia, including China, and Europe as liquidity and earnings pressures persist.

Banks at risk

A new monitoring tool would have identified many banks at risk in March 2023, including those that failed or were taken over.

Banks signaling risk in three or more risk dimensions
(total assets, in trillions of US dollars)



Source: Bloomberg Finance L.P.; Visible Alpha; and IMF staff calculations.

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The sizable group of weak banks identified in both exercises underscores the need for new policy measures in the banking sector:

• Stress tests by supervisors should include market-based analysis, include smaller lenders, and test banks against scenarios that are more severely adverse yet still plausible.

• Bank supervisors need to be proactive and stand ready and willing to address identified weaknesses. Our Financial Sector Assessment Program has found that more than half of economies do not have independent bank supervisors with adequate resources.

• International standards need to be raised to keep liquidity and interest rate risks in banks at bay. At least one-fifth of economies have weak supervisory and regulatory practices to monitor and address these risks, and the March turmoil shows why this is such an important issue.

• Banks would be more resilient if better prepared to access central bank lending facilities. Banks should periodically test such access while supervisors assess whether weaker lenders can easily tap the emergency assistance.

Now that banking strains have abated, the institutions and their regulators and supervisors should take this time to increase resilience. And they should prepare for a possible resurgence of these risks, as interest rates may stay higher for longer than currently priced in markets.

— This blog is based on Chapter 2 of the October 2023 Global Financial Stability Report, “A New Look at Global Banking Vulnerabilities.”

IMI International Monetary Review

The Recent Financial Tumult: Lessons and Responses*

By KLAAS KNOT *

As many of you know, I am a General Board member of the European Systemic Risk Board (ESRB). In that capacity, I contribute to, and follow the work of the ESRB closely. But today, I will be speaking as chair of the Financial Stability Board. And so, I wanted to begin by highlighting a few similarities between these two important international bodies.

Both the ESRB and the FSB were created after the 2008 global financial crisis (GFC). The former under the EU, the latter under the G20. Those of you who have been involved in one of our committees such as the ESRB's ATC or the FSB's SRC will know that we share a love for acronyms.

But, of course, we have something far more fundamental in common. We both monitor vulnerabilities in the financial system. We make policy recommendations to address them and we look at how these recommendations are implemented.

Ultimately, we have the same goal. Increasing the resilience of the financial system. Either with a European focus, in the case of the ESRB; or with a global focus – in the case of the FSB. International cooperation is in our DNA.

So what has the FSB been doing?

Since our inception in 2009, we have overseen a range of financial sector reforms. These include:

- increases in the quality and quantity of capital and liquidity in the banking system;
- frameworks to resolve failing financial institutions; and
- enhancements to the resilience of non-bank financial intermediation, among others.

I think it's fair to say that these post-crisis reforms have made the financial system better equipped to withstand unexpected shocks.

Of course, our focus is on the financial system at large. Therefore, individual financial institutions may fail even as the broader system continues to function. We saw this happening in the banking sector earlier this year.

But, however unexpected shocks like these may have been, in hindsight, they can be explained. And so, it is up to us, regulators, but also the industry, to look for that explanation and draw lessons from it.

As we do so, and look ahead to possible future systemic threats, it is important to start with the broader macro-financial backdrop. Because shocks never happen in a vacuum.

For much of the past 15 years, financial conditions have been highly accommodative. This spurred risk taking. At the ESRB we sometimes called it the 'hunt for yield'. A hunt in which some financial institutions relied on business models based on the presumption of low and stable interest rates.

An old banker's adage states: 'it's not the speed that kills, but the sudden stop'.

So, with those accommodative financial conditions coming to a swift end, the vulnerabilities that developed during the 'hunt for yield' could be crystalised.

Financial markets and indeed regulators did not fully anticipate the 'sudden stop'. But, both the ESRB and the FSB had been warning about the developing vulnerabilities for some time.

There was bound to be transition risk for financial institutions and the system at large when coming from such a long period of low interest rates. Today, we find ourselves in that transition phase.

At the same time, there is limited fiscal space in many countries. This is the consequence of elevated public debt, alongside a higher interest rate environment. And, of course, until inflation is returned to target, monetary policy space is similarly constrained. Thus, the scope to lean against an economic downturn is more limited than in the past.

For this reason, financial policy makers need to be especially vigilant.

With this backdrop in mind, let me now turn to the recent disruptions affecting the global financial sector, across both banks and non-banks. As I said, in the aftermath of such events, it is important to draw the right lessons and to respond. The FSB is working hard on both.

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* Klaas Knot spoke on the lessons to be learnt from the recent financial sector tumult at the 7th Annual Conference of the European Systemic Risk Board, on 16 November 2023.

* Klaas Knot, President of De Nederlandsche Bank, Chair of the Financial Stability Board

Earlier this year, the banking sector saw the most significant system-wide stress since the GFC, in terms of both scale and scope. A global systemically important bank in Switzerland had to be rescued, and several medium-sized US-based banks failed. These events highlighted a number of issues for financial stability:

- First and foremost, the importance of banks' own risk management and governance practices was again brought to the fore.
- Second, we witnessed an unprecedented speed of bank runs. This underscores the growing impact of technology and social media on depositor behaviour.
- Third, the recent failures provided a number of important lessons for regulators.

On this last point, the Basel Committee on Banking Supervision (BCBS) recently issued a report in which it outlines its initial learnings for bank regulation and supervision. Among other things, the bank failures raise important questions about:

- the calibration and usability of bank liquidity buffers,
- the regulatory treatment of held to maturity assets and interest rate risk in the banking book, and
- the application of the Basel framework to smaller regional banks that may be systemic upon failure.

The BCBS is taking this work forward and will assess the need to explore policy options in due course.

The FSB has published its own lessons learnt report. In our case, regarding the international bank resolution framework.

Our findings uphold the appropriateness and feasibility of the framework. But we find that there is still work to do – regarding how key parts of the framework are implemented and operationalised.

For instance, we are looking at whether resolution planning and loss-absorbing capacity requirements should apply to a broader range of banks. The regional US banks that failed earlier this year were not subject to the full range of these requirements. Indeed, they did not have in place long term debt, designed to absorb losses in the event of the bank failing. This meant that uninsured depositors were at a greater risk of taking losses. That, in turn, created a strong incentive for these depositors to run when signs of trouble emerged.

And there are various other topics that the FSB is addressing, like

- the choice and flexibility of resolution strategies,
- temporary public sector liquidity backstops, and
- ways to address legal challenges to executing bail-in across borders.

Making progress on these issues is essential to ensure that we can effectively resolve systemic banks without undue harm to either the economy, or the taxpayers' pocketbook.

In our pursuit of financial stability, we must also look beyond banks. Unfortunately, severe liquidity stress and even institution failures have also recently occurred in the non-bank financial intermediation sector.

In the past few years alone, we witnessed:

- widespread pressure on core funding markets when the pandemic hit,
- the demise of Archegos,
- extreme pressure on commodity markets and traders following Russia's invasion of Ukraine, and
- turmoil among liability driven investment funds and pension funds in the UK.

These events each reflected a combination of two vulnerabilities: excessive leverage and insufficient liquidity risk management on the part of the affected non-banks.

On various occasions in recent years, large market movements or redemption pressures have placed non-banks under strain.

These disruptions aren't just an existential threat to the players involved. They spill over onto other institutions – and in some cases, they affect the functioning of the underlying markets.

So, following the March 2020 market turmoil, the FSB embarked upon a wide-ranging effort to bolster NBFI resilience. In our work so far, we have focused on both entity types and activities which may contribute to systemic risk. We have made good progress, including by issuing policy recommendations for money market funds in 2021. Looking ahead, we will soon issue policy recommendations to address liquidity mismatches in open ended funds. And next year we will advance our work to address excessive leverage in NBFI, and to enhance liquidity preparedness for margin calls.

Let me conclude.

The failures of various banks this year were an important reminder of the speed with which vulnerabilities can be triggered in the current environment. We are learning lessons from this. At the same

time, contagion from these individual bank failures was limited. This is thanks to the swift and concerted actions of authorities on both sides of the Atlantic, and amid confidence in the resilience of the broader financial system. That confidence is underpinned by the financial reforms that regulators collectively introduced following the GFC.

I don't know what the future will bring. There will certainly be more challenges to come. But as long as we continue to learn from the past. As long as we advance the implementation of the reforms already agreed upon. And as long as we work together across jurisdictions to address emerging vulnerabilities - we can maintain a level playing field, set on a solid foundation. And, we can safeguard a future in which the financial system remains a source of growth and prosperity for our economies.

January 2024
Vol.11, No.1

The Importance of Effective Liquidity Risk Management*

By MICHAEL S. BARR *

In my remarks, I would like to provide perspective on some of the lessons learned from the banking stress experienced in the United States last spring for both banks and their supervisors. In particular, I will focus on how banks manage liquidity risk, the role of the central bank's discount window lending in this process, and the importance of robust liquidity planning for good times and bad.

Last March, several large U.S. banks faced acute liquidity pressures when uninsured depositors looked at the banks' balance sheets and judged that the banks would be insolvent if they needed to liquidate their securities portfolios to meet potential outflows. The banks' poor interest rate and liquidity risk management triggered a crisis of confidence in their uninsured depositors, resulting in liquidity crises at these banks. In short, they faced old-fashioned bank runs, the speed of which was anything but old fashioned. Despite their compliance with our capital rules, these banks lacked enough capital to reassure uninsured depositors that they had sufficient resources to weather this liquidity storm.

In addition to our domestic strains, Credit Suisse came under renewed pressure in March 2023 after a long period of liquidity pressures that had been acute since the fall of 2022. Of course, Credit Suisse had been a troubled bank for some time, with doubts about its future viability after the Archegos and Greensill scandals had tarnished its reputation. These concerns became reality when the firm was forced to announce that its internal controls over financial reporting were ineffective and had been for several years. Credit Suisse was acquired by UBS in a deal that involved triggering of Credit Suisse's contingent convertible capital instruments, a severe dilution of shareholders, and the removal of senior bank management, as well as emergency liquidity support and extraordinary loss sharing from the Swiss government.

While there is more that regulators and supervisors can do to help to ensure banks' interest rate risk management and capital bases are sufficiently calibrated to the risks of their business models, today I will focus most of my comments on liquidity risk management and operational readiness for firms in the United States to utilize the Federal Reserve's discount window. This is not a new topic, as I have spoken about lessons from March and the importance of bank's preparedness to tap Fed facilities previously. Today I will revisit those themes and provide some additional observations about the March stress events, including the importance of discount window preparedness relative to some specific liquidity risk factors such as uninsured deposits.

A striking feature of recent U.S. experience with bank stress was that Silicon Valley Bank (SVB) and Signature Bank struggled to cope with unprecedented deposit outflows arising from a loss of confidence of their uninsured depositors. While ultimately the amount of their outflows made it not possible for these banks to continue operating, these banks started from a state in which they were not sufficiently equipped to manage liquidity risk—including by being adequately prepared to tap the Federal Reserve's discount window. Banks that experienced spillovers during this period also struggled with insufficiently robust liquidity risk management. It is crucial that banks have a diversified range of liquidity options that they are able to access in a variety of conditions. And in the case of banks that are eligible to borrow from the Federal Reserve, discount window borrowing should be an important part of this mix.

There are a few major reasons for this conclusion. First, the discount window provides funding at a predictable interest rate, namely the primary credit rate, which does not fluctuate daily, unlike interest rates on private sector liquidity sources. More specifically, the discount window is always available as a standing facility, with the primary credit rate currently set at the top of the federal funds rate target range. This rate—along with that of the standing repo facility (SRF), also set at this level—should serve as a backstop rate to short-term market interest rates and provide eligible firms with certainty about the highest rate they will face to gain liquidity against eligible assets at any given time. The discount window provides ready access to funding that can help banks manage their liquidity risks. The ability to access funding at a predictable rate through the discount window should figure importantly into banks' liquidity risk management plans under a range of scenarios.

* At the ECB Forum on Banking Supervision, Frankfurt, Germany, on December 01, 2023
* Michael S. Barr, Vice Chair for Supervision of the Federal Reserve System

The discount window is also an important tool for monetary policy. The primary credit rate, set at the top of the target range, is a component for how we can achieve rate control under a range of conditions. To achieve our monetary policy aims, the discount window needs to be readily usable: if banks do not feel free to use the discount window when private sources of funding are more expensive, the discount window will not be an effective part of our monetary policy implementation toolkit. Banks have previously said that they are afraid of receiving negative feedback from their supervisors in the event that their sole grounds for tapping the discount window is that it is the most convenient or cheapest form of funding immediately available to them. In light of this, we at the Federal Reserve have been underlining the point to banks, supervisors, analysts, rating agencies, other market observers, and the public, through numerous channels, that using the discount window is not an action to be viewed negatively. Banks need to be ready and willing to use the discount window in good times and bad.

The discount window is also an important tool of financial stability, because the Federal Reserve can provide liquidity in an array of circumstances, including those when other sources are impaired. Liquidity provision through the discount window is not reliant on the smooth functioning of private-sector funding markets. This is in contrast to most other options available to banks, including access to the Federal Home Loan Banks (FHLBs). Moreover, banks that have pre-pledged collateral at the discount window and tested its operations are not dependent on other market infrastructure and payments systems to borrow against this collateral. These features mean that discount window preparedness provides additional diversification benefits that can meaningfully enhance effective liquidity risk management.

The experience of last March warrants reviewing to gain better insights into how well banks are positioned to borrow through the discount window. In doing so, I will discuss some observations from March in greater depth and note some potential lessons to be drawn from that experience. I will also briefly note some observations about our work on cross-border collaboration with our international counterparts.

Lessons Learned: Uninsured Deposits and the Speed of Deposit Loss

The speed of the bank runs in the spring of 2023 was unprecedented. The failure of Washington Mutual in 2008, the largest bank failure seen in the United States before this year, was the culmination of stresses that occurred over several weeks. The deposit losses experienced by SVB were much greater in both relative and absolute terms, and they occurred in less than 24 hours. Digital banking and social media were factors in the rapid escalation of SVB's problems, though they were not the underlying source of vulnerability. SVB's concentrated and highly networked depositor base of venture capital firms, portfolio companies, tech and crypto companies, and high-net-worth individuals communicated quickly with one another and, in effect, coordinated the massive and rapid run. And more fundamentally, as I said, SVB failed because of a textbook case of mismanagement of interest rate and liquidity risk. This mismanagement made depositors lose confidence in the bank's solvency, so they ran.

The March stress also showed that contagion is possible among large regional banking organizations whose size and scope are well below those of banks that have been designated as globally systemically important. Liquidity stress at SVB quickly led other banks that were perceived to have weaknesses to experience outflows as well.6 Those banks that came under greater pressure tended to have large unrealized losses in their securities portfolios, to rely heavily on uninsured deposits, and to have a deposit and client base focused on the technology and crypto sectors, venture capital, or high-net-worth clients. But the contagion extended beyond such banks and threatened to cause disruption more broadly to regional and community banks with traditional business models and to the banking system as a whole. The Federal Reserve, the Federal Deposit Insurance Corporation (FDIC), and the U.S. Department of the Treasury stepped in quickly to stop that contagion, and the strategy worked: deposit flows returned to normal, and stress in the banking system slowly abated.

This experience has changed everyone's perception of the possible speed of bank runs. What occurred in two or three weeks or, in some cases, many months in previous episodes may, in the modern era, now occur in hours. These issues are top of mind as we review and consider future adjustments to the way in which we should supervise and regulate liquidity risk.

Monetization Issues

We also saw during this period that firms were not as well positioned to monetize (that is, to borrow against or be ready to sell) their assets as they should have been. Many underestimated the size and speed with which liquidity needs could appear. Banks of all sizes are expected to maintain contingency funding

plans (CFPs) to meet potential stressed liquidity outflows. In response to the Global Financial Crisis, regulators also now require large banks to maintain a multi-week buffer of high-quality liquid assets (HQLA) that can be easily converted to reserves even during times of stress.

These HQLA buffers are essential to ensuring funding resilience at large firms. The March stress episode, however, highlighted the fact that, in practice, there can be operational impediments to a bank's ability to monetize its liquidity buffers in large volumes and in a rapid time frame in acute stress. In a world in which a bank run took place over a matter of weeks, it was reasonable to assume that a sufficient volume of the most liquid securities could be monetized to meet the demand for reserves associated with deposit withdrawals.

But times have changed, and I see several flaws in our previous assumptions. First, it may be difficult for a firm to conduct significant asset sales in a short time frame without becoming the subject of adverse attention or, if the firm is large, without affecting market prices with fire sale effects and potentially leading to broader contagion. Second, the March stress underlined the possibility that private repo markets may not be a viable financing channel for banks that need to rapidly ramp up access, especially for banks that may not regularly transact in these markets, even if such repo markets can be a viable source of liquidity for banks that regularly tap such markets and have more gradual funding stresses. Sharp shifts in calls on private repo market capacity, particularly by firms experiencing stress, may not be easily met.

In addition, it proved especially difficult to monetize assets in those cases in which firms held substantial amounts of longer-dated securities, with significant amounts of unrealized losses, as we saw in the experience of SVB. The experience showed that when these securities are sold and losses are realized, it understandably may send a negative signal to the market about the bank's viability. A compounding factor in these situations is that if the securities that a bank needs to sell are in held-to-maturity portfolios, the sales under acute stress can have a severe effect on the bank's balance sheet, as I discussed in a previous speech.

Discount Window Preparedness for Times of Stress

While, as discussed, the discount window provides ready access to funding to help banks manage liquidity risks in normal conditions, it is also incredibly important that it be available to banks dealing with idiosyncratic or market-wide stress events. When other forms of funding or related market infrastructure are not immediately available, readiness to borrow via the discount window—including with prepositioned collateral—is even more crucial. In contrast to private-sector liquidity sources, the Fed can provide immediate liquidity against a wide range of collateral to one or a number of depository institutions simultaneously. This function provides additional time for a more orderly monetization. An update on contingent liquidity readiness that the bank regulatory agencies published in July also makes clear that all of the agencies understand the importance of a bank's readiness to make use of the discount window.

The banks that failed because of the stress event that began in March had access to, and utilized, the Federal Reserve's discount window, and their failures were the result not of lack of access to the discount window but of basic mismanagement of interest rate and liquidity risk that left them effectively insolvent in the eyes of uninsured depositors and unable to stem bank runs. That said, they also faced internal operational challenges in quickly identifying and moving collateral that would have provided them additional borrowing capacity at the discount window. While this additional borrowing capacity would not have ultimately saved these banks given the speed and the severity of their deposit outflows, the lessons from managing their stress events can help others facing less acute events. Greater operational readiness can provide for greater optionality when a bank hits a bout of turbulence. Ready access to sufficient liquidity provides breathing room for a bank to determine and execute its path forward.

There are two key aspects of discount window readiness: preparedness to access the discount window and prepositioning adequate amounts of collateral. In terms of preparedness, the majority of banks that are eligible to borrow from the discount window have the legal agreements in place. This is the first step. However, many of these banks had not recently tested their discount window access prior to the stress event. Engaging in testing through actual transactions at regular intervals is a key component of operational readiness. In the case of some banks, the amount of collateral prepositioned was also a tiny fraction of potentially flight-prone liabilities going into the stress event. This lack of pre-pledging is a concern for several reasons, including that certain collateral types can require more time to pledge. Less liquid collateral can take longer to be assessed and valued at the discount window, meaning that banks should not expect they can gain immediate liquidity against these assets. But these are the very assets that would be best pledged to the discount window, so that more liquid assets are held for other uses.

The Intersection of Discount Window Readiness and Existing Liquidity Regulations

The existing standards that require banks to hold HQLA buffers for self-insurance are an essential element of the regulatory framework. Requirements applying to large banks, like the liquidity coverage ratio and the net stable funding ratio, have meaningfully increased the resiliency of the banking system to liquidity stress and positioned large banks to deal better with a 30-day stress period. This type of self-insurance is critical to bank resilience and to the robustness of the financial system; however, these requirements may not, on their own, be sufficient to stem a rapid run. The speed of bank runs and the impediments to rapidly raising liquidity in private markets that may be needed in hours rather than days suggest it may be necessary to reexamine our requirements, including with respect to self-insurance standards and to discount window preparedness. The lessons from March also indicate that some forms of deposits, such as those from venture capital firms, high-net-worth individuals, crypto firms, and others, may be more prone to faster runs than previously assumed.

As I have emphasized today, and in two previous speeches, the discount window is a tool that banks can and should use to help them respond to a wide array of conditions and provide additional time for orderly monetization of liquidity buffers in private markets, but only if banks are prepared to use it. Given these dynamics, we are currently studying what the lessons from March, and the variability in discount window preparedness across eligible banks, mean for the safety and soundness of individual banks and for the stability of the financial system more broadly. Since March, some banks have been assessing their operational readiness to tap the discount window, particularly relative to their runnable liabilities, such as uninsured deposits, and have been taking measures to test and pre-pledge assets where possible. Banks have also been reassessing their assumptions on the liquidity value of hold-to-maturity securities, given the experiences of March.

International Coordination and Cooperation

Let me wrap up by sharing some thoughts with you on international spillovers to liquidity stress events. Episodes of financial stress have, in some instances, gone hand in hand with stress in U.S. dollar funding markets. Foreign banks, which have more limited access to dollar deposits than U.S. banks and rely more heavily on dollar wholesale funding for their operations, are particularly vulnerable to dollar liquidity strains. Of course, these banks have an important role in providing credit to the U.S. economy, and strains that they experience can affect U.S. businesses and households. In addition, dollar funding markets are global, and so strains in one segment can have broader repercussions for market functioning.

Foreign banks that have branches in the United States have access to the discount window. Outside the United States, some of these firms also have access to dollar liquidity from their own central banks. The Federal Reserve maintains swap lines with foreign central banks and also maintains the Foreign and International Monetary Authorities (FIMA) repo facility to provide dollar liquidity to foreign official counterparts. These facilities have proven effective in damping pressures in U.S. dollar funding markets when adverse pressures have emerged, pressures that could exacerbate strains in broader U.S. domestic financial markets. Indeed, during the Global Financial Crisis and the COVID-19 pandemic, the peak outstanding amounts for the swap lines were a little above and a little below $500 billion, respectively, making them among the most used of our liquidity facilities. As with all backstop facilities, however, it is not just their use that helps the smooth functioning of markets, but banks and central banks knowing that liquidity will be available when needed that helps to prevent liquidity hoarding and precautionary sales that can contribute to stresses. In part for this reason, the Federal Open Market Committee decided to make the swap lines and FIMA repo standing facilities, after initially setting the operations up only as temporary.

These observations underscore the importance of our ongoing communication and collaboration with our counterparts—both other central banks and regulatory authorities—in order to ensure that we have a comprehensive understanding of evolving financial market dynamics and cross-border linkages that can affect our respective financial markets and financial institutions and also so that we can work to address gaps before pressures emerge. In my experience, these cross-border collaborations have been essential in enhancing the resilience of individual banks and the robustness of the financial system.

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Monetary Policy

Monetary Policy in Times of Multiple Challenges *

By JOACHIM NAGEL *

1 Introduction

I would like to join you in looking back on monetary policy in 2023 before looking ahead to 2024. And, as the title of my speech suggests, we will address "multiple challenges".

2 Key challenge: excessively high inflation

Of the many challenges facing the Eurosystem's monetary policy, one is clearly key: inflation in the euro area has been too high for far too long. We in the Governing Council of the ECB must fulfil our mandate. We need to bring inflation back in line with our target of 2% over the medium term.

Developments observed over the past few months are encouraging: in September and October, inflation eased substantially – both in Germany and in the euro area. According to preliminary estimates, inflation rates as measured by the Harmonised Index of Consumer Prices fell further in November, down to 2.4% in the euro area and 2.3% in Germany. By comparison, they had peaked in October of last year at 10.6% and 11.6%, respectively.

In view of past price dynamics, the findings of a multi-year study on Germans' fears are hardly surprising, but they are alarming. This year, the cost of living going up was Germans' number one concern (65% of respondents) for the second year in a row. As central bankers, our mandate in the ECB Governing Council is to bring inflation back under control and restore price stability. That way, people will no longer have to worry about inflation.

It is particularly inflation expectations that are important for monetary policy because they influence the way in which economic agents behave – for example, influencing households' purchasing and saving decisions, employees' and wage bargainers' actions in wage negotiations and firms' price-setting behaviour.

If economic agents expect price stability and behave accordingly, it is easier for monetary policy to achieve its objective. Conversely, monetary policy's job is made more difficult if higher inflation expectations lead, say, to higher wage increases or stronger price growth. A Bundesbank survey, for example, has shown that the Eurosystem's medium-term inflation target of 2% became significantly less relevant as an anchor in wage negotiations in Germany over the course of 2022. This is especially true with regard to trade unions' wage demands.

As inflation has fallen since November 2022, the short-term inflation expectations of households in Germany and the euro area have moved in the right direction. As surveys by the Bundesbank, the ECB and the European Commission have all shown, the highs recorded in the second half of 2022 were followed by a downward movement. Since this summer, however, households' inflation expectations have tended to move sideways or, in some cases, even go back up, despite inflation rates continuing to fall at the same time.

There remains major uncertainty on the financial markets regarding longer-term price developments. While the markets are pricing in a further decline in inflation over the coming months, long-term market expectations are still a long way off from 2%. Market participants are continuing to hedge against the risk of excessively high inflation over the long term. And the war in the Middle East war has rekindled inflation risk.

* Keynote speech by Dr Joachim Nagel, at the annual reception of the Association of German Pfandbrief Banks (vdp), Berlin, 30 November 2023.

* Joachim Nagel, President of the Deutsche Bundesbank

The Eurosystem's 2% target serves as an anchor for inflation expectations, to be sure. However, what has been achieved is not something that monetary policy can be satisfied with.

3 Monetary policy: the year in review

Looking back, we tend to ask ourselves: What was good? What was bad? What could I have done better?

Through its interest rate hikes, the Governing Council of the ECB has made it crystal clear how determined it is to fight inflation. I am most satisfied with this as things stand today. In September, we increased the key interest rates for the tenth time in a row. Overall, interest rates have gone up by 4½ percentage points in a space of just 14 months.

As well as raising policy rates, we are scaling back the Eurosystem's balance sheet. So far, the fact that banks are repaying their loans under the longer-term refinancing operations has made a major contribution to reducing total assets. What's more, we first reduced reinvestments under the largest asset purchase programme, the APP, and then discontinued them altogether in July. This is shrinking the Eurosystem's balance sheet by an average of around €25 billion per month.

Compared with just over a year ago, the balance sheet of the Eurosystem is around €1,700 billion smaller. However, its total assets still stand at roughly €7 trillion. So from my point of view, we could step up the pace. Because – and I will go into more detail here in a moment – a leaner central bank balance sheet is still desirable.

4 Outlook for 2024

And now it's time to look forward. In two weeks, the Governing Council of the ECB will meet for the last time this year. That is also when the new Eurosystem staff projections will be published. So far, inflation rates in the euro area are expected to remain well above 2% this year and next. In 2025, they will hopefully then be very close to target.

On the one hand, upstream prices are falling noticeably, and this will probably gradually be passed through to consumers. And the dampening effects of monetary policy tightening are having a lagged impact on prices. On the other hand, wage growth will probably remain robust, so the underlying price pressures are expected to ease only slowly. In October, the Governing Council of the ECB carefully weighed up the risks of inflation and decided not to raise policy rates any further.

Where will interest rates go from here? I won't try to answer this question because the right course of action now is to make data-driven decisions on a meeting-by-meeting basis. In my opinion, inflation risks are tilted to the upside, not least because of the current geopolitical situation. So I wouldn't rule out a further interest rate hike. At the same time, I believe it is considerably too early to even think about potentially lowering policy rates.

And looking ahead to next year, I assure you that we will remain persistent in the fight against inflation. The general public should have one less major issue to worry about. They should be able to sleep more soundly again and trust in price stability. So key interest rates must remain at a sufficiently high level for as long as necessary.

Another item on the ECB Governing Council's agenda is a review of the operational framework by the spring. It will focus on how we intend to manage short-term market interest rates in future and will involve various decisions that influence the future size and composition of the Eurosystem's balance sheet.

In my view, a leaner central bank balance sheet is desirable, especially because it creates additional space. It would give the market mechanism more leeway again, allowing resources to flow to where they can be used productively. And monetary policymakers would regain room for manoeuvre, enabling us to continue taking all the monetary policy measures necessary to ensure the primary objective of price stability.

We need to bring individual elements of the operational framework together to create a coherent overall package. For example, there are various ways of influencing the monetary policy stance via short-term interest rates. In other words, the framework for conducting monetary policy and the monetary policy stance are two very different things.

Potential losses in the central bank's balance sheet are also separate from the monetary policy stance. This topic will probably be back in the spotlight by the end of the winter at the latest, when the Bundesbank presents its annual accounts for 2023. The Bundesbank is carrying financial burdens created by the extremely expansionary monetary policy of previous years and the exceptionally sharp rise in

interest rates that followed. But central banks neither seek to maximise profits, nor can they fail like commercial banks.

If the Bundesbank's financial buffers are no longer sufficient in the next few years, we will report a loss carryforward. Even in this event, the Bundesbank's balance sheet is sound. The Bundesbank has considerable assets above and beyond its financial buffers. What's more, a loss carryforward would be nothing new for the Bundesbank and would not prevent it from fulfilling its monetary policy mandate as part of the Eurosystem.

5 Multiple challenges

The exceptionally strong rise in interest rates is also associated with challenges for the financial system. At this point, I would like very briefly to touch upon the key messages contained in the recently published Bundesbank's Financial Stability Review.

The abrupt rise in interest rates has caused the market value of interest-bearing assets to drop. So far, the German banking sector has coped well, thanks not least to a good capital base. In mid-2023, Pfandbrief member institutions likewise held just under €40 billion more common equity tier 1 capital than required by supervisors. (This equates to approximately 3.4% of risk-weighted assets.)

However, going forward, banks' net interest income is likely to be less of a support for earnings than in the current year. This is because German banks have so far benefited from having been slow in part to pass through the higher interest rate level to their customers' deposit rates. This interest rate pass-through is likely to accelerate if rates remain elevated. Households and firms have already begun to shift funds from low-interest sight deposits into higher-yielding time deposits.

On the credit side, the pass-through or transmission of the unprecedented rise in interest rates has so far been significantly stronger than on the deposit side. However, this does not mean that the transmission on the credit side is undesirably strong. All in all, our analyses conclude that the extent to which the tighter monetary policy is passed through is normal by historical standards.

Higher financing costs, a lower supply of credit and weaker demand for loans are intentional monetary policy effects. This is a necessary interim step in order to dampen aggregate demand and, ultimately, price pressures.

One area in which the interest rate reversal is having a clear impact is the real estate market, which you Pfandbrief banks also always monitor very closely. You are a step ahead with your vdp real estate price index; roughly six weeks ahead of the Federal Statistical Office, to be precise. Your index, which is also widely used at the Bundesbank, suggests that prices continued to drop in the third quarter. According to Pfandbrief statistics, prices for residential real estate are currently just under 6% below their mid-2022 peak. Commercial property prices have meanwhile fallen by just over 12% from their peak in the second quarter of 2022.

The Bundesbank's economists believe that the decline in residential real estate prices is likely to help bring down still-existing overvaluations. This will reduce the risk of strong price corrections in the future. Nevertheless, I have no doubt that lenders will remain vigilant – not least because their collateral is losing value.

The Bundesbank sees elevated risks in the commercial real estate market. Here, a slight increase in credit defaults is already in evidence – albeit from a low level. The downturn in the commercial real estate market is being accompanied by structural challenges stemming from e-commerce, working from home and energy standards.

All in all, the effects of the rise in interest rates are not yet fully feeding through to banks' balance sheets. In addition, there are risks from structural change and heightened uncertainty. In this environment, institutions should maintain, and if possible strengthen, their ability to cushion negative developments without external assistance. Profits should therefore be used to strengthen their resilience.

This brings us to the next and final part of my speech. The interest rate reversal is not the only phenomenon that is making adjustments necessary. At the same time, there are fundamental transformation processes that undoubtedly pose challenges – for both the economy and society as a whole. These are, first and foremost, deglobalisation trends, decarbonisation, digitalisation and demographics – in a nutshell: the four Ds.

5.1 Deglobalisation trends

Let's start with possible deglobalisation trends. In principle, it makes no sense to forego the advantages of an international division of labour. However, the experiences gained during the pandemic have

prompted a rethink, with the need seen to make supply chains more stable. And what has happened with Russian energy commodities since the start of the Ukraine war is grist to the mill of critics of unilateral international ties.

"Geo-economic fragmentation" is the catchword here. This refers to political efforts to disentangle economic relations with certain countries and to limit dependencies. At least in the case of strategically important goods, some enterprises might well reshore parts of their production and the associated supply chains over the next few years: by homeshoring, nearshoring or friendshoring them.

From a monetary policy perspective, it is important to note that more security for supply chains is likely to come with a price tag. Greater inflationary effects could be expected, in particular, if supply relationships had to be abandoned abruptly. By contrast, a gradual adjustment of supply chains is likely to have only limited effects on inflation. This naturally depends on the size of potential cost increases and the extent to which they are passed on to customers. In any case, scientific studies have found only limited effects on headline inflation during the era of globalisation, though we have probably all felt the price-lowering effects of globalisation on individual products. As a central bank, we will be keeping a close eye on these developments.

5.2 Decarbonisation

The second D, decarbonisation, also represents a far-reaching restructuring of the economy. The ever-higher record temperatures and the increasing frequency of extreme weather events such as drought or heavy rainfall, coupled with the consequences of such events, show just how essential and urgent the ecological transformation is.

An appropriate price for each tonne of CO2 emitted is the most efficient means of climate action. It creates market incentives to consume less, to invest more in green technologies and thus to generate lower emissions. There is also the scope for spending created by revenue – to mitigate social hardship, for instance. Carbon prices are likely to rise significantly on the path to net zero. In addition, measures mandating or prohibiting certain actions may come into consideration. However, these can selectively lead to even stronger cost increases in certain areas.

It is not only the transition to a greener economy that entails costs, but also climate action and the increasing damage being caused by climate change. Imagine, for example, that drinking water were to become increasingly scarce and expensive.

Monetary policymakers must therefore expect a trend increase in price pressures over a given transitional period. How things will progress from there is still highly uncertain. If the wind and sun are sufficient, the electricity produced by wind and solar power is unrivalled in terms of affordability – meaning that electricity prices could even fall, under certain conditions.

The extent to which the transition poses challenges for the economy and monetary policy will crucially depend on how climate action and economic policy are set out. For example, model analyses by the Bundesbank show that, in the event of a disorderly climate policy transition, the economy might experience considerable additional burdens.

If climate and economic policy measures are aligned with the long-term objective in a coherent and efficient manner, they can make a significant contribution towards reducing risks and uncertainties. Our experts' calculations, for instance, show that reliably predictable carbon price pathways are likely to generate, at most, moderate inflationary pressure – something that monetary policymakers would have to take into account.

5.3 Digitalisation

The third D, digitalisation, is in full swing. All-purpose technologies such as artificial intelligence are developing at breakneck speed. It must be questioned whether digital change will make firms more efficient, and whether the productivity of the economy as a whole will ultimately increase. This is crucial to economic growth and prosperity.

Productivity growth has been low in many industrial countries for some time now, even though digital technologies are spreading rapidly. This comes as something of a surprise, because digitalisation is said to be capable of sustainably increasing labour productivity.

Our economists at the Bundesbank examined the period between 1997 and 2018 and deduced the following for the large euro area countries: efficiency gains in the digital sectors were significantly higher than in the rest of the economy. And although the digital sectors account for only a relatively small share

of the economy as a whole, they have had a decisive impact on the macroeconomic development of labour productivity.

Without efficiency gains in these sectors, productivity growth in the large euro area countries would have been considerably lower, or productivity would have even stagnated. However, the efficiency-enhancing power of digital change appears to have diminished over the period under review (up to 2018). While the pandemic did subsequently boost the use of digital technologies, it is not yet possible to say precisely whether this will lead to measurable efficiency gains. That being said, surveys of firms on this subject are yielding optimistic results.

Where digital transformation processes increase labour productivity, this, taken in isolation, drives down firms' unit labour costs, easing price pressures under otherwise equal conditions. This would relieve some of the work of monetary policymakers, as otherwise price pressures would be even higher.

5.4 Demographics

However, there is a growing body of evidence suggesting that the ageing of society is reducing innovation and the proliferation of new technologies. The fourth D, demographics, can be summed up quite easily: the population is getting older. And, without significant immigration, it will contract. As things stand, more than one-fifth of people in Germany are aged 65 or above – and this trend is on the rise.

A topic that is now becoming increasingly significant is the fact that demographic developments are likely to lead to a decline in the labour supply. In Germany, the number of baby boomers going into retirement will probably, in just a few years, already outnumber the number of young people entering the labour market, despite net immigration.

There is already a widespread shortage of staff today. Businesses are not only frantically searching for highly qualified specialist staff – labour is in short supply across the board. This is particularly the case in structurally expanding sectors of the economy that have greater staff requirements, such as health and social services and IT. In other areas, however, even in times of economic difficulty, firms are often loath to dismiss employees for fear of not being able to replace them once the situation improves again. This hoarding of workers is also probably one reason why unemployment remains relatively low at present.

As labour shortages increase, competition for workers is likely to become even stronger. Policymakers can counteract labour shortages by improving the framework conditions to create a greater supply of labour. However, it is my responsibility as a monetary policymaker to be aware of the potential consequences of permanently tight labour markets.

Persistently higher wage pressures could amplify domestic inflation. Bear in mind in particular that the price of services is heavily dependent on wages. Monetary policy would have to respond to such wage-driven inflationary pressures by tightening monetary policy accordingly.

6 Conclusion

We can either rise to meet challenges or be overcome by them. This is true of many situations in life, but also applies to the economy. More specifically, the challenges an economy has weathered can make it more efficient, resilient and future-proof. Here, price stability creates a sound foundation for all economic activity. Monetary policy has made substantial progress in its key challenge of combating excessive inflation in the euro area. We must be wary of slackening our efforts too soon.

For 2024, I have four wishes for you, though they do not begin with D: good fortune, health, happiness and every success in rising to the challenges of the future! Let us hope that the global situation will become more peaceful and that timely progress will be made in addressing climate change.

IMI International Monetary Review

Reflections on the Economy and Monetary Policy*

By MICHELLE W. BOWMAN *

I find great value in engaging with and learning from the experiences and perspectives of those who are directly engaged in the economy—businesses and consumers, and those who support economic activity by providing access to financial services through the broader financial system. These experiences help provide context for the economic and financial data that we rely upon for our economic analyses. I look forward to learning about how your businesses—and the clients and communities you serve—are navigating the current economic and financial conditions.

Since joining the Board of Governors of the Federal Reserve System five years ago this week, the U.S. economy has experienced a number of unique economic challenges. In my remarks today, I will include some of my observations on a number of economic developments that our economy has experienced during that time. I will also consider the monetary policy actions taken by the Federal Open Market Committee (FOMC) in response to these developments and conclude by highlighting several uncertainties surrounding the economic outlook and how they affect my views about appropriate monetary policy going forward. Prominent among these uncertainties are whether supply-side improvements will continue to reduce inflationary pressures; the extent to which the demand for goods, services, and labor will come into better balance with supply given the current setting of monetary policy; and the level at which the federal funds rate will be consistent with the FOMC's inflation and maximum-employment goals in the longer run.

The Post–Financial Crisis Economy and Monetary Policy

Five years ago, monetary policymakers faced a much different set of challenges than those we face today. At that time, one of the primary concerns of the FOMC was that inflation had consistently been running slightly below the Committee's 2 percent inflation target, despite years of accommodative monetary policy following the 2007–08 financial crisis and subsequent recession. More broadly, many central banks around the world were grappling with the prospect of structurally lower interest rates due to a variety of factors including demographic changes and higher savings rates, lower potential output and productivity growth, and greater investor demand for safe assets like Treasury securities.

One central topic of discussion during FOMC meetings in 2018 and 2019, my first year as a Governor and permanent voting member of the FOMC, was how monetary policy strategies and tools could best achieve the Committee's dual mandate of price stability and maximum employment in a world of structurally low interest rates and disinflationary forces that kept inflation persistently under the Committee's 2 percent target. Relatedly, there was an ongoing concern that the federal funds rate, the FOMC's key policy rate, was too close to the "zero lower bound," which would limit the Committee's ability to respond effectively to an adverse shock by lowering interest rates. So much so that even during the economic expansion there was concern that the Fed would likely be severely limited in its ability to stimulate the economy.

In 2018, the FOMC was nearing the end of a gradual monetary policy tightening cycle that had begun in late 2015. At the time the FOMC had been slowly tightening monetary policy, it had the benefit of a strong labor market, a steadily expanding economy, and inflation near 2 percent. The U.S. was also experiencing one of the longest economic expansions in its history, with consistent labor market gains for all segments of the workforce. During my first FOMC meeting in December 2018, the FOMC completed this hiking cycle by raising the target range for the federal funds rate by 25 basis points to 2-1/4 to 2-1/2 percent. The FOMC maintained this range until the second half of 2019, when the Committee reduced the federal funds rate by a total of 75 basis points in response to moderating economic growth and inflation and global economic uncertainties related to expectations of lower U.S. growth. Although the underlying issues were quite different, there were similarities to the issues we face today. At that time, the Federal Reserve was also in the process of normalizing the size of its balance sheet, which stood at just under USD4 trillion in December 2018.

* At the Utah Bankers Association and Salt Lake City Chamber Banker and Business Leader Breakfast, Salt Lake City, Utah, November 28, 2023

* Michelle W. Bowman, member of the Board of Governors of the Federal Reserve System.

Then, in March 2020, the COVID-19 pandemic created an unprecedented shock to the global economy and financial system. This shock—combined with the policy responses of governments and central banks around the world—disrupted many of the economic dynamics that had influenced the economy over the past several decades. These impacts will affect how we think about monetary policy going forward, but let's put the event and response into better context.

The Pandemic Policy Response and Economic Recovery

Widespread economic lockdowns and social isolation, combined with other pandemic effects, caused the swiftest and deepest contraction in employment and economic activity since the Great Depression. Many critical parts of the U.S. financial system experienced significant disruption or completely ceased to function. The Federal Reserve responded forcefully to mitigate the financial market turmoil and the economic effects of the rapid shutdown of the U.S. economy. As a part of its response, the FOMC quickly lowered the target range for the federal funds rate back to 0 to 1/4 percent and began purchasing large amounts of Treasury and agency mortgage-backed securities. These purchases were initially designed to support the smooth functioning of security markets to support the flow of credit to businesses and households and, later, to provide additional monetary policy accommodation to support economic activity and labor markets.4

Central banks in other countries and jurisdictions also implemented accommodative monetary policy to support their economies during the early phases of the pandemic. In addition, fiscal authorities around the world implemented programs to support labor markets and enable household and business spending. In the U.S., these programs and policies included the Paycheck Protection Program and other CARES Act programs designed to support businesses, households, and state and local governments. These policies, combined with extremely accommodative monetary policies, bolstered private-sector and local government balance sheets. They also resulted in what has come to be referred to as "excess savings"—money that consumers would have spent otherwise but couldn't, given a number of physical- and supply-related constraints.

The innovative approaches adopted by many American businesses—including shifting to online sales and complying with social-distancing requirements to meet government operating requirements—the excess savings, and the newly introduced medical treatments supported a sharp economic rebound in 2021, with more than 5 percent real gross domestic product (GDP) growth in the first two quarters. Strong demand, early retirements, generous fiscal support, very low legal immigration, and a mismatch between available jobs and workers all contributed to a very tight labor market. The unusually rapid rebound in economic activity, the pandemic-driven shift in consumer spending toward goods, reduced manufacturing capacity in some sectors, and supply-chain vulnerabilities led to crippling supply-chain bottlenecks in a number of areas. Eventually, given these supply–demand imbalances amid accommodative fiscal and monetary policies, inflation moved up to very high levels.

By the second half of 2021, inflationary pressures intensified and became more broad based. Labor markets were extremely tight, though data available at the time did not reflect the true extent of this tightness. Of the many difficult issues the Committee faced at the time, one of the most important was whether the inflationary pressures would be persistent or resolve as supply-side pressures eventually eased.

The June 2021 Summary of Economic Projections (SEP) showed the median FOMC participant expected annual personal consumption expenditures (PCE) inflation to be 3.4 percent at the end of 2021 and to settle at 2.1 percent by the end of 2022. Private-sector forecasters expected slightly lower inflation of 2.9 percent at year-end 2021 and projected it to be 2.3 percent by the end of 2022. With the benefit of hindsight, we know now that most forecasters, ourselves included, vastly misjudged the persistence of inflation at that time, with PCE inflation of 5.9 percent for both 2021 and 2022. This underscores the challenge we faced in discerning which factors were driving inflation and how long those forces would persist.

High Inflation and the Response of Monetary Policy

In the second half of 2021, it became clear that the FOMC's monetary policy stance was too accommodative in the presence of growing inflationary pressures and that the Committee needed to move toward a tighter policy stance. It seems likely to me that the experience of the years leading up to the pandemic, when inflation was persistently low, made it hard for forecasters to foresee how quickly that could change. Of course, the inflation and labor data did not accurately reflect the economic conditions

prevailing at the time and were subsequently substantially revised. Together, these factors likely also led to a delay in the removal of monetary policy accommodation in 2021. The monetary policy experience during the pandemic highlights how structural changes in the economy can be difficult to identify in real time.

By November 2021, the target range for the federal funds rate was still at 0 to 1/4 percent. And we continued to purchase assets at the same pace as earlier in the year, although at our November 2021 meeting we announced that we would begin to slow the pace of purchases later that month and in December. At the December 2021 meeting, we doubled the pace of tapering, which accelerated the end of purchases to the following March.

The FOMC finally raised the target range for the federal funds rate by 25 basis points and ended the purchase of Treasury and agency mortgage-backed securities at the March 2022 meeting. And in May, the FOMC announced its plan to reduce the size of the Federal Reserve's securities holdings—which then stood at around USD8.5 trillion—starting in June and at a pace much faster than in the previous episode of balance sheet reduction. The FOMC also continued to increase the target range for the federal funds rate over the course of 2022 at a pace much faster than in previous tightening cycles, as it became clear that inflation was higher and more persistent than many forecasters had expected. Twelve-month total PCE inflation peaked at 6.6 percent just before the June 2022 meeting, reflecting both high core inflation and higher energy and food prices, which were influenced by geopolitical conflicts.

To date, the FOMC has increased the target range for the federal funds rate to 5-1/4 to 5-1/2 percent and has been reducing the size of the Federal Reserve's securities holdings, which now stand at just above USD7 trillion. We have also seen significant progress on bringing inflation down, so far without impairing the strength of the labor market and economic activity.

Looking Ahead

At our most recent meeting, the FOMC voted to maintain the target range for the federal funds rate at the current level and continue to run off the Fed's securities holdings. Inflation readings have come in lower, with some of the improvement related to a continued easing of supply-side pressures. But the level of inflation remains high, with the most recent readings of 12-month total and core PCE inflation at 3.4 percent and 3.7 percent, respectively. And recent progress has been uneven. The economy has remained strong as the FOMC has raised the federal funds rate, and recent data indicate that economic activity accelerated in the third quarter, with real GDP growing at a 4.9 percent annual rate. The most recent employment report showed a continuation of healthy job gains. Labor force participation has improved over the past year, with a somewhat slower, but still strong, pace of job gains, a sign that labor market supply and demand may be coming into better balance.

At our last meeting, I supported the FOMC's decision to hold the target range for the federal funds rate at the current level as we continue to assess incoming information and its implications for the outlook. But my baseline economic outlook continues to expect that we will need to increase the federal funds rate further to keep policy sufficiently restrictive to bring inflation down to our 2 percent target in a timely way. However, monetary policy is not on a preset course, and I will continue to closely watch the incoming data as I assess the implications for the economic outlook and the appropriate path of monetary policy.

There are several uncertainties surrounding my baseline outlook that will influence my view of appropriate monetary policy going forward. First, much of the improvement in inflation over the past year has been due to supply-side improvements, such as improving supply chains, increases in labor force participation, and lower energy prices. It is unclear whether further supply-side improvements will continue to lower inflation. Some firms are now shifting their supply chains closer to home in place of more global supply chains. Government policies such as the CHIPS and IRA Acts are supporting these shifts by encouraging greater investment in developing domestic manufacturing capacity, including for semiconductors and electric vehicle batteries. How these investments work out over time may affect the productive capacity of the U.S. economy. And while these investments have the potential to increase productive capacity, over the next few years they may also create strong demand for labor and equipment in areas without the necessary physical resources to support the development, which may increase inflationary pressures. In my view, there is also a risk that over the coming months higher energy prices could reverse some of the recent progress made by supply-side improvements to bring overall inflation down.

Second, over the past year, the number of workers in the labor force has increased from improved labor force participation and other factors, including recent growth in work visa issuance for some immigrants.

At the same time, the average pace of job gains has slowed somewhat and vacancies have declined, a sign that labor supply and demand may be coming into better balance. However, future gains in labor force participation may be limited, since prime-age labor force participation is currently higher than pre-pandemic levels. It is also unclear whether all of the workers who retired or left the labor force during the pandemic will eventually return.

We also know that pandemic-era education disruptions from school closures and remote learning resulted in extensive learning losses. There is a real risk that these learning losses will limit the productivity of the American workforce in coming years. Over time, American workers who experienced these education disruptions may overcome the pandemic-era learning losses, but today, as young people leave education and transition into the work force, there is a risk that either the economy will experience lower long-term trend growth, or that the divide between those who suffered learning losses and those who did not results in vastly different economic and overall outcomes for this generation of American workers.

The third of these uncertainties is the extent to which strong aggregate demand and the composition of spending will continue and contribute to inflationary pressures going forward. It is possible that consumption pattern changes that occurred during the pandemic will prove durable. Prior to the pandemic, goods consumption comprised just under one-third of overall consumption. During the pandemic, consumption shifted to a greater proportion of goods, like home office and gym equipment, in part because pandemic-related restrictions limited the opportunities available to consume services. As we emerged from the pandemic, the initial expectation was a return to stronger services consumption, but goods consumption remains near 35 percent of overall consumption. If goods consumption continues to be a greater proportion of overall consumption, the expected deflationary effect from goods prices could be delayed.

There is also a risk to inflation from higher services consumption. With too few workers to fill the number of existing job openings, a continued increase in the demand for services may contribute to persistently high core services inflation. Additionally, a lack of fiscal restraint could further contribute to inflationary pressures.

Another uncertainty is the reaction of economic activity and inflation to the continuation of higher interest rates and tighter financial conditions. We don't yet know the full extent of the effects of tighter monetary policy and financial conditions on economic activity and inflation. There are some signs of interest rate sensitivity for small business loans and corporate debt, and slightly higher delinquencies for existing credit card accounts and auto loans, in comparison to before the pandemic. However, the presence of cash buyers in the housing market has lowered some of the interest rate sensitivity in the housing sector. Further, many households continue to hold significant excess savings and are realizing ongoing savings from mortgages originated or refinanced when interest rates were low.

In considering business investment and interest rate sensitivity, the evidence has been mixed. The most recent Richmond and Atlanta Federal Reserve CFO Survey suggests that roughly 40 percent of respondents have already pulled back on investment requiring financing at current interest rates.15 However, another 40 percent say that they are not interest rate sensitive, their financing or borrowing is not influenced by rates, or they do not know the level at which the rate would become an impediment.

Finally, given all of the considerations I have just discussed, it is not yet clear whether the appropriate level of the federal funds rate will need to remain at a higher level than before the pandemic in order to effectively foster low and stable inflation and support full employment. In my view, given potential structural changes in the economy, such as higher demand for investment relative to saving, it is quite possible that the level of the federal funds rate consistent with low and stable inflation will be higher than before the pandemic. In some respects, a higher longer-run level of the federal funds rate would be a welcome development, as this would allow the FOMC to more effectively respond to future negative economic shocks by lowering the policy rate. Structurally higher interest rates might also lead to less concern about the possible financial stability effects of reach-for-yield behavior, as higher interest rates ease pressure on institutions like life insurance companies and pension funds that manage extended-duration liabilities.

Conclusion

In conclusion, I continue to see an unusually high level of uncertainty as I consider current economic conditions and my own views on the outlook for the economy and monetary policy. My colleagues and I will continue to make our monetary policy decisions at each meeting based on the incoming data and the implications for the economic outlook. I remain willing to support raising the federal funds rate at a future

meeting should the incoming data indicate that progress on inflation has stalled or is insufficient to bring inflation down to 2 percent in a timely way.

We should keep in mind the historical lessons and risks associated with prematurely declaring victory in the fight against inflation, including the risk that inflation may settle at a level above our 2 percent target without further policy tightening. Returning inflation to the FOMC's 2 percent goal is necessary to achieve a sustainably strong labor market and an economy that works for everyone.

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Climate Policy and Green Finance

Climate Crossroads: Fiscal Policies in a Warming World*

By RAPHAEL LAM *

We just launched in October 2023 the Fiscal Monitor. And then this topic is on the climate crossroads. What kind of impact does it have on the public finances in different areas from the sustainability angle? How much does it cost the government to achieve some of the policies? So this would be more focused on the public finance area on top of the fund that has been developing Excel into different areas on the climate policies.

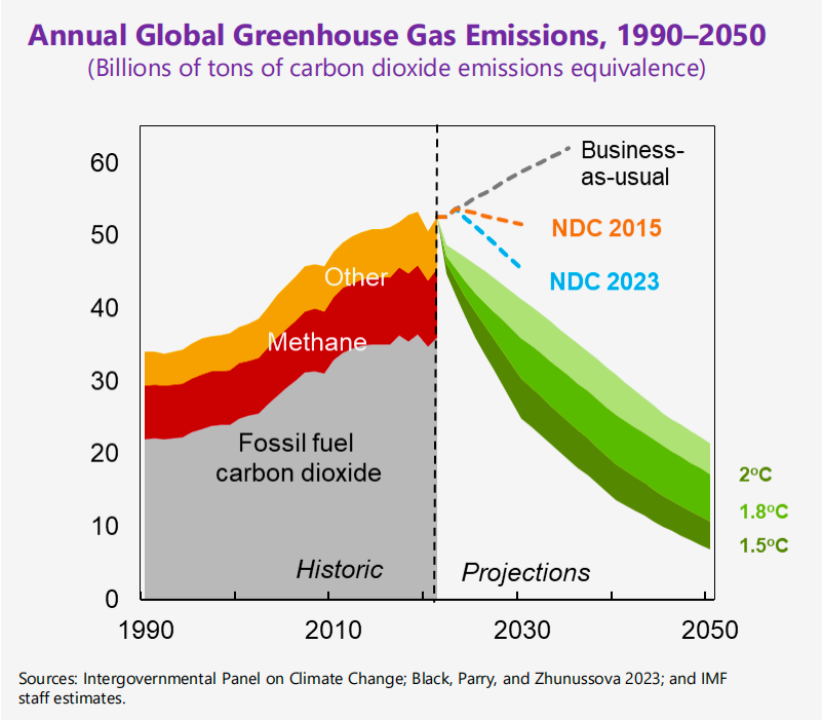
So to start with, certainly, I mean, as everyone would be aware that now countries have been starting to implement some of the policies in order to reduce their emissions. However, if you look at the left-hand side, what countries agreed in the Paris Agreement in 2015 is to reduce emissions to about net zero by the mid-century 2050. By those measures, if the purpose is to reduce global warming to keep the rise in the global temperature just by around 1.5% to 2% degrees relative to the industrial level. So that will be the green trajectories that countries will need to do in order to achieve climate goals.

However, although countries have started the measures, on average, they are falling short of the need that to achieve net zero emissions by mid-century.

You can see the two dotted lines called the Nationally Determined Contributions (NDCs) both the 2015 version as well as the 2023 version, which is the latest one that we estimated, somewhat still far away from the gap that we needed to close by the midcentury. This means that although countries are making efforts, as we can see that we are already making efforts from the orange line to the blue line, it is still far away to get into the green corridor. So certainly more actions are needed in order to close or narrow the implementation as well as the ambition gap. So these will be the ideas that countries would definitely need to do more.

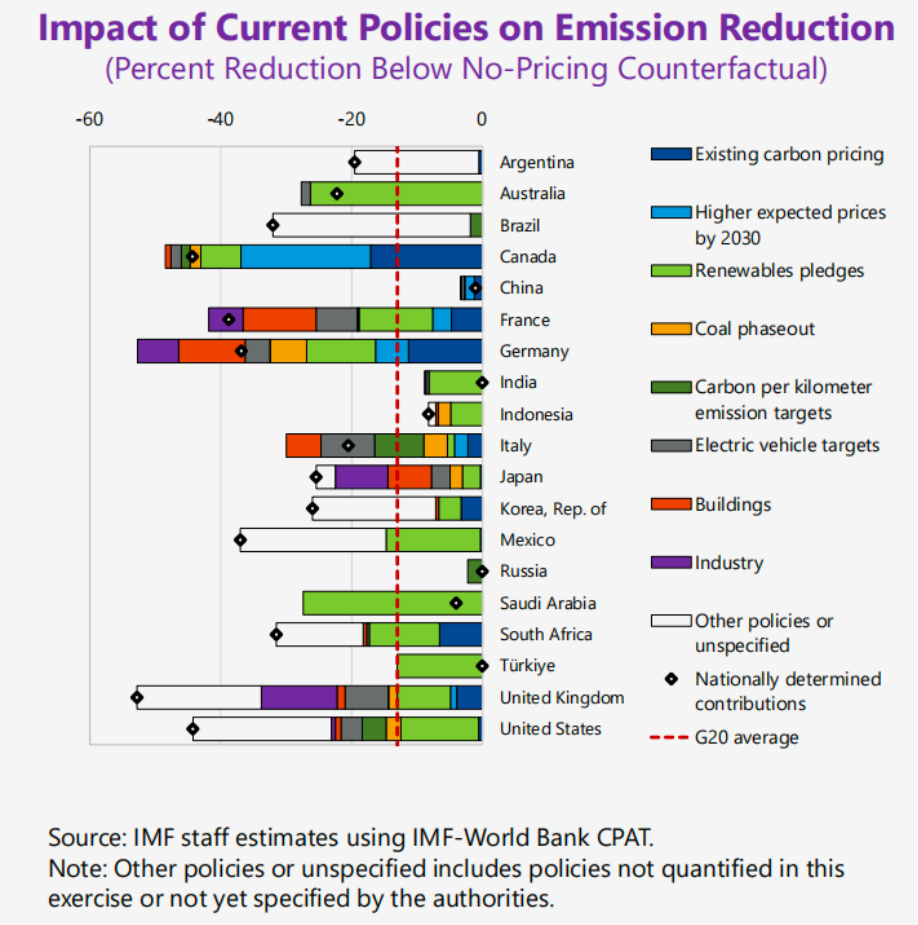
* This is based on the speech by Raphael Lam at the Macro-Finance Salon (No. 215) held at IMI on October 24, 2023.

* Raphael Lam, Deputy Division Chief, Fiscal Affairs Department, IMF



And I think there's increasing awareness of the public of policymakers and then both the domestic level as well as the international level. Here I think China is also very proactive in committing itself to a range of climate goals, not just in emissions but also in other areas.

However, we see that on the right side, countries are pursuing different types of kind of policies with varying degrees of success. Here we focus on the G20 economies both for advanced as well as emerging markets. As you can see the bars, which are denoted. They are doing in terms of different sectors rarely quite significantly across. So for instance, in China, over there, the blue bar is very obvious then we take in terms of the current policies for reducing emissions. But on average the G 20s is committed only to reducing 13% of the regions which is a red dotted line there, much short of the goals that are required to achieve the net zero emission. Some countries are doing more, for example, Canada, or maybe France and Germany. So there are different degrees of success in these contexts, as you can see.



So the key questions that we raise in the Fiscal Monitor will be: If countries are pursuing different types of policies and if they want to scale it up in order to get the emissions down to the green corridor, would that be feasible to achieve it by just spending more? So would it be good for public finances? Would it be good to achieve a net zero emission by spending more?

The second question is that we want to understand better what countries can do in terms of the kind of policies. There are different sets of policies that could be used to reduce emissions like by promoting green cars or electronic cars, you can provide subsidies. The government can undertake a lot of investment or a charge of price on carbon emissions. So how can policymakers design some of the policies, balancing the political side and the public finance impact as well as finding a way to that is more cost-effective in delivering the objectives?

And then the third one is that the private sector needs to play a bigger role in terms of the decarbonization efforts. Can the government do more to facilitate the green transition among the firms? So it's not just the role of the private sector and the public sector, but it also needs a lot of involvement on the private side, both firms and households. So to review the results, let me give you a quick overview.

So we, the monitor would probably give out a conclusion that we cannot just scale up the spending policies. But some countries have started to do it. For example, in the last couple of years, the US has brought out the Inflation Reduction Act. The European Union has proposed the Green Deal industrial policies. We're spending a little bit more on the public side in order to reduce the gap in emissions. But in our assessment, some of these measures, if we scale it up further, tend to be inefficient, but at the same time, to put that sustainability at risk. I will go back to that in some of the analysis. The monitor would find that the only way they could kind of achieve the best mix of the policies would be we find a way that includes both on the spending side, but also some revenue measures in which could make a good balance of public financing.

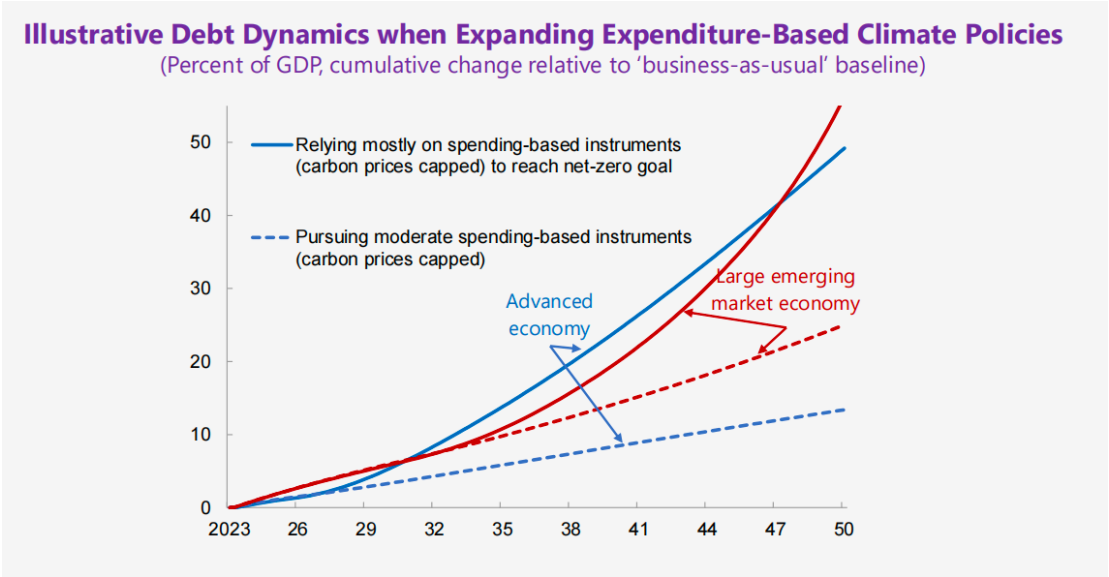
And particular we consider that carbon pricing should play a more central role or integral within the overall policy package. We see that in the last part, firms still play a role in terms of decarbonization. And this is important for the government to withdraw the regulations. As for some of the fiscal incentives, you

are not just to encourage firms to invest in non-carbon technology. Certainly, in recent measures of the big subsidies that are rolled out by countries, we need to be involved carefully so that it doesn't stop some of the competition among firms across borders but at the same time encourage the firms to invest in signal carbon technology.

1. Can countries scale up spending measures to reach climate goals?

So maybe we start with the first questions to show you some of the results of why we consider that the countries cannot just scale current spending-based policies.

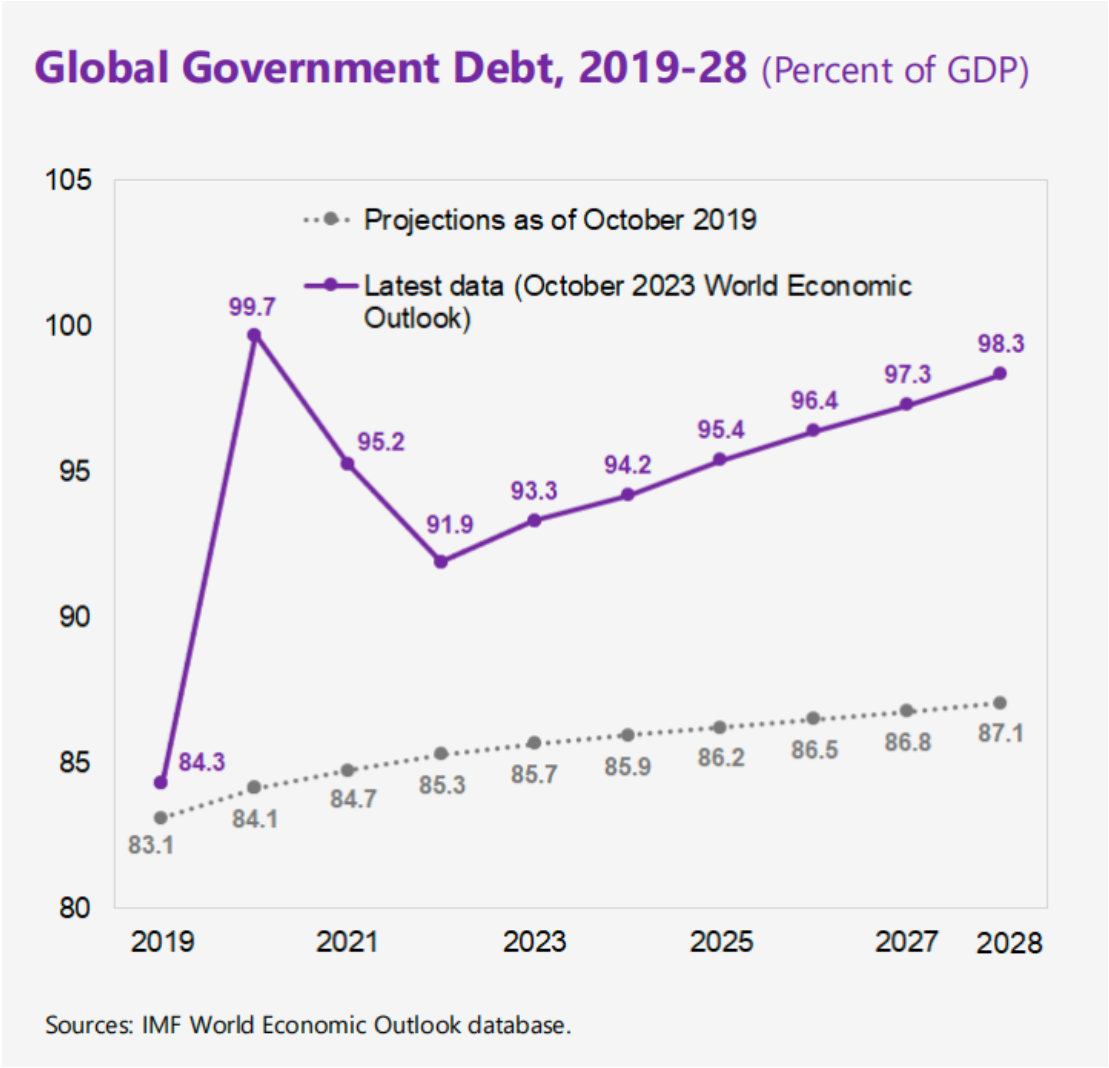
Here we used a dynamic general equilibrium model, a modeling framework that includes the effects if the government spends more, what will be the impact on growth, inflation as well as time with emission based on some of the parameters that we use in the literature. So the model is kind of a dynamic general medium and then we consider different scenarios. The scenarios we consider as for both the advanced economy as well as the large emerging market economies. Which are shown in the blue and red lines in the chart. The one that we want to illustrate is what if the government's scaling up in order to achieve net zero emissions by midcentury, meaning that on average countries will need to spend by an additional 2% of GDP per year in order to achieve the reduction of emission, assuming that the carbon pricing is kind of capped as about USD75. For advanced economies and emerging markets, at USD45 for carbon emissions. So this is a relatively low level, although it is higher than the current level, it is relatively low in order to achieve massive emissions.



This picture illustrates the impact on public finance measured by the debt to GDP. As you can see in both the advanced economy and in large emerging markets, the debt would essentially roll up or expand at a very rapid pace, by about 45% to 50% of GDP by 2050, relative to the business-as-usual baseline. So basically relative to the baseline we have, we will see an additional 45% to 50% of GDP increase if the countries scale up some of the spending measures in order to reach the net zero emissions goal. That's certainly not sustainable for many countries because countries already have a very high debt level. So this is the situation certainly is not sustainable from the financial viewpoint.

The second set of scenarios illustrated in the dotted line here shows a different picture. Which is essentially the government spends. That's the same as what it is now, a little bit higher. But at the same time, keep the carbon pricing effects. So there's no carbon price increase for moderate actions to increase in terms of spending. Because of moderation, you can see that debt increases relatively mild, but at the same time, we will not achieve net zero emissions by 2050. It's failing to reach the climate goals. The reduction of efficiency is only by about 30% to 40%, relative to the necessary degree that is required to reach net zero. So this is the situation that we face. For a lot of governments, is how to balance public finance while advancing the kind of policies.

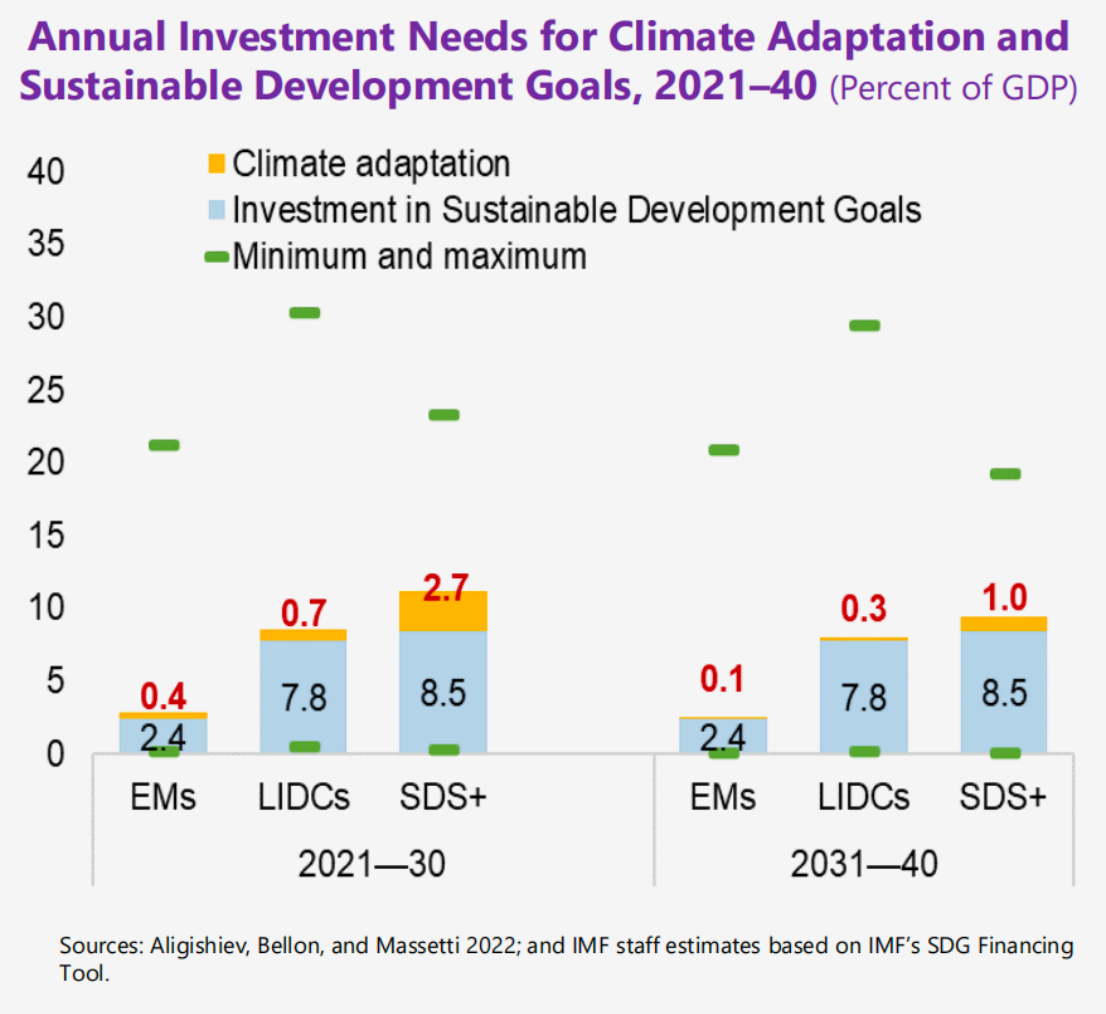
Here we show the latest illustrations of real projections that maybe some of you are aware of. Not only is the increase in public debt notable, but it will put it at an unsustainable level if countries scale up spending. The government debt already right now is at a very high level. It is expected to reach 93% of GDP for the global public debt by the end of this year. You can see after the two-year debt decline from 2021 to 2022, it started to pick up again in our forecast. And the pace of pickup is at about 1% of GDP per year over the medium term. And it would approach 100% of GDP by the turn of this century. So this would be significant if governments want to pursue a common policy by increasing debt. Not only that, you can see the takeoff in the pace of the debt outlook has worsened than the pre-pandemic projections.



But see that the pace of the debt increase will be much higher than people's projections. At the same time, a lot of the emerging markets as well as the low-income countries would not only face the problem of the mitigations, but they also need to adapt to climate change. They also need to have priorities to meet their sustainable development goals, for instance, on education, healthcare, sanitation, infrastructure, etc. This would all cost money in order to achieve it. And we have some estimates in the Fiscal Monitor to put a number on it. How big it is and the numbers are very sizable.

For instance, for this decade, it is estimated that the emerging markets that have low-income countries need to spend an additional 0.4% and 0.7% of GDP per year. And this is certainly sizable. And for the small states, small developing states, meaning that it's somewhat exposed to all kinds of risks, they would need to spend a much higher level. Similarly for the investment to a Sustainable Development Goal, there is also very sizable. This would essentially mean that public finance is already scratched in terms of reaching some of these development goals while at the same time delivering an additional objective on all kinds of policies. So certainly countries will be facing a lot of problems. The monitor will frame it as

governments or the policymakers are facing a policy trend, meaning that they will try to balance different objectives. At one goal, they want to achieve the climate goal by reducing emissions and building resilience against climate risk. Alongside, we are keeping public debt in a sustainable way so that we contain sovereign debt distress and building buffers for future shops that certainly would already be kind of a very challenging situation.

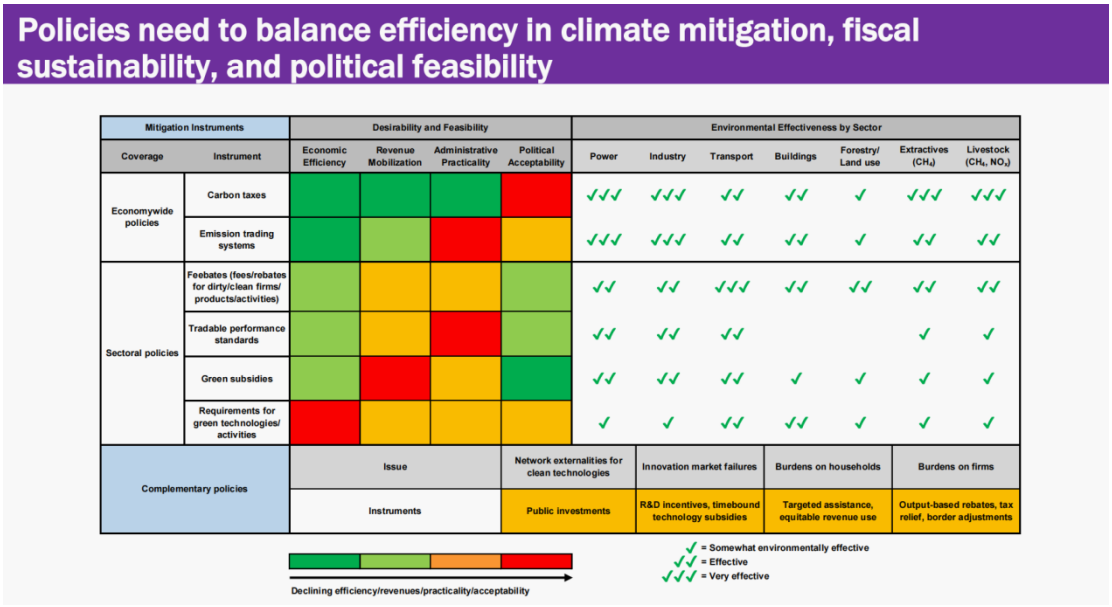


The issue is certainly the government has some options to raise revenue either to increase tax because a lot of tax as the capacity or a lot of potential according to a recent estimate by our colleagues at the Fiscal Affairs Department. Or you want to increase some of the expensive pricing on carbon emissions. In China, it is the carbon tax or emission trading system. However, this would relax some of these constraints in order to reach out to climate goals and keep public finances on track. Most of those revenue measures are politically less feasible or the public will usually dislike them. We usually dislike those additional metrics on taxation. So certain political constraints would be important considering the situation here.

2. How to strike a balance on the policy trilemma?

So essentially the government will need to face the policy trend by striking a balance between these two, between the three carriers. So in terms of the monitor, we are trying to understand better how the government is doing it, and should try to strike a balance between the triangle that I just illustrated. The way that the monitor didn't demonstrate is that there are possible ways. It's difficult, but it's possible to achieve balance here. Basically, it shows the balance between the efficiency of measures, meaning that there are some measures that could achieve climate mitigation in a much more efficient way. We also want to balance fiscal sustainability and also to achieve results that are politically feasible.

Here this is a relatively complex table. Let me walk you through it. But it essentially shows different types of instruments that are shown on the left side. According to different criteria that we just laid out, whether they are cost-effective, whether they are able to mobilize revenues, whether they are easy to be administered, and whether they are politically acceptable. So different categories and in different colors. On the green side, it is easier to do so. On the right side, it means that it is more difficult.

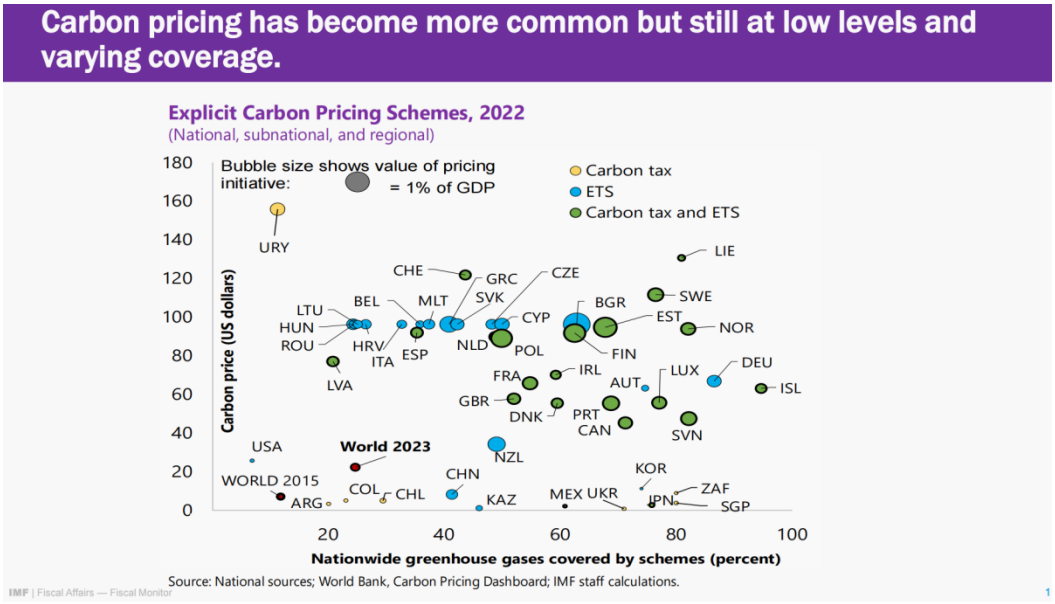


We also show the effectiveness according to different sectors, power industries, transport, buildings, and also in different categories. Some are easier in a couple of days. And in terms of emissions, some are much more difficult in another setting. So you could think of cement industries. Or you could think of aviation if you travel. And also causes sort of common issues. So different types of instruments will have different effectiveness in these areas.

So from this table, we could illustrate that carbon taxes are usually a very efficient way to reduce emissions because they affect a lot of incentives at a quarter range, encourage households and firms to preserve energy use or to move to a lower polluting technology, or to essentially facilitate the transitions to a green energy source.

However, it's usually politically feasible. A lot of the country's citizens are insisting on those measures that are going to increase carbon pricing. So it is important to think of these policy packages as consisting of different instruments. Some of them may need to include green subsidies to support firms, particularly in areas that have a lot of network externalities or market failures, then the green subsidies will be used. So overall, the Monitor gives us some country examples along these dimensions as well as a kind of brand instrument for introducing different criteria. Ultimately we want to kind of reach out to find an optimal solution to achieve carbon reduction while meeting some of the tremendous difficulties.

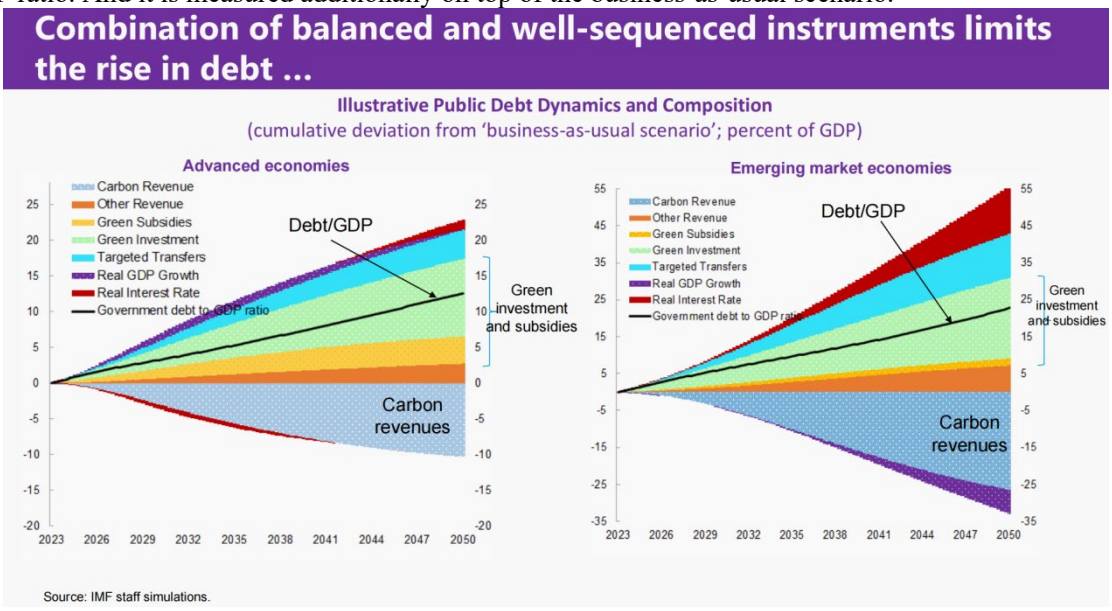
Talking about carbon pricing, there are a lot of receptions, but overall we consider that carbon price has become much more common over the last decade. So right now, as of our analysis in 2022, about 49 countries have explicit carbon pricing schemes, either in the form of carbon taxes or in the form of Emissions Trading System (ETS), which is the blue dot. But you could see that although a lot of countries have adopted it, the overall level is still at a very low level. It will change, increase about USD20 per time, but it's already a significant rise. When they keep to the world in 2050, which is about USD5 per ton.



But only so far, less than a quarter of the global emissions are covered under the carbon pricing scheme. So it's not a horizontal axis. Not only that, you could see that in a lot of the large economies, such as the US, China, and Japan, the level of carbon pricing is still at a relatively low level, meaning that there's a lot of scope to generate revenue if we have a pricing.

Understanding it may not be very politically acceptable in any case. But the good deal is that countries are starting to have carbon pricing schemes. And on top of these 49 countries, we have also observed that maybe 20 countries are also considering having explicit pricing schemes. That could be implemented in the next couple of years. So in terms of the appropriate mix of the fiscal policies, we have done some analysis in the Fiscal Monitor by illustrating the implications using a model-based analysis. The model we use is similar to the one I introduced earlier, which is based on the dynamic general equilibrium model. So it accounts for all the impact of government policies affecting the micro variables and feedback effects coming from that.

So this is the most advanced analysis in the whole presentation on the Fiscal Monitor. I will walk you through these two charts. Here we basically want to understand the impact on public finances of different illustrations of climate policies. So in the chart, the debt to GDP ratio is shown in the black line. So on average, you can see that countries pursue different types of policies that will have an impact on debt to GDP ratio. And it is measured additionally on top of the business-as-usual scenario.



The primary policies that we consider have different elements. One is certainly about green investment meaning that the public sector undertakes the investment. You can imagine it's an electricity great. Imagine there's a big scale of investment in the green sector. We also consider some of the subsidies which are indicated in the orange or yellow area. So these are the two main sources of government spending in order to promote the transitions to the green sector, in order to reduce efficiency. The estimates vary across countries certainly and we are using some of the estimates obtained from the International Energy Agency in this analysis. For advanced economies, on average, it is about 0.4% to 0.5% of GDP. And for emerging markets, it is about 0.7% to 0.8% of GDP per year on average.

Another important set of the policy makes as we indicate will be carbon pricing, which indicator is carbon revenue. And it has results in keeping the debt build-up in a more contained way by reducing the debt increases.

So on average, this is a significant source of tax revenue that could motivate climate reduction, but also at the same time, generate revenues for adults. As you can see from the advanced economies here, the Carbon Revenue scheme pack is quite significant. Although I mean the peak of carbon revenues are going to be controlled in about the mid-2030s over the longer term. So all these implications would either have an effect on that, increasing it, or decreasing it. So the use of a dynamic general equilibrium model would also have additional features, not just by putting these samples together, but also account for the indulgence effect coming from the interest rate, which is the red part, as well as the purple one on growth impact. So if countries spend more, it could be promoted to growth. Whereas some of the taxes may also contain rising growth.

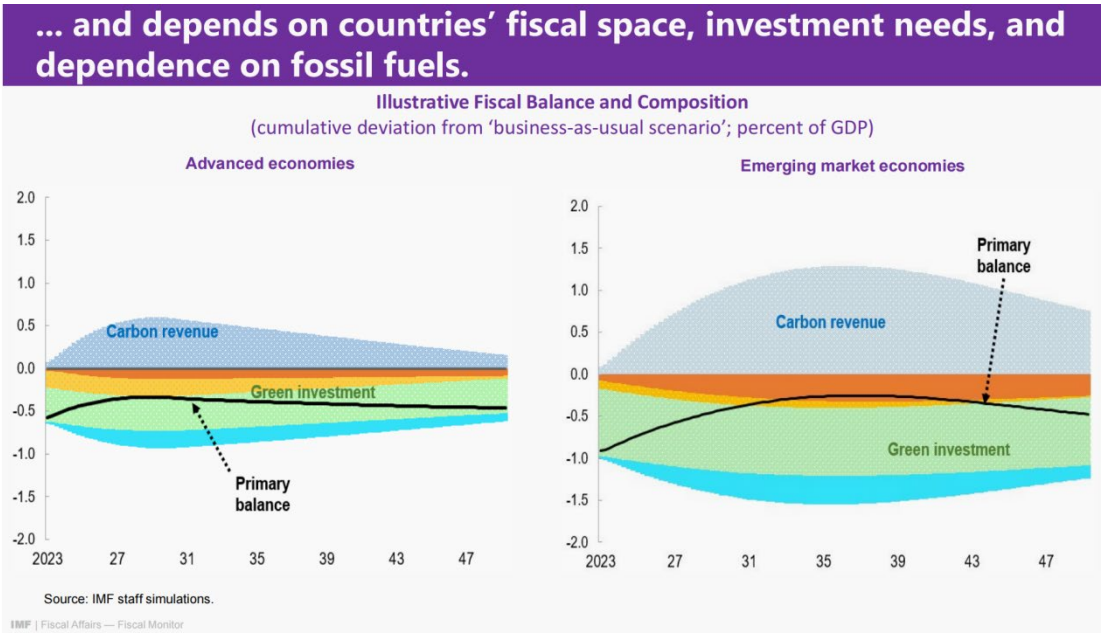
But overall, as the simulation illustrated, the growth impact of all these carbon policies which are well designed, tends to be minimal, which is in line with some of the literature that we have indicated or found over the last couple of years, in which case that as long as carbon pricing is introduced. However, with some mechanisms recycling direct use, the growth impact tends to be relatively neutral rather than an earthquake disease. And we have shown some of the literature results in the fiscal market.

The important part here, as you can see on average, the debt would rise by 10% to 15% of GDP by 2050, which is a notable amount. At the same time, we do look at the emerging market economies, which we consider the average of the large emitters in G20 countries. The magnitude of increases is relatively simple. But at the same time, if you look at the individual components, they look quite different. For instance, the red part which is coming from the interest rate effect. For instance, the red part, which is the interest rate effect, is notably much higher in emerging markets than in advanced countries, meaning that, because debt in emerging markets tends to be more vulnerable to changes in interest rate, in which case if the emerging market economy has a higher debt, interest rate tends to be higher, the foreign cost has to be higher and that people have a deteriorating effect on debt buildout.

Similarly, the investment needs for free investment are higher, as we mentioned before. Drawing from the estimate in literature, carbon revenues are also much bigger than the advanced economy, suggesting that they have higher revenue potentials, given that they're continuing to have increasing carbon emissions over the medium term as they grow and develop. By 2030, by some estimates, emerging markets will account for about 70% of global emissions.

So let me illustrate the impact on the deficit. These two charts are exactly the same as before but instead of showing that increases. These two charts show the flow, which has an impact on the annual budget measure in terms of the primary balance. So essentially a negative means a debt. By having the same scale in the two charts, one could see that the comparison between the emerging markets and advanced economies becomes much clearer. As I mentioned, carbon revenue is much bigger even though the carbon prices per ton of carbon emissions are much lower in emerging markets. Here we assume it will reach about $150 per ton by the end of 2050. Whereas, the advanced economies will be over $200 by the mid-century. And then you can see that they have a different peak of the shape pattern. Within advanced economies, the peak is much earlier via the turn of the decade. Whereas the emerging markets will be around the mid-2030s. So the role of carbon revenue potentials will eventually subside because by then carbon emissions, the tax base will be smaller even though the pricing continues to increase. And of course, because the important part is also the shape of the deficit path. Given that most of the public investment and green subsidies are frontloaded, the initial impact on the deficit is generally higher. Although, on average, it is about 4% until 2050. This level of debt increase and deficit for some advanced economies may be manageable, particularly for those that have fiscal space. But for a lot of emerging markets, especially developing countries, there will be great challenges given that they already have bad problems.

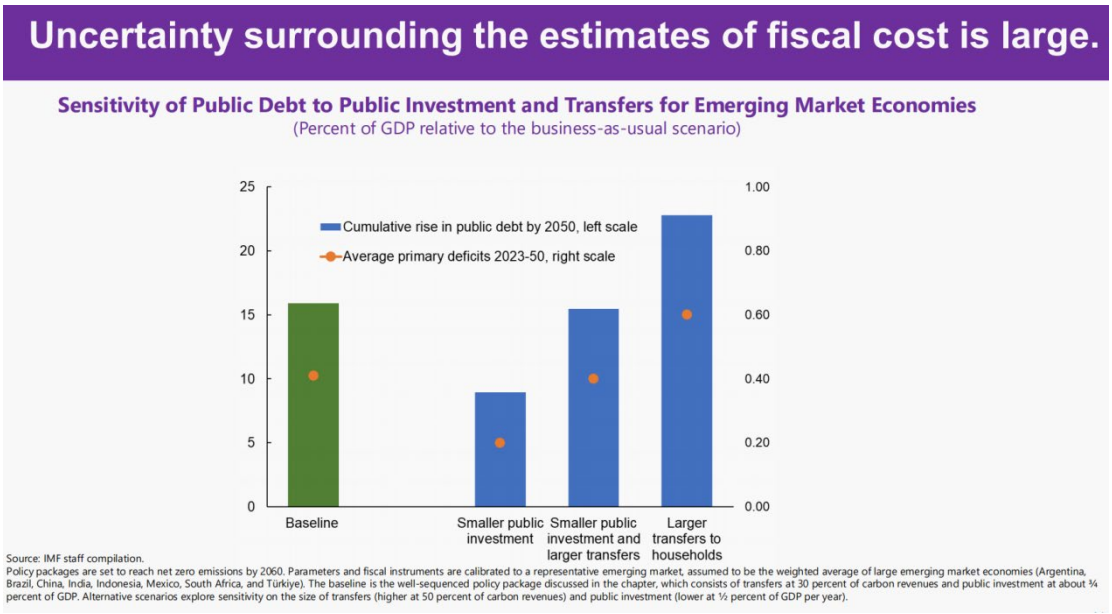
Interest rates are going to rise. In addition, resources that may be needed to devote to climate mitigation would certainly be a big challenge for a lot of emerging markets. That would justify some of the indications mentioned by rural development. They need to have stronger global cooperation, making sure some of the financing will be able to channel issues support in the emerging markets or developing countries in climate mitigation.



The fund has established some of the facilities as a first step, but certainly, much more needs to be done by the global community. So this will be the main key results of the Fiscal Monitor looking at public finance impact.

So there are some of these estimates that we introduce 10% to 15% of GDP that increases would vary according to some of the assumptions we made. The estimates of the fiscal cost could be very big because we are forecasting over a long time horizon until 2050. In the costs, a lot of things could have changed, but we illustrated some of the sensitivity analysis with different degrees of macro net increase.

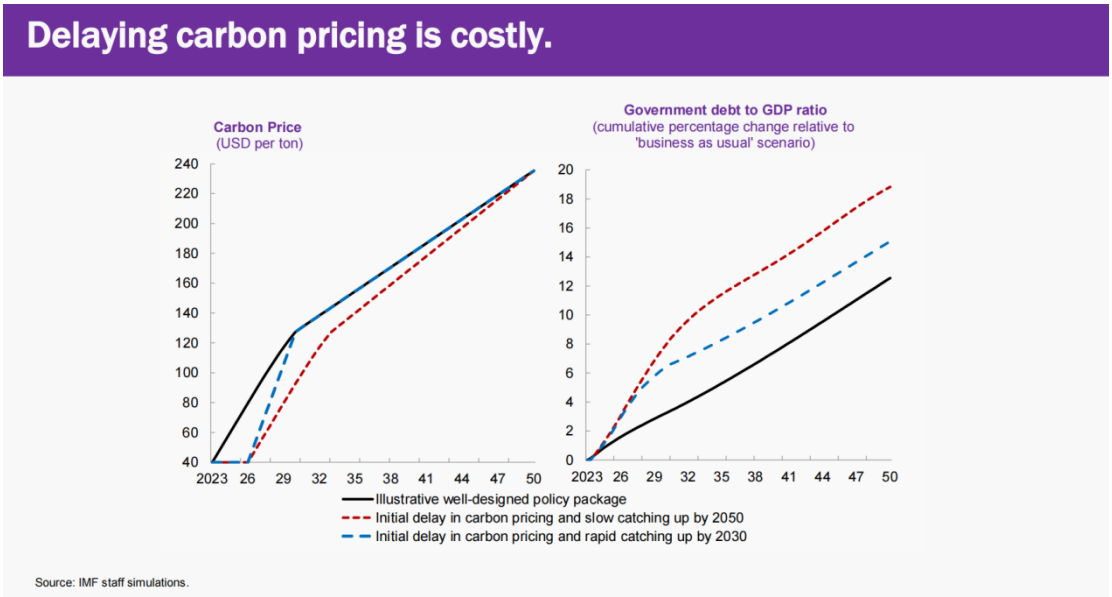
For instance, we show that on the baseline for emerging markets countries, it's about 10% to 15%, slightly higher than 15% by 2050. But if we had a smaller public investment, the debt increase would likely be smaller.



That would be the case because some countries may already have invested in green investment and the additional lease may be smaller. In particular, one could reduce their investment in the fossil sector, and use the same money to invest in the green sector. So that net investment could be smaller than we have put in the baseline. Then certainly that would help the public that increase. But at the same time, if we transfer a lot more money to households in order to protect the vulnerable ones, the extra fiscal cost may give rise to a much higher debt increase of about 20% to 25%. So the main purpose of showing this analysis is that there is a lot of uncertainty surrounding it.

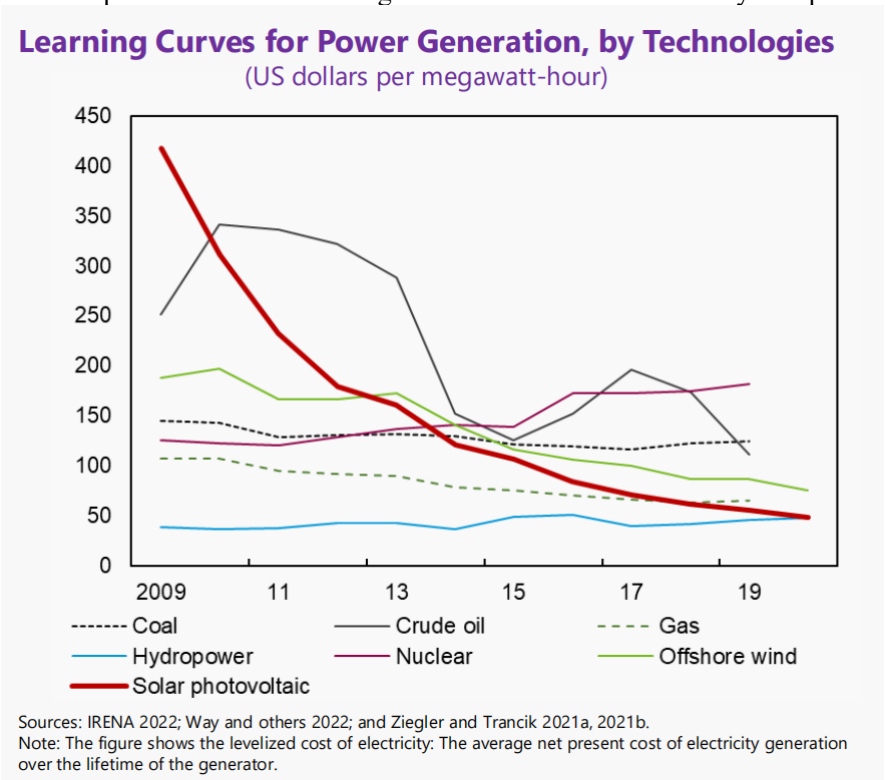
That doesn't mean that some of these actions we could defer it in each case actually delaying some of the carbon price measures even though they are politically not feasible or less accepted.

The monitor will provide you with some analysis also using the same model of a scenario of a three-year delay of the type of currency. So the black line is the baseline of how the carbon prices in the model will behave over time. You can see that advanced countries will rise to about 125 dollars in 2030 and then gradually rise over the long term. If there's a three-year delay, then you will be divided into blue or red dotted lines depending on how the subsequent prices are going to increase over the later years. You could see that the debt increase is even higher. On average, that will increase the debt ratios by about 0.8% to 2% of GDP per year until 2050. So it is important to take action now otherwise the problems only become severe.



And then there are a good deal of challenges arising in this debt outlook. Certainly, how the impact of the governing actions on time is important, but it depends a lot on what are the type of energy technologies that we use.

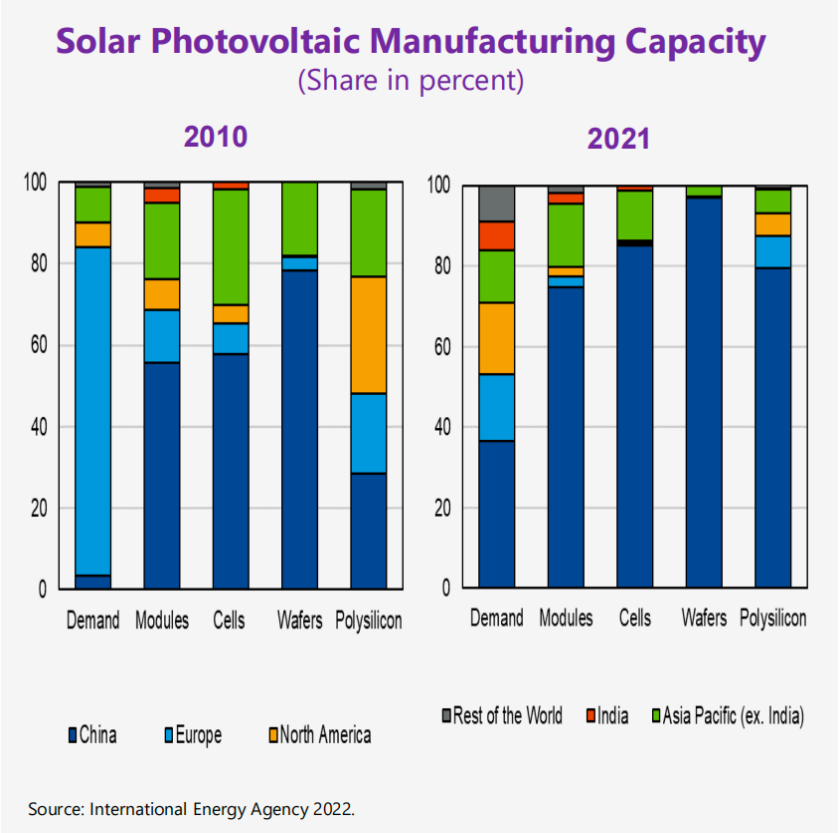
Here in the technological sphere, there are both opportunities and challenges. On the good side, I mean, we have seen there's a significant improvement in a lot of renewable resources, including solar energy, hydropower, and wind power. In particular, if you look at solar photovoltaic, which is a red line here, we see a significant reduction in the cost to allow for almost cheaper or even lower than some of the fossil fuels. So there's certainly an adoptable improvement, much better than the projections that we had a decade ago. So this means that a lot of renewable sources of energy are actually now cheaper than fossil fuels, making sure that it's important to use those energies because their cost is actually cheaper.



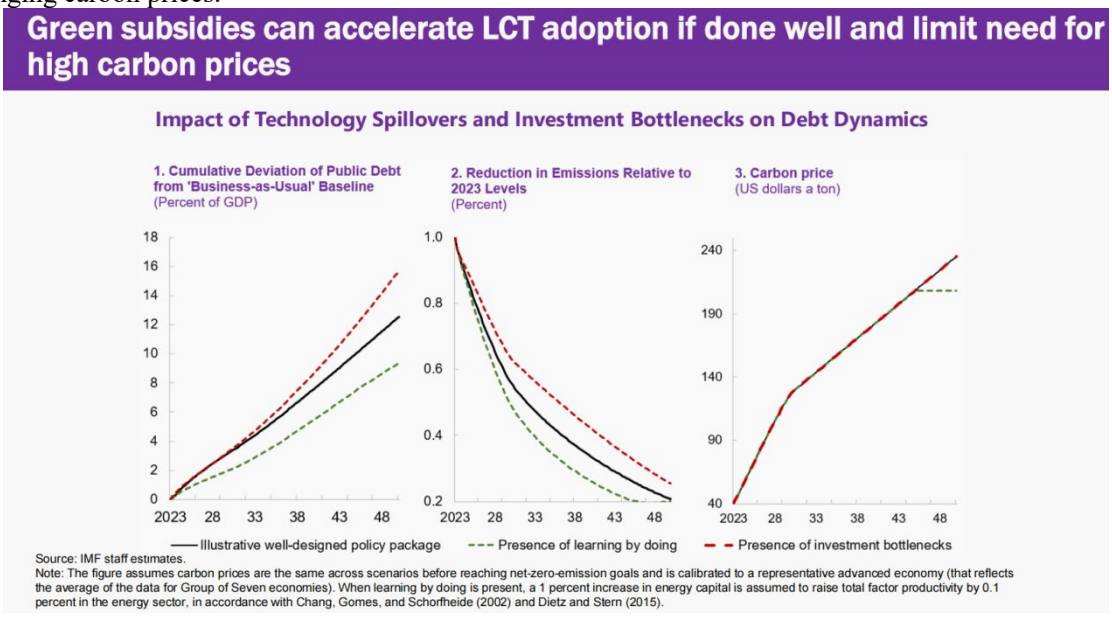
Sources: IRENA 2022; Way and others 2022; and Ziegler and Trancik 2021a, 2021b.
Note: The figure shows the levelized cost of electricity: The average net present cost of electricity generation over the lifetime of the generator.

But certainly, there are some challenges. I mean there are a couple of challenges. One is for the demand and supply of renewable sources. And so you could see that from 2010 to 2021, over the last decade, a lot of the demand and supply side area on solar energy is actually concentrated in several countries, including in China. So given the rising geopolitical fragmentation risk, some of the supply chains would provide some of the challenges of our countries adopting these technologies.

At the same time, we have some indirect evidence mentioned in the monitor that is sometimes very difficult for countries to adopt or apply some of these well-known existing technologies, particularly in low-income developing countries. It's very difficult to spread those new technologies to them either because of financing or because of access to that technology. So certainly this will present some challenges. If we could get energy technologies spread quickly to those developing or emerging markets, the cost of the green transition would be lower. But if those technologies remain at the kind of exclusive access to those developing countries, its cost will be higher. This would mean that the green subsidies that are done by a lot of countries may be able to increase low-carbon technology adoption. But this also teaches a lot about whether there's a bottleneck or policies for investment.



Here we illustrate two scenarios using the same model we talked about before. The Black line is the baseline illustrated showing the increase in public debt on the left side. The reduction in the middle, as well as another line on the carbon price on the right side. So you could see that, if there is a significant improvement in low carbon technology, in the sense that there are not a lot of externalities through other learning by doing or some of the network effects, then one could achieve a faster reduction in emerging emission reduction, which is a green line there, while keeping carbon prices largely the same when it reduces money to reach the maximum of what it should go. This will mean that technology is easier to diffuse and be adopted by countries. And then we could see that the impact of public finances will be more favorable, meaning that you could use fewer fiscal costs in order to reach the same kind of goals without changing carbon prices.



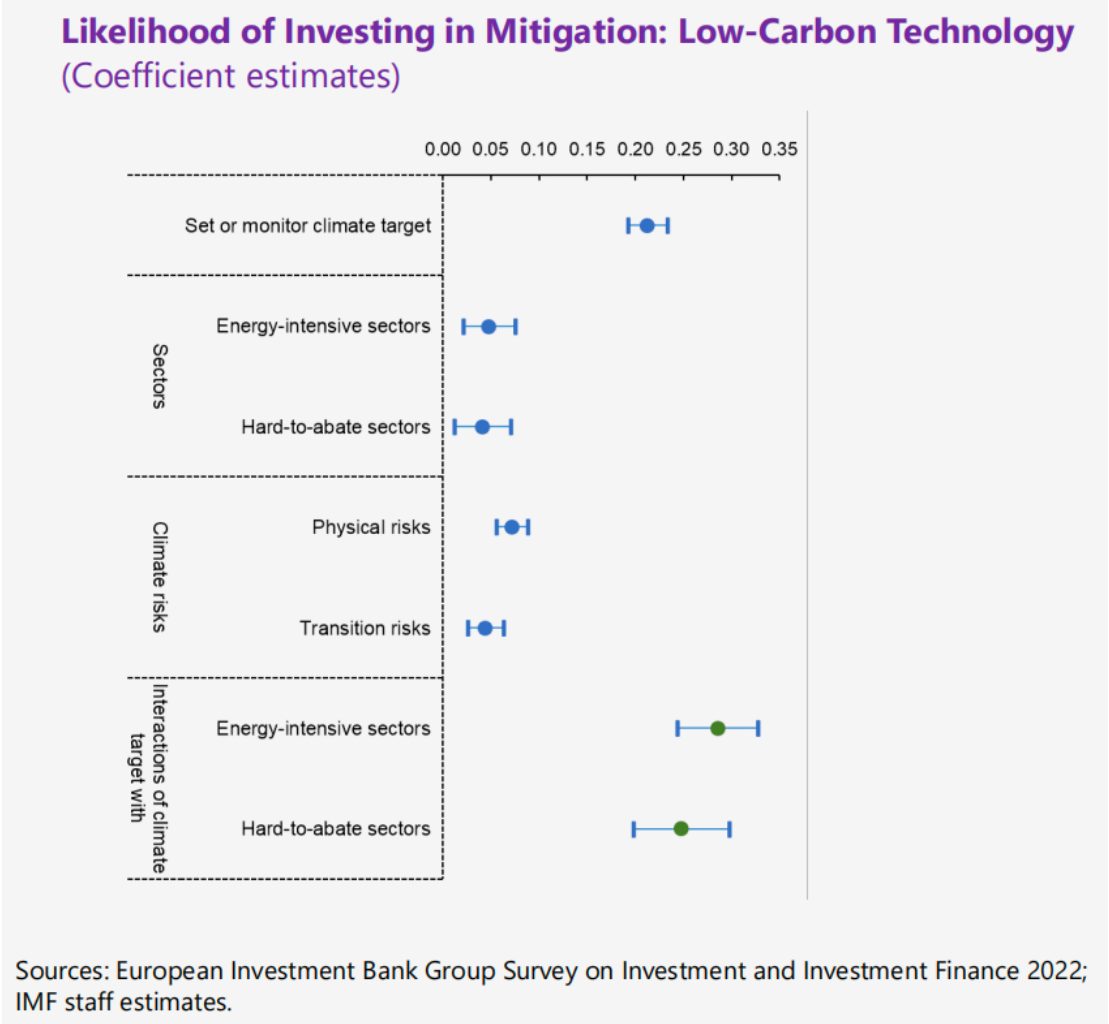
On the other hand, on the negative side, because of the investment bottleneck or investing in these low-carbon technologies, we could see that it would lead to an increase in debt further. And also a slower carbon emission reduction over the years. This was particular in the sense that if there's a large adjustment cost, you will think of standard assets in the fossil fuel sectors, meaning that you cannot just simply close the coal plants or oil fields, but it takes time to do it. At the same time, if you invest in the green sector, it also takes time given the supply chain consideration. So that would only further delay some of the carbon emission schedules, but the cost will be even higher.

3. How can governments facilitate the green transition among firms?

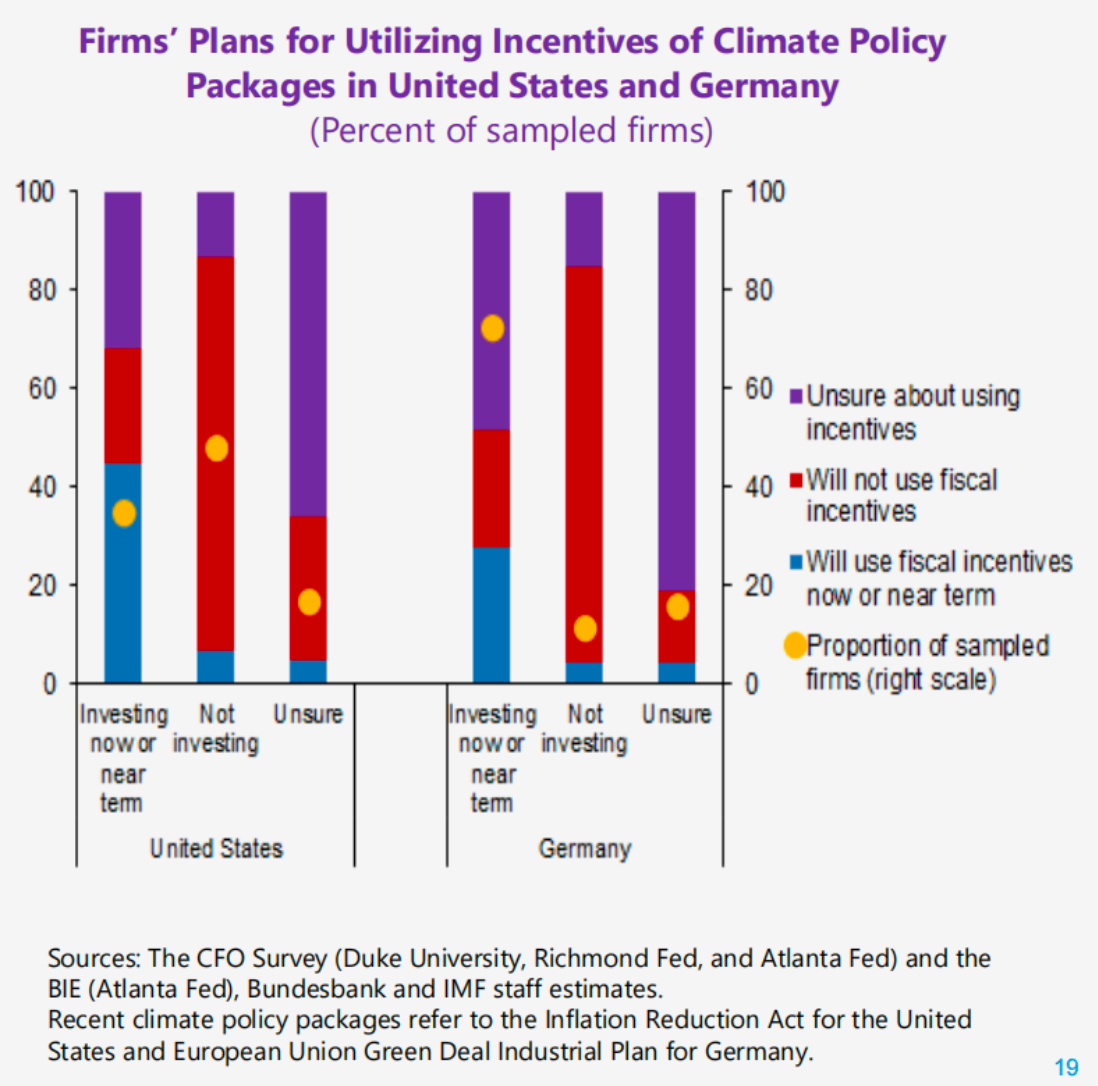
So the last part to think about it as how the government facilitates the transition among firms. This is a pretty big topic and the Fund has already done some analysis in the previous publication, so the Fiscal Monitor this time tends to provide additional features using some of the Microlevel analysis.

Here we present true results based on the firm platform surveys. Here we are working in partnership with the European Investment Bank in some access to some firm-level surveys which is a representative sample from both Europe as well as United States. At the same time, we also ask countries in partnership with the Federal Reserve Bank as well as the Bundesbank to try to understand how firms respond to the latest government package including the reduction engine in the US as well as the European industrial green policy.

So on the left side, on the EIP data, we see that countries with governments either set or monitor some of the tiny emission goals by firms tend to encourage firms to undertake green investment, meaning that if the government has some regulations in order to set or monitor some of the firm's investment in carbon emissions that actually could help firms to reduce carbon emission. And it has a stronger effect, particularly in those firms that are highly energy-intensive sectors as well as hard-to-abate sectors. These are exactly the areas which we want firms to kind of transition to the green sector. So there's certainly an important role played by the regulations.

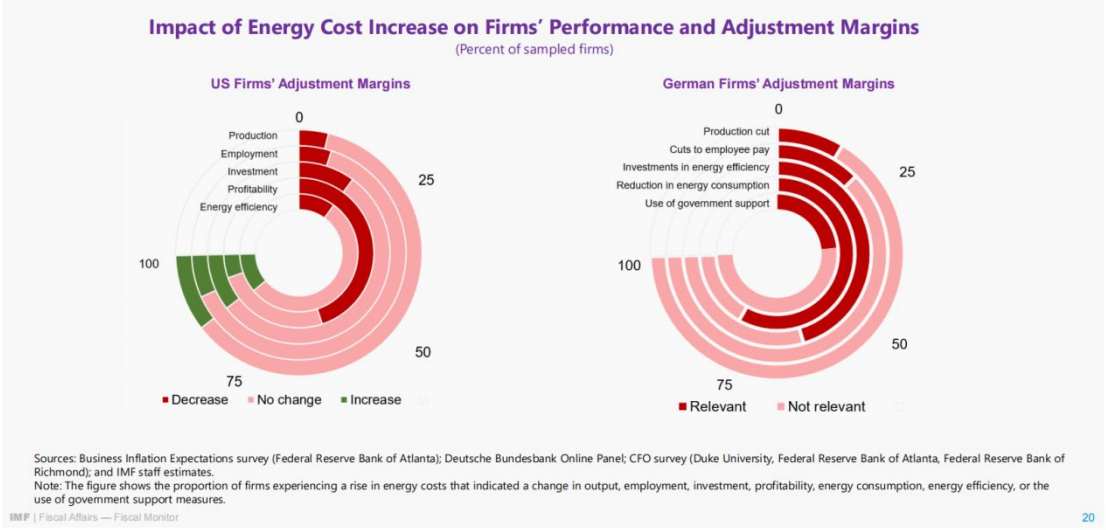


On the right side, there's another survey result across firms. Asking them how they behave if the government provided an incentive, a real policy package. And how would they respond? Do they investigate low-carbon technologies? A lot of firms are actually unsure about using those incentives. A lot of firms are in the purple area. But for those who are using them, particularly the German side, many of them have already made some of the efforts in energy efficiency. So it opens up questions about whether the policy package has been allowed by the US or the European Union. It's actually reaching out to the right firms and maybe there are some policy certainty or better targeting could be there.



The good news we presented or obtained from this film and for the survey is that films are actually pretty resilient to further changes in the energy crisis. For example, he asked Charles David how they felt over the last year in 2022. How do they respond to the energy shots in the face of the war in Ukraine?

The US Firms' Adjustment Margins are on the left, the German firms are on the right. The US surely has much fewer energy shocks in terms of pricing. So most of them do not see the big impact. Although a lot of them are reporting a reduction in profitability, if you look at the data itself, most of the reductions are clearly small. However, on the German side, the energy shock is much more severe. Maybe, for example, gas prices have increased 5, 7 fold over a very short period. A lot of German firms actually either increase energy efficiency or reduce energy consumption. And they didn't have either production or employment, so those only have a very mild impact. That means that they may be ready to face higher carbon pricing over the coming years without jeopardizing their survival.



Some of the first types of micro-analysis would be very efficient and useful for fiscal market research. Maybe I conclude the presentation on this side. As we have gone through, policymakers face a difficult trilemma. Current climate action is insufficient to achieve a viable path to net zero emissions by the mid-century. Scaling up primarily through spending could put debt sustainability at risk. Raising revenue often crosses political red lines. The Fiscal Monitor is trying to highlight some of these risks as well as provide more viable options. The design schedule is delicate. And it should vary across countries. We have been providing a lot of advice, either in the financial settings or multilateral settings on how to design those packages. The analysis done in the Fiscal Monitor shows that the rise in debt during the green transition will be smaller if policy packages contain robust carbon pricing. Delayed action is costly to help myself as well. The private sector should play a large role in climate actions and financing. here we have a new accompanying chapter in the global financial policy, financial stability report that looks at some of the financing findings. So if you're interested, you can take a look as well. Well-designed green subsidies and appropriate regulatory policies can encourage firms to invest in and adopt LCTs. We should see increasing importance as we move along given that the private sector would play a role.

IMI International Monetary Review

Green Finance in Emerging Markets: A Ground-Level View *

By DIMITRI DEMEKAS *

Private financial firms in emerging markets and developing economies face specific challenges in developing green finance products and practices. These challenges reflect the characteristics of EMDE economies and financial sectors.

As a group, EMDEs tend to rely more than advanced economies on fossil fuels for domestic energy consumption. At the same time, many of them are heavily exposed to physical climate risk, while insurance coverage of this risk is low. As a result, these economies face higher hurdles in their energy transition.

Most EMDEs face substantial capacity and data gaps, especially in assessing climate-related exposures and risks. They also tend to have bank-dominated financial systems, shallow financial markets and a significant presence of foreign banks. These factors can influence the success of initiatives to introduce climate-related considerations in financial business decisions and, more broadly, the design of green and sustainable finance frameworks in these countries.

The characteristics of financial sectors in EMDEs are not always given due consideration by advanced economy policy-makers and transnational regulatory networks, whose initiatives largely shape the global regulatory environment. And even when advanced economy and EMDE regulators talk to each other, for example through the Network for Greening the Financial System, the concerns of the private sector do not always come to the forefront.

To address this gap, the International Finance Corporation has carried out a survey of private financial sector firms in emerging market and developing countries. The survey involved interviews with almost 60 participants from 29 private financial institutions in Bangladesh, Brazil, Colombia, Côte d'Ivoire, Egypt, Indonesia, Kenya, Mexico, Morocco, the Philippines, Poland, Serbia, South Africa, Turkey and Vietnam.

Four conclusions from the survey

First, the operating environment in EMDEs is fragmenting, with some financial firms coming under much greater pressure than others to incorporate climate-related considerations in their business. This pressure does not, as a rule, come from regulators, whose efforts in this area are still at a nascent stage, but from within the industry.

For foreign-owned subsidiaries or branches of financial firms from advanced economies, the parent company is the biggest source of pressure to meet climate and broader sustainability goals, often without regard to the conditions in the host country. Pressure also comes from development finance institutions in their capacity as investors or sources of financing. For insurance companies, the role of re-insurers is crucial. In contrast, pressures from civil society or domestic shareholders tend to be much less relevant in EMDEs.

This opens a rift between two types of financial firms. On one side are firms under pressure from parent companies, foreign investors, re-insurers or other stakeholders to green their activities. On the other are smaller, mainly local firms that are under little or no such pressure. The former is caught between a desire to move faster towards green finance and concern about losing market share. This produces an uneven playing field, creating a 'first mover disadvantage' that can hold back the adoption of green finance practices.

Second, although green and sustainable taxonomies are increasingly being introduced in EMDEs, they fall short of the principles required for effectiveness. They often have limited coverage (primarily energy generation, construction, agriculture and transportation) and are not sufficiently granular. They do not always specify the data required for assessing compliance or, when they do, the required data are not always available. The problem is worse in EMDEs that have imported a taxonomy developed in advanced economies without adapting it to domestic circumstances.

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* This article first appeared on OMFIF Commentary on November 29, 2023.

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As a result, individual financial firms often have substantial leeway in assessing and reporting compliance with the taxonomy. The inevitable inconsistencies reduce the benefits of the taxonomy, create room for greenwashing and aggravate the unevenness of the competitive playing field.

Third, gaps in the regulatory environment in EMDEs pose a separate set of obstacles. Advanced economies have made progress in developing tools for assessing climate-related financial exposures and risks, although the experience has revealed several analytical and conceptual challenges. In most EMDEs, however, central banks and financial regulators lag their advanced economy counterparts in this area, mainly due to lack of data and expertise.

In several cases, regulators have recommended or required financial firms to disclose the environmental risk of their exposures without providing detailed guidance on how to do so. Even when guidance is provided, most respondents to the survey reported that it is too high-level, general or otherwise inadequate. As a result, individual firms are often left to their own devices in monitoring and managing these risks. The lack of a rigorous methodology and regulatory enforcement inevitably favours those firms applying less strict standards.

Fourth, private financial firms in EMDEs are aware that the move towards green finance entails both opportunities and risks. Some of the concerns expressed in the survey were similar to those in advanced economies. For example, given the scarcity of investable green projects, a rushed move towards green finance – in anticipation of or prompted by regulators – could create a severe demand-supply imbalance and fuel a 'green bubble'. Other concerns were specific to the environment in EMDEs.

One of them was the risk of a sudden change in domestic regulations – perhaps under pressure from international standard-setters – to penalise certain exposures or encourage others, given the dearth of relevant and sufficiently granular data on which to base compliance. Another concern was adding to a regulatory agenda that is already overloaded in many EMDEs, notably with initiatives to encourage digital finance, micro-finance and financial inclusion. Adding another regulatory priority would not only increase compliance costs for financial firms but also stretch the resources of the supervisor.

But the biggest concern is the lack of an overarching long-term transition strategy by governments. Participants to the survey stressed that the goal should be to 'green' the whole economy, not just the financial system. Divesting from carbon-intensive assets and industries may help banks 'green' their balance sheets but would do little to aid the transition to net zero if incentives are not aligned, alternative assets and technologies are not available or various government policies are not coherent and consistent with each other.

It is the government's responsibility to establish a transition strategy with realistic multi-year targets for economy-wide greenhouse gas emissions reductions, appropriate carbon tax and pricing policies consistent with these targets, national taxonomies with disclosure requirements for financial and non-financial companies and steps to generate and disseminate the data required to make these classifications and disclosures meaningful.

Only once such a strategy is credibly in place can the financial industry play its role in the long-term process of reallocation of capital needed to support the transition.

IMI International Monetary Review

Climate Risks and Financial Stability: What Can Central Banks and Financial Sector Supervisors Do?*

By TOBIAS ADRIAN*

This event comes at a perfect time to discuss policies that could address challenges in unlocking the necessary private climate finance in emerging market and developing economies, also known as EMDEs. As the world's most populous continent, Asia is in a unique position. On the one hand, there are potential economic gains offered by tapping the tremendous human capital Asian countries boast. However, on the other hand, larger numbers of people face the hazards brought on by climate change. In recent years, the region has been the engine of global growth, and must now strike a balance between maintaining growth levels, managing climate risks, and contributing to global climate goals by moving to a low-carbon economy. This will necessarily involve building adaptive capacity through investments in resilient infrastructure, early warning systems, and targeted social safety nets.

Adaptation and mitigation will require an unprecedented and massive scaling up of investments. In EMDEs, which currently emit around two-thirds of greenhouse gases, achieving the transition to net-zero emissions by 2050 means about USD2 trillion will be needed annually by 2030, according to the International Energy Agency. Despite the recent growth of climate finance, the region falls short of the target as we showed in our 2022 Global Financial Stability Report and our newly launched departmental paper. The private sector will have to cover a major share of the large climate mitigation investment needs in EMDEs given severely stretched public sector budgets.

Large emerging economies are generally better placed to access climate finance; many smaller EMDEs face significant challenges in attracting private finance for mitigation and adaptation. Some of these challenges are related to low credit ratings, which limit the potential investor base. Moreover, climate policies of major banks and insurance companies are not yet aligned with net-zero emission targets. And despite the growth in sustainable investment funds, only a small share of the invested money is dedicated to creating a positive climate impact. As we show in our latest Global Financial Stability Report, the majority of funds that make investment decisions based on environmental, social, and corporate governance factors don't necessarily focus on climate issues. In line with what we heard in the previous session, the recent survey of government officials from Asia-Pacific countries suggests three additional challenges: (i) persistent large gaps in climate data and disclosures that hinder reporting and analysis; (ii) conflicting national policy approaches—such as introducing carbon taxes amid widespread subsidization of fossil fuels; and (iii) increasing geo-economic fragmentation, which might jeopardize collective action on climate change.

In my view, a broad mix of policies is needed to create an attractive environment for private climate mitigation finance in EMDEs.

- Carbon pricing can provide an important pricing signal for investors, but it faces political hurdles in its implementation.
- Policies aimed at strengthening macroeconomic fundamentals, deepening capital markets, and improving governance will help improve credit ratings, mobilize domestic financial resources, and lower the cost of capital. Expanded use of guarantees by multilateral development banks and donors could be an effective instrument to reduce real and perceived risks in EMDEs.
- A strong climate information architecture is also a vital part of the policy mix. For instance, more-comprehensive transition taxonomies would help support the growth of sustainable markets and the production of climate data that is useful for financial decision-making, as well as climate risk assessment, regulation, and supervision. In a report released in partnership with the World Bank and the OECD, the IMF identifies common principles and technical considerations to link national climate plans and alignment strategies. In this regard, international disclosure and data initiatives like those of the

* High-level Seminar on Climate Change Issues for Governors and Financial Sector Policymakers, Bangkok, Thailand, December 12, 2023.

* Tobias Adrian, Financial Counsellor and Director of the Monetary and Capital Markets Department, IMF

International Sustainability Standards Board, the Network for Greening the Financial System and the Financial Stability Board are crucial.

- Innovative financing solutions such as blended finance and securitization instruments should be employed as part of the policy mix to broaden the range of private-sector investors.
- In low-income countries, additional international support will be needed. The IMF's Resilience and Sustainability Facility, by supporting reforms, can help create an enabling investment environment and attract private capital.

Last but certainly not least: central banks and financial sector supervisors, as the gatekeepers of financial sector stability, should also be considered as part of the policy mix. This is the topic of our discussion in this session. Let me offer my views on two important tasks of central banks and financial sector supervisors as a background for the discussion.

- Preserving financial stability is the core mandate of financial supervisory authorities. It is important to emphasize that while supervisors should play an active role in climate-risk supervision, all the initiatives should be consistent with the core mandate of financial stability. Prudential regulation and supervision should not be used as substitutes for effective government policy on climate. Specifically, supervisors should ensure that climate-related risks are adequately analyzed and captured in their supervisory processes. Take, for instance, physical risks, such as more frequent and severe natural hazards, or risks of stranded assets in the transition to a low-carbon economy. These must be integrated into risk assessments and prudential frameworks to ensure that financial institutions are well-equipped to withstand climate-related shocks.
- To help accurately measure risks, central banks and financial sector supervisors need to build capacity to adapt their stress-testing frameworks. In particular, these frameworks should incorporate the channels through which climate risks amplify and transmit risks to the financial sector. In Asia, climate risk analyses and climate stress-testing exercises are still in the early stages of development. However, some jurisdictions in the region, have conducted top-down or bottom-up climate stress tests.
- Here, identifying and closing data gaps is key. Our experience from the Financial Sector Assessment Program, as well as from our technical assistance work, shows that lack of relevant climate data is common across jurisdictions. Financial sector experts and climate experts need to collaborate to address these climate data gaps. More specifically, efforts are needed to build comprehensive datasets related to physical risk projections and granular exposure data of the financial sector to both physical and transition risk. These datasets will be also a valuable tool for analyzing cross-border risks for banks with an international footprint.
- Central banks and financial supervisors should incorporate climate-related financial risks into the prudential framework. Where possible, the Basel Committee on Banking Supervision Principles for the Effective Management and Supervision of Climate-related Financial Risks should be implemented by supervisors through adapted guidance and monitoring. This should consider the specific risk profile of each jurisdiction regarding the impact of climate change, as well as the principle of proportionality. Bridging data gaps for supervisory reporting and financial disclosure is a pre-condition for effective supervision of climate-related financial risks. Earlier this year, the International Sustainability Standards Board issued international standards on climate-related disclosure. But supervisory reporting should be tailored to each jurisdiction, depending on the risk profile and supervisory needs. For instance, in a number of jurisdictions, non-life insurers are at the front line of exposure to physical risks, and supervisors there should focus on how non-life insurers are managing such risks. Here in Asia, supervisors are in different stages of climate supervision. Some have already taken advanced initiatives while others are in the exploratory phase. And in this session, we will have an opportunity to hear practical experience from our distinguished panel.
- On our side, through our Financial Sector Assessment Program and our capacity development work, delivered in part by regional centers, the IMF provides guidance to central banks and financial sector regulators on how to conduct climate risk analysis and adjust their frameworks in line with the Basel Committee's Principles. We are also collaborating with the Interagency Group on Economic and Financial Statistics, the European Space Agency, the World Bank, and the Network for Greening the Financial System to tackle climate data gaps.

To conclude, although Asian countries currently face a number of important challenges, including on climate finance, they need to tackle the adverse impact of climate change. Central banks and financial sector supervisors can contribute to this goal in three main ways. First, by closing climate-related data gaps

and strengthening climate-related financial disclosures; second, by incorporating the reporting of climate risks into the supervisory processes; and third, by enhancing their capacity to conduct climate risk analyses. I am delighted this conference will provide a platform for us to advance our thinking in this area. And for this session we have deputy governors from Bangladesh, Brunei Darussalam, Cambodia, Maldives, and Philippines, who will provide practical insights into the challenges they face in ensuring financial stability in the era of climate change.

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Central Bank Digital Currency

Legitimacy, Privacy, Integrity, Choice: Towards a Legal Framework for Central Bank Digital Currencies*

By AGUSTÍN CARSTENS [*]

Introduction

We are all looking forward to a stimulating discussion of the important legal questions that must be addressed if central bank digital currencies (CBDCs) are to become a core part of monetary systems, whether in wholesale or retail form.

Importance of CBDC

Before addressing the legal issues, I would like to talk about CBDCs more fundamentally.

A key role, perhaps the key role, of central banks is to provide money for society. Currently, they do this primarily through the provision of cash and central bank reserves. In practice, these account for only a small share of the money used by the public. The bulk of it consists of commercial bank money, in the form of bank deposits. Even so, central banks play a pivotal role in ensuring the public's trust in money. It is this trust that makes commercial bank money useful as a means of payment in our societies.

Central banks create trust in several ways. They regulate and supervise the payments system. They control the economy's unit of account. They provide for settlement finality. And the central bank also underpins the solvency of the banking system as a whole. As lender of last resort, the central bank provides emergency liquidity to the system and mitigates against potential bank runs.

Taken together, these actions uphold confidence in the safety and value of money. They ensure that a dollar is a dollar, a euro is a euro and, here in Basel, that a franc is a franc, whether that dollar, euro or franc is a banknote or a deposit.

This apparently simple concept – the "singleness of money" – is extremely important. If singleness were ever to be in doubt, people would run for cash. Individual banks – and ultimately the whole system – would be under threat. And relatedly, central banks guarantee the finality of settlements in central bank money, providing assurance that transactions are final and irrevocable, even if parties to the transaction go bankrupt or fail.

As the defender of the value of money, central banks have a responsibility to ensure that money is available in forms that meet society's needs and expectations.

The current monetary system, based on cash and commercial bank money, continues to serve society well.

But it needs to evolve. Cash use is declining. Users are increasingly demanding new forms of money. Advances in digital services are highlighting shortcomings in existing systems, while raising expectations about what money should do. People want their money to be digital and programmable. They want to be able to transfer it across borders quickly, cheaply and safely.

The private sector has sought to meet these demands by issuing new forms of private money. Examples include unbacked cryptocurrencies and stablecoins. While they have achieved some popularity as speculative investments, these financial instruments are not money. They do not offer the backing and protection of the central bank; a reliable regulatory and supervisory framework; access to the central bank

* Speech by Mr Agustín Carstens at the BIS Innovation Hub-Financial Stability Institute conference on legal aspects of central bank digital currencies, Basel, Switzerland, 27 September 2023.

* Agustín Carstens, General Manager of the BIS

as lender of resort; or guaranteed finality of payments. Even stablecoins do not assure a stable value. They do not and cannot meet the standards the public expects of money.

Central banks have a responsibility to meet the public's demands and drive innovation in money and the financial system more broadly. But they cannot do this alone. They must work closely with other stakeholders, including the private sector.

Increasingly, central banks around the world are examining how CBDCs could address these demands. According to a CPMI survey, in 2022 93% of central banks were engaged in some form of CBDC work. Of these, more than half were running concrete experiments or working on pilots.

Some central banks are focusing on wholesale CBDCs, intended for the settlement of interbank transfers and related wholesale transactions. Wholesale CBDCs have vast potential in the areas of automation and risk mitigation. They could in effect make central bank money programmable, for example by providing that settlement will occur if and only if certain conditions are met.

Wholesale CBDCs would also facilitate the development of more sophisticated financial products for retail purposes, such as tokenised deposits. The resulting system would likely resemble today's two-tier banking system, with central banks providing the foundational layer and private entities providing the customer-facing services. A "unified ledger", as proposed in our recent Annual Economic Report, would help to seamlessly integrate the various layers of the digital monetary system. In time, it could even be extended to allow for simultaneous and instantaneous settlement in central bank money across asset classes.

Other central banks are exploring retail CBDCs and this is the focus of the conference today. A retail CBDC has a lot of potential to respond to the public's evolving needs. It could exist alongside cash, offering the public a digital alternative to banknotes and coins. It could deepen financial inclusion, as several experiences with digitalisation in emerging and developing countries have shown. And it has huge potential to make payments faster, cheaper and easier, particularly across borders.

Importance of legitimacy for any CBDC implementation

Much of the discussion around CBDCs focuses on technology. But, as this audience knows, this is only part of the challenge. Legal frameworks must also advance if we want CBDC to deliver on its potential.

Money is a social construct. People trust in it today because they know others will trust in it tomorrow. The legal framework is a key underpinning for the legitimacy of money, and the trust that people place in money. Without the law, money cannot function.

This applies as much to CBDCs as it does to other forms of money. At the same time, CBDCs raise new questions and will involve new use cases. The legal framework must keep up.

Most fundamentally, the legitimacy of a CBDC will be derived from the legal authority of the central bank to issue it. That authority needs to be firmly grounded in the law.

Central banks have legally defined mandates that set out the functions and tasks they must perform, and the powers they have to accomplish them.

In most countries, laws are specific about the kinds of money the central bank can issue. In most cases, these include banknotes and coins, as well as credit balances on current and reserve accounts. According to an IMF paper published in 2021, close to 80% of central banks are either not allowed to issue a digital currency under their existing laws, or the legal framework is unclear.

This needs to be rectified. The public rightly demands forms of money that meet their needs and expectations. Central banks have a mandate to meet those demands and have made significant investments to address the technical and operational requirements for CBDCs. It is simply unacceptable that unclear or outdated legal frameworks could hinder their deployment. The work to address these issues needs to begin in earnest. And it needs to proceed at pace.

A CBDC also needs to function within a framework of clearly defined rights and obligations. In my view, at least three core elements must be preserved:

- the privacy of CBDC users and the protection of their data;
- the integrity of the financial system; and
- the ability of users to choose between CBDC and other forms of money.

These are fundamental issues and the legal framework for CBDC must get them right.

Privacy

Let me start with privacy.

Most countries have laws to protect people's personal data. These laws set out what governments and the private sector may and may not do in relation to the collection, storage and use of personal information. They reflect a social consensus on the protections for and the limits on privacy.

These laws establish strong privacy protections but also limits to that privacy. We see the operation of some of those limits when we consider the safeguards that currently exist around the use of cash in the formal economy.

Integrity

These safeguards impose limits on our privacy to strengthen the integrity of the financial system as a whole.

Let me give a concrete example. I can buy a bottle of water with cash, anonymously and with no questions asked. But if I wanted to withdraw a large amount in cash, or if I tried to buy a house with cash, I would expect to receive significant additional scrutiny.

Why? Because governments are concerned to ensure that these transactions are not being conducted in order to launder the proceeds of crime.

The challenge we face is how to adapt existing privacy protections and financial integrity safeguards so that they can operate in a digital context.

Choice

After privacy and integrity, we come to choice. While the trend away from cash towards digital payments is strong in many countries, it is important that it reflects the choices made by consumers and businesses. A retail CBDC may be expected to be available alongside cash. It would be one of a menu of options available to users, which should continue to include both cash and commercial bank money. A central bank that introduces a CBDC should increase the choices for society, not diminish them. The legal framework will play an important role in ensuring this is the case.

Conclusion

As I see it, the task we face is to update and modernise the existing legal framework in a way that ensures legitimacy, privacy, integrity and choice in a digital context.

I hope that our discussions today will facilitate the development of international principles that can guide jurisdictions working on these issues. It is a complex balance of national and international perspectives.

First and foremost, a conversation needs to take place inside countries. Different legal systems approach these questions in different ways. It is for each jurisdiction to decide whether to issue CBDC and how to balance the rights and obligations of its users at a national level. The answer to these questions will often depend on the local legal framework, as well as on culture and traditions. Many countries are happily going cashless. For others, cash is still king.

At the same time, international coordination and cooperation is critical. It would be unfortunate if we ended up with a fragmented system and legal framework in which different digital currencies don't interoperate.

The BIS is committed to continuing to support work in this space and to providing a forum for these important discussions. Work is ongoing through the legal projects led by the BIS Innovation Hub but gatherings like this are also invaluable in informing national and international work.

I look forward to rich and insightful discussions today. By building a robust legal framework, we can all ensure that CBDCs will flourish.

IMI International Monetary Review

Simplifying Cross-Border Payments through CBDC Technology*

By ANTHONY RALPHS *

With the world now accustomed to completing business transactions in three seconds or less, there is an opportunity for bankers to consider central bank digital currencies as a platform for innovation and a new way to accelerate cross-border payments.

A report by Juniper Research on CBDCs and stablecoins found that the 'value of payments via CBDCs will reach USD213bn annually by 2030; up from just USD100m in 2023. This radical growth reflects the early stage of the sector; currently mostly limited to pilot projects.' To understand the growth predicted for CBDCs, let's examine the problems they can solve.

CBDCs offer similar advantages to the capacity of central bank money for settlement finality, liquidity and integrity. This makes digital currencies backed by central banks more attractive to businesses and consumers. They allow central banks and governments to bring the level of innovation to traditional domestic markets as seen by the wider cryptocurrency industry. The opportunity for central and commercial banks to work with technology providers to facilitate cross-border transactions will allow banks to acquire new consumer and business customers

CBDCs enable low-cost, virtually instant settlement of both domestic and cross-border payments, reducing risk and improving the user experience. Digital currency technology, like Ripple's CBDC Platform, introduces instant settlement and capabilities that are not possible with legacy technology. This helps ensure that payments are quickly sent and received in local currency on either side of a transaction while providing a platform for further innovation.

With the use of blockchain technology, a digital ledger efficiently maintains an audit trail of financial transactions, lowering operational costs and reducing carbon dioxide emissions by minimising energy usage. An example of this is the energy-efficient XRP ledger technology, which stands in stark contrast to the energy used by cryptocurrencies like bitcoin. CBDCs also eliminate the high costs of printing and distributing fiat currency, thereby conserving paper, energy and lowering transportation costs that fiat currencies can require.

Cross-border payments currently have high costs and slow transaction speeds. In traditional banking systems, banks may charge consumer and merchant fees for handling transactions, along with account fees and ATM surcharges. In a blockchain-based system using CBDCs, transaction fees could be dramatically reduced by the use of peer-to-peer wallets without the need for intermediaries to perform settlement-related activities.

As CBDC pilots evolve, it is clear that there is no single magic bullet to develop and accelerate cross-border payments. There are risks inherent in using CBDCs for these transactions, including the translation of the values of some currencies into digital form and perfecting settlement times and interoperability in payments.

Through Ripple Payments, Ripple has significant experience in providing solutions across the world, enabling frictionless cross-border transactions, reducing risk and cost through harmonised standards.

In traditional bank systems, the complexities of cross-border payments have necessitated the use of third parties (such as payment networks and credit card companies) to facilitate the process. These third parties can charge high fees for their services in bridging disparate payment systems, while potentially having access to transaction data. As CBDCs can ensure that banks can make cross-border payments without intermediaries, this allows them to stop sharing data with third parties while reducing the cost of cross-border payments for everyone.

Finally, interoperability between blockchains and currencies is still evolving, but CBDC technology can allow for interoperability between disparate currencies. Financial institutions and technology providers must learn as they plan and execute pilots. The good thing about digital currency technology is that it can allow organisations to be nimble when making changes while providing greater governance on the changes. This allows central banks to implement much-needed adjustments throughout the production lifecycle.

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* This article first appeared on OMFIF Commentary on December 18, 2023.
* Anthony Ralphs is Director of Product Management for CBDCs, Ripple.

From the few existing and completed CBDC pilots, we can see that the challenges include interlinking systems, achieving regulatory compliance between jurisdictions and incorporating effective business goals into the technology design.

A key differentiator of the Ripple CBDC Platform is the ability for central banks and governments to adapt their currency plans through each stage of the CBDC production lifecycle. Adapting CBDC plans to align with the goals of a specific country requires this type of flexible solution and business planning before a pilot commences. As more countries work to adopt CBDC plans, new ways of executing and accelerating cross-border transactions should continue to evolve, helping central banks deliver value to consumers and businesses.

IMI International Monetary Review

Working Paper

Crises Have Shaped the European Central Bank ⋆

By NOUT WELLINK *

Abstract

Europe embarked on the Economic and Monetary Union 25 years ago without sufficiently safeguarding some of the essential conditions that must be met to run a monetary union smoothly. The consequences of this omission came to light during the many and unprecedented crises that have shaped the European Central Bank. This article analyses and critically discusses the changing interpretation of the objective of price stability and the use of non-conventional policy instruments to realize this objective. Furthermore, the author analyses the problems with the monetary transmission within the eurozone and the framework for financial stability and supervision.

Keywords: Conventional and unconventional monetary policy, Economic and Monetary Union, European Central Bank, Bank supervision, Financial stability

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* The author (former Governor of the Dutch Central Bank and former member of the Governing Council of the European Central Bank) especially thanks Sylvester Eijffinger and Mary Pieterse-Bloem for detailed comments on earlier versions of this paper, and the other speakers, Lex Hoogduin and Jakob de Haan, of the ECB@25 Symposium held at Erasmus University Rotterdam on 7th July 2023 for their useful comments, as well the participants for their discussion.

1. Introduction

The European Central Bank (ECB) started on June 1, 1998, as an independent central bank primarily focused on monetary stability, two crucial features borrowed from the successful model of the Bundesbank, a model based on its legal status on the one hand and hard-fought in the political arena on the other (Berger, 1997). Societies as well as economic and political relations evolve, as do central banks. The biggest changes take place during or after an economic or political crisis.

The ECB has faced several crises since its inception. The financial crisis of 2008 and in particular the European debt crisis have turned this young central bank into a somewhat hybrid institution: not only a monetary authority, but also a "co-decisive" partner of the European Commission (EC), a central bank with significant formal responsibilities in the area of financial stability, and a micro- and macroprudential supervisor.

Some of the new tasks are laid down in additional legislation, some not because it was assumed that they fell within the scope of the existing Treaty and Statutory provisions. There were regularly differences of opinion on the latter, and the ECB's room for maneuver was defined more precisely in legal proceedings. The issue that I address is to what extent, why, when, and how the ECB has changed over the last 25 years with respect to the inflation target, unconventional monetary policy tools, notably asset purchase programmes and forward guidance, the responsibility for micro and macro-prudential supervision as well as for financial stability. My focus is on some of the most important changes, recognizing that Presidents, voting behavior, organizational structure, quality and composition of staff, communication policy, size and composition of the Governing Council (GC), appointment procedures of council members, the relationship between the ECB and the national central banks (NCBs), etc., are an integral part of the process that has led to the current ECB.

The ECB has known very different Presidents (Wim Duisenberg, Jean-Claude Trichet, Mario Draghi, and Christine Lagarde), each of whom has left their mark on this institution, in interaction with the widely varying challenges they faced. Eijffinger and Pieterse-Bloem (2022) distinguish three ECB policy regimes during the last 25 years: January 1999–July 2010; August 2010–December 2013; and 2013–2021. I see the identified second regime as a kind of interim period in which the first steps were taken towards the third regime, characterized by a dominant leadership and the introduction of new, unconventional monetary policy instruments. The real pivot point for the ECB is Draghi's appointment in November 2011. Presidents do matter.

2. Price stability

Ensuring price stability is enshrined in the Treaty on the Functioning of the European Union (TFEU) and in the Statute of the ECB. Sufficient clarity in the definition of price stability is crucial to the success of a central bank's monetary policy. Providing that clarity is, within the law, left to the central bankers.

2.1. How to define price stability?

In October 1998, the GC defined price stability "as a year-on-year increase in the Harmonized Index of Consumer Prices (HICP) for the euro area of below 2 %. Price stability is to be maintained over the medium term". An "increase" implies that falling prices are not consistent with price stability. The medium term was understood to mean a term of 1–3 years. The word "maintained" in the definition comes from the Treaty but has now been replaced by "aiming for 2 % over the medium term" (ECB Economic Bulletin, 2021). Importantly, the GC had deliberately not set a specific inflation target within the bandwidth below 2 %.

The ECB officially targets headline inflation, like most central banks (Ehrmann et al., 2018) but naturally uses in its economic and monetary analyses headline and core inflation concepts. The difference between the two boils down to removing temporary factors. The experience of the ECB (and other central banks), for example in 2021, shows how hard it is to separate temporary from structural factors and if temporary factors have a long(er) lasting impact. Both inflation concepts are therefore closely monitored.

At its meeting in 1998, the GC was well aware that other central banks used different numerical values for price stability. A tolerance band of 0.5 % or 1 %-point on either side of 2 % was also not unusual. Hans Tietmeyer, President of the Bundesbank, in 1999 called these differences "small, but not negligible" (Tietmeyer et al., 1999) Differences in the target definition, which may seem small at first sight, can have major consequences for monetary policy in practice.

2.2. The first monetary strategy review; deflationary threats on the horizon?

In November 2002 Mervyn King and Ben Bernanke each gave a speech on deflation King, 2002, Bernanke 2002). However, both central bank governors saw no immediate deflationary threats. These speeches led to a discussion in the GC, initiated by Executive Board member and Chief Economist Otmar

Issing, about the definition of price stability. In those years Issing was the intellectual conscience of the ECB, Padoa Schioppa the passionate European. Sometimes that clashed.

The ECB undertook an in-depth review of its monetary policy strategy (Issing et al., 2003). In its press release of May 8, 2003, the GC explicitly confirmed the 1998 definition, but added that, in the pursuit of price stability, it will aim to keep inflation rates "close to, but below 2 %" over the medium term. The GC felt that, by introducing these words for clarification, it could sufficiently address quality issues related to the measurement of inflation, while meeting the need for a margin against the risk of deflation. "Below 2 %" was "stolen" from the old definition, "close to" a gesture to those members of the GC who were in favor of a 2 % inflation target.

Heated debates ensued over whether the ECB's price stability objective was symmetrical or asymmetrical. The words "close to, but below 2 %" gave some the impression that the ECB would respond more forcefully to inflation above this target than below it. This could lead to a downward drift of inflation and inflationary expectations.

The symmetry discussion was (and still is) confusing. Tietmeyer's view was that both a deflation in the sense of a sustained decline in the price level and a rate of monetary erosion of 2 % and more, are deemed to be harmful Tietmeyer et al., 1999. Draghi saw in 2016 asymmetry not in the mandate but in the tools used, due to the existence of the zero lower bound (Draghi, 2016). An ECB staff article concluded that until mid-2014 monetary policy was asymmetric (more vigorously responding to overshooting the "close to, but below 2 %" target than to undershooting), and symmetric over the period 2014–2019. The article also concludes that, if after mid-2014 the ("old") asymmetric pre-2014 policy response would have been followed, inflation and output would have been lower than its actual realization (Maih et al., 2021).

I have always found these kinds of studies confusing. The GC disliked undershooting of its "below, but close to 2 %" target as much as overshooting it but saw during the early days of the EMU a greater risk of inflation than of deflation. Just as the ECB concluded in 2021 that "the risk is more acute in the face of an increased prevalence and duration of lower bound periods compared with the conditions prevailing in 2003" (ECB Economic Bulletin, 2021).

2.3. A fundamental change in the definition of price stability?

Up to and including the ECB meeting in Vilnius on 6 June 2019, the words "below, but close to 2 % over the medium term" appeared in every press release. Then something unexpected happened. In the press release of the next meeting, in July 2019, these words were replaced by: "Accordingly, if the medium-term outlook continues to fall short of its aim, the Governing Council is determined to act, in line with its commitment to symmetry in the inflation aim". In addition to not referring to a numerical inflation target, the words "a commitment to symmetry" appeared for the first time.

When asked by a journalist at the press conference whether we can "expect the ECB to rephrase, redefine its policy objective", Draghi responded with: "No, there isn't any change really […] the Governing Council reaffirmed its commitment to symmetry around the inflation aim, which in a sense is 1.9 - it's close to, but below, 2 % […]. The symmetry means that basically there is no cap, or 2 % cap, and that inflation can deviate on both sides". Draghi's remarks caused great confusion and were seen by some as weakening the ECB's commitment to price stability.

In my opinion, the July meeting saw a non-transparent change in one of the cornerstones of the ECB's monetary strategy, "freilich ohne das von einem Ratbeschluss gedeckt zu sein" (Sinn, 2021). The formal confirmation took place with the strategy change in 2021. On October 4, 2019, several former central bankers, all concerned about the extremely accommodative policy stance being taken by the ECB, published at the initiative of Jürgen Stark a memorandum on its monetary policy (Memorandum, 2019). I was one of the signatories. According to this memorandum, the GC had de facto modified the 1998/2003 price stability definition by interpreting the "below, but close to 2 %", as kind of a point target and had introduced an insufficiently specified symmetric approach. The former bandwidth for price stability had been replaced by a new one on both sides of 2 %. The extent to which this has had an impact on monetary policy thereafter is difficult to determine. But it is not unlikely that the GC's adoption in 2019 of a symmetric approach around a point target had increased its risk appetite to exceed in the future the "close to, but below 2 %" limit, as inflation had been so low for so long.

2.4. The formal introduction of a new definition for price stability

On 8 July 2021, the ECB announced the results of its second strategy review and mentioned for the first time in a press release that the inflation target is 2 %, that positive and negative deviations are equally costly and therefore a symmetric approach will be followed. The ECB had finally and formally established

the new compass it wanted to sail on, but it remains difficult to see why this is a better compass than the previous one. Although the new price stability definition removes indeed "any possible ambiguity and resolutely conveys that two percent is not a ceiling", it also creates major new ambiguities and is short of specifics.

The GC did not indicate when actions ("especially forceful measures") would be needed in the event of an overshooting of the target and for how long and to what extent, after undershooting the 2 % target, the ECB would allow for such an overshoot. GC member Weidmann admitted that there could be temporary deviations from the target in both directions, but added in the same breath that the ECB's monetary policy is forward-looking and not dependent on targets that have not been met in the past. He was right, but this is not what "ordinary people" in Alan Blinder's definition of price stability Blinder, 1994) would call a "symmetric" approach. They would interpret "symmetric" as justifying a longer, less restrictive monetary policy during the recovery of the economy. This is, for example, the interpretation in a paper on the new strategy, prepared for the European Parliament, in which the ECB's "new" symmetric approach ("making up for "losses" at the ZLB") is called an optimal exit strategy (Benigno et al., 2021).

When inflation started to accelerate in the second half of 2021 and then exploded in 2022, all the ECB could say was that inflation would be brought back to its medium-term target of 2 % in a timely manner. No confusing theoretical subtleties and symmetry discussions anymore. However, there are already (and again) calls for an inflation target above 2 % (e.g. Blanchard et al., 2010, Blanchard 2023).

2.5. A step towards a multiple mandate?

The ECB is legally fully entitled to specify more precisely how it defines, in operational terms, the concept of price stability. Flexibility already existed under the old definition (a price increase >0 %, and below, but close to 2 %), but this flexibility has been brought to a "higher" level (around an inflation target of 2 %). The ECB sees that this new strategy allows for a smoother adjustment of macroeconomic imbalances in euro-area countries. According to its 2021 strategy review, balanced economic growth, full employment, and price stability are mutually consistent objectives (Lane, Paris 2022). This implicitly weakens - in case of a point target of 2 %, with an unspecified bandwidth, and in an uncertain economic environment with sometimes "tensions" between the theoretically mutually consistent objectives - the priority the ECB is obliged to give to price stability, based on the EMU founding fathers' strong conviction that this would contribute best to economic prosperity.

In my opinion, the ECB has taken an unclear step in its strategy review towards, in practice, a multiple mandate. The ECB could make its overriding priority for price stability more convincing by being more concrete about its medium-term orientation, and by specifying a (narrow) margin around the price stability target, whereby, of course, the upper end of this margin should not become the new inflation target.

When and to what extent support of the general economic policies in the Community would weaken the ECB's price stability mandate and infringe on the primary responsibility of national governments for those policies has been a (legal) bone of contention for the past 25 years, especially in Germany. The frequency with which Art. 127 is quoted has clearly increased over the years, partly under pressure from outsiders (politicians, press, analysts) who sometimes put other priorities, such as unemployment, climate and inequality, above price stability. Giving in too much to this pressure leads to mission creep. Mission creep is a gradual process. The democratic legitimacy of the ECB as an independent monetary authority is based on its very narrow mandate. Extending that mandate runs the risk of jeopardizing independence through involvement in broader political and social debates. Climate change can have an impact on prices, but that does not make it part of the ECB's monetary policy objective, no matter how important the climate issue may be. Many other important developments outside the realm of central banks have an impact on prices but for which other authorities are responsible.

3. First steps towards non-conventional monetary policy: Addressing transmission problems

On 8 October 2008, just after the collapse of Lehman Brothers, the ECB responded to the unfolding financial crisis by cutting its key interest rates and announcing a bold series of non-standard measures. These measures were deemed necessary as developments in the money market threatened to undermine the monetary transmission mechanism. Unlimited central bank liquidity was ensured, while collateral requirements were relaxed at the same time. On 9 May 2009 the ECB initiated additional longer-term refinancing operations, extended the maturity of these operations and also announced euro-denominated covered bond purchases until June 2010. Where necessary, additional liquidity (ELA: Emergency Liquidity Assistance) was provided under the discretion of NCBs.

The ECB acted with its refinancing operations as lender of last resort (LOLR) to the banking system, thus resolving the system-wide liquidity shock. Uncertainty had led to a fall in the money multiplier and

the broad money velocity. The purpose of the ECB was to "restore" the functioning of the Fisher Equation (Praet, 2016).

From the outset, the GC had regarded the non-standard measures as temporary in nature. They would be terminated respectively phased out when the situation had normalized. That normalization process took longer than expected. In 2010, tensions in financial markets flared up, prompting the ECB to re-introduce some non-standard measures and to announce the Securities Markets Programme (SMP) in May 2010, followed in September 2012 by the Outright Monetary Transactions (OMT) programme.

As a result of all these measures the composition of the Eurosystem's balance sheet changed and its size increased considerably, from around EUR 1 trillion in 2008 to EUR 2.5 trillion at the height of the European debt crisis, and ultimately to a peak in 2021 of EUR 8.5 trillion. The explosive development after 2014 was mainly caused by the ECB's assets purchase programmes.

3.1. The legal framework for asset purchases

According to its Statute (Art.18.1), the ECB is to operate in the financial markets and to conduct credit operations, whereby loans are granted based on adequate collateral. The ECB can therefore buy and sell financial assets, including bonds of public authorities. The Statute also authorizes the central bank to pursue intermediate objectives (Art. 12.1, Statute). Therefore, addressing monetary transmission problems falls within the competence of the ECB.

Purchases of government bonds – from here on I confine myself to these bonds - by the E(S)CB are subject to certain legal restrictions. They must be proportionate to the legitimate objectives of the ECB, must not lead to direct monetary financing of governments (Art. 21), must not undermine the "no bail-out clause" and must respect the principles of an open market economy. Most importantly, they must not jeopardize the ECB's overriding responsibility: to maintain price stability (Art.2, Statute). If the above conditions are met, the ECB may support the general economic policies in the Union (Art. 119 TFEU). The interpretation of these restrictions has been the subject of many heated debates and legal battles.

3.2. The Securities Market Programme (SMP) and Outright Monetary Transactions (OMT) were created

The formal decision by the GC to establish the first securities market programme (SMP) was taken on Monday 10 May 2010 and was supported by an overwhelming majority. Irwin (2013) called it "a triumph of pragmatism over principle". Opposition came from Weber and Stark. I joined them. Under SMP, explicitly announced as temporary, the ECB and the euro area NCB's can conduct – according to their capital keys and under some other conditions – outright interventions in euro area debt securities markets. The scope of the interventions would be determined by the GC and the purchased bonds would be held to maturity. It was also decided to sterilise the impact of these interventions through specific operations to absorb the liquidity injected through the SMP to ensure that price stability remained the ECB's top priority. Important is that euro area Member State governments "will take all measures needed to meet (their) fiscal targets this year and the years ahead in line with excessive deficit procedures", and of the precise additional commitments made by some euro area governments. The ECB did not claim preferred creditor status under its asset purchase programmes and accepted the same treatment as private and other creditors, thus respecting the principles of a market economy.

The interventions under SPM remained limited and proportionate to the legitimate interest of the ECB. The highest amount held in the SMP portfolio was EUR 219,5 billion, a modest amount compared to the size of the asset purchases under subsequent asset purchase programmes. Almost 50 % consisted of Italian bonds. Overall, the ECB appeared to have fulfilled the legal conditions for making asset purchases.

The few lawsuits the SMP triggered were low profile. That was the calm before the storm. The SMP ended on September 6, 2012, and was replaced by the Outright Monetary Transactions (OMT) programme. With the introduction of this new instrument, a fundamental battle broke out over the legality of these two monetary policy tools.

By mid-2012, EMU was on the brink of collapse. To restore confidence and buy time for governments to further reduce their budget deficits and make structural adjustments to their economies, Draghi pledged on July 26, 2012 in London: "Within our mandate, the ECB is ready to do whatever it takes to preserve the euro. And believe me, it will be enough" (Draghi, 2012). Draghi's statement was so successful because it effectively overruled the no bail-out clause.

The GC, concerned that monetary policy could be considered subordinate to fiscal policy, was more precise than Draghi, imposing strict conditions on its OMT decision of September 6, 2012. For carrying out OMTs strict and effective conditions were attached to an appropriate EFSF/ESM programme. The GC

also decided that such a programme should include the possibility of EFSF/ESM primary market purchases and access to the bond markets of the programme countries. After heated discussions, it was decided to also involve the IMF ("for the design and monitoring of the programme(s)).

Draghi's "Whatever it takes"-statement was further "refined" by a more precise interpretation of the words "Within its mandate", to keep this statement within the proportionality requirement. The GC decided to consider OMTs to the extent justified from a monetary policy perspective and only as long as the program was fully adhered to. No ex-ante limits were set on the size of OMTs, but the liquidity they generate would be absorbed ("sterilised") through targeted operations (ECB press release, 6 September 2012). Moreover, to comply with market principles, the ECB would accept the same (pari passu) treatment as private creditors or other creditors with respect to bonds issued by euro area countries through OMT. The GC had done its utmost to bring OMT within legal limits.

Despite the promise to operate within the mandate of the ECB, the wording of hard conditions and the promise to absorb the created liquidity, the open-ended character of Draghi's "Whatever it takes" statement and that no ex-ante limits seemed to be set convinced markets but scared many (especially in Germany), as also did his reference to the euro. This reference suggested that the ECB had entered the realm of economic policy. OMT has never been tested in practice. Draghi was so effective in his communication that it turned out not to be necessary to deploy this instrument, but that does not make the legal battles that have taken place around this tool any less relevant for future ECB policy.

Thousands of Germans - amongst them politicians, professors of law and economists - challenged OMT, claiming that the programme exceeded the ECB's mandate, infringed on fundamental rights of German citizens, and violated the prohibition of monetary financing (TFEU Art.123.1). The German Federal Constitutional Court (FCC) was asked for a ruling. It was a balancing act for the FCC: on the one hand the Court reserved its own judgment on the interpretation of the German Constitution (FCC, 2014), on the other hand it realized that the European Court of Justice (ECJ) is the highest Court for European Institutions. It therefore traditionally grants the ECJ a "right to a tolerance error".

The ECJ extensively addressed several important issues raised by the FCC (ECJ, 2015). First, 'on Draghi's "Whatever it takes" statement the ECJ was informed that an (undisclosed) limit had been set internally. Making that limit public was not an option, because it would undermine the effectiveness of OMT. Second, on whether the FCC was right to conclude that the ECB had entered "predominantly" economic policy territory" the ECJ is crystal clear. A monetary policy measure cannot be treated equivalent to an economic policy measure. And program conditionality as part of OMT does not mean that this instrument should be treated as the "functional equivalent" of an economic policy measure, merely because it can have indirect effects on the stability of the euro. Third, purchases of debt instruments directly from public authorities in the euro area are not allowed, but indirect purchases on secondary markets are not excluded if they are not used to circumvent the ban on direct purchases. Fourth, it is not the responsibility of a central bank to smooth "warranted" (justified) risk premiums. The purpose of OMT, according to Advocate General (AG) Cruz Villalón in the Gauweiler case, is not just to reduce costs "but rather to return them to levels that reflect the macro-economic reality of that State" (Cruz Villalón, 2015).

The AG's observation goes to the heart of the issue. Justified risk premiums must be accepted, unjustified ones must not. Unfortunately, systemic mispricing of sovereign debt risks is part of EMU's story (De Grauwe and Ji, 2012). Policymakers are self-evidently aware of that, but the extent to which risk premiums reflect macro-economic reality and how much is the result of unjustified (speculative) forces cannot be objectively determined. Upon activation of the OMT (or other anti-fragmentation programmes), the ECB will have to judge whether risk premiums are justified or not, thereby also taking into account that in a market economy uncertainty is part of the economic reality and must be reflected in risk premiums.

On June 21, 2016, the Second Senate of the FCC ruled on the above judgment of the ECJ, that the volume of the purchases should be mandatorily fixed from the outset and not exceed the amount needed to restore the transmission mechanism but need not be made public. Furthermore, the limitation of the programme, which restricts it to what is necessary to restore the transmission mechanism, must be transparent. Only in exceptional cases purchased bonds can be held until maturity. All these conditions ultimately boil down to a narrowing of the scope of Draghi's "Whatever it Takes" statement and are relevant (although sometimes forgotten) for future cases. If the above conditions (and some others, which are not covered here) are not met, there is an ultra vires act and then the Federal Government and the Bundestag are obliged to intervene.

The views of the Supreme Court of Germany, as the guardian of the German Constitution, are binding on German citizens, including the government, parliament, and Bundesbank. While the FCC has no

authority over the ECB, given Germany's importance to the monetary union, its views can make or break the system. Therefore, the ECB's legal department should take this Judgment seriously when advising the Governing Council on the legality of specific monetary policy instruments. My impression is that this has not been done sufficiently enough with regard to the Pandemic Emergence Purchase Programme (PEPP) and the in 2022 announced new anti-fragmentation tool, the Transmission Protection Instrument (TPI).

Until 2014 the whole discussion was about instruments, SMP and OMT, aimed at addressing temporary liquidity and monetary transmission problems. After these two programmes, up to and including the pandemic asset purchases programme (PEPP), the focus was on preventing deflation and, subsequently, on bringing the inflation rate to the ECB's goal of price stability, while at the same time addressing any transmission problem. A closer look at the monetary portfolio of the ECB shows that the explosive development of this portfolio cannot be separated from recurring problems with the monetary transmission mechanism. However, transmission problems in the eurozone turned out to be problems of a more permanent and structural nature than the transient and temporary disturbances in the financial markets that central banks had to deal with in the past and what Art.18.1, in my opinion, was intended for. Addressing recurring monetary transmission problems comes very close to (or sometimes is) conducting economic policies, bailing-out countries, and monetary financing budget deficits. The broadening of its scope has given the asset purchase programmes a different, more open-ended, and legally even more complex character.

4. The full transition to unconventional monetary policy: A road paved with legal battles

4.1. Deflationary threats

In 2014 deflationary risks reappeared on the radar screen of policymakers. Inflation was indeed extremely low in the years 2014–2016: in the US 0,6 %, 0,1 %, and 1,3 % respectively; in the eurozone 0,4 %, 0 %, and 02, %.

On May 8, 2014, Draghi told his audience at the press conference that, in view of these deflationary threats, there was unanimous agreement on the willingness to use, within the ECB's mandate, unconventional monetary policy tools. In June, several measures were announced: further cuts in the key ECB interest rates, (unconventional) targeted longer-term refinancing operations, a suspension of the SMP sterilization operations, and preparatory work on outright purchases of asset-backed securities.

On 4 September 2014, the GC decided to start purchasing non-financial private assets under the so-called asset-backed securities purchase programme (ABSPP), and euro-denominated covered bonds purchase programme (CBPP3). Unlike SMP and OMT, which were designed to be neutral with respect to the money supply, these new programmes were designed not only to enhance the transmission of monetary policy, but also to facilitate credit provision, to ease borrowing conditions, and to contribute to returning inflation rates to levels closer to 2 %, consistent with the primary objective to maintain price stability. An obligation to sterilise did not fit in with that.

In the period September 2014-January 2015, the GC became even more concerned about the possibility of deflationary forces setting in. At its meeting on 22 January 2015, the decision (Decision 2015/774) was taken to launch an expanded asset purchase programme (APP), encompassing the already existing programmes but also public sector (i.e. Eurozone government bond) securities, to address downward risks to price stability.

The Quantative Easing (QE) that the ECB embarked on with all these programmes, and especially the APP, was a quantum leap in policy: asset purchase programmes were "promoted" from limited interventions to address temporary market frictions into a "broad" monetary policy tool for preventing a deflationary spiral and (somewhat later) achieving price stability. This "promotion", which had begun with the abolition of the sterilisation commitment, opened the door for potentially very large asset purchases. The ECB pushed the limits of its legal possibilities.

Mid-2017 Draghi declared victory over deflation: "The threat of deflation is gone, and reflationary forces are at play", but he added that inflation dynamics were not durable and self-sustaining (ECB press conference 9 March 2017). Therefore, monetary policy needed to be "persistent" (persistently accommodative). The fear of deflation did not disappear from the ECB's table after mid-2017 and gradually became, in my opinion, deeply engrained in the minds of (the majority of) the GC. It can safely be said that in the years 2017–2019 the ECB has further consolidated its monetary quantum leap. From solving rather unique problems at the ZLB, asset purchases became a (conventional) tool (to try) to bring inflation sustainably to the target value of "close to, but below 2 %. Andrew Haldane called this approach

"QE for all seasons", rightly noticing that if QE were to grow in scale and permanence, the fiscal/monetary boundary would become blurred (Haldane, 2015).

4.2. Root causes of low inflation

The world went during the 1990 s and 2000 s through the largest-ever positive labor shock in history, accompanied by a global opening of markets. The effective labor supply had doubled over the past thirty years due to the rise of China, the return of Eastern Europe to the world trading system, and the increase in the participation rate of women (Goodhart and Pradhan, 2020). No wonder that wages, prices, and interest rates came under enormous pressure. No wonder the bargaining power of trade unions became very weak. By not taking these developments sufficiently into account and pursuing an ultra-loose monetary policy central bank had built a monetary pyre (Sinn, 2021).

The relation between base money and broad monetary aggregates is unstable and complex, especially in periods of uncertainty, and the same holds for broad money and spending. But being unstable and complex doesn't mean that there is no relation at all, only that it is uncertain under what circumstances the accumulated potential will have inflationary consequences. An exogenous shock, this time the corona crisis amplified by the Russian invasion of Ukraine, had triggered a complex series of unforeseen behavioral reactions and interactions, in a macro-economic environment characterized by multiple supply chain problems. The underestimation of the importance of monetary aggregates was one of the reasons why inflation started to pick up so fast from mid-2021 in the US and Europe.

We are now in the midst of a confluence of regime changes: ageing populations, the long(er)-term consequences of the corona crisis, climate change, and more regional globalization at the expense of "global" globalization, the latter reinforced by geopolitical developments around Russia and China. All these developments imply an upward pressure on inflation and have consequences for the monetary policy to be pursued in the future.

4.3. Another legal battle, this time over the Public Sector Purchase Programme (PSPP)

Foreseeably, proceedings were again initiated, this time against asset purchases under PSPP (the Public Sector Asset purchase component of APP). On December 11, 2018, the ECJ issued its Judgment in response to a request from the FCC for a preliminary ruling (ECJ, 2018). According to this Judgment PSPP was in full compliance with the requirements of the Treaty.

The FCC took a different view, ruling that the PSPP Programme was partially unconstitutional and required the ECB to re-issue its decision with better justification and conduct a proportionality assessment within three months (FCC, 2020). This sparked much excitement among legal experts (Eleftheriades, 2020), who felt that the FCC was overstepping the limits of its judicial mandate under the German Constitution and EU law. In its ruling, the FCC instructed the government, and the German parliament to ensure that the German Constitution would be observed and to actively ensure that the ECB would carry out a proportionality test within three months in which all aspects, including all possible side-effects of monetary policy, are considered. After the ECB provided further clarification and the Minister of Finance and Parliament declared that the ECB's assessment met the requirements set out in the ruling of the FCC, the excitement of legal experts melted like snow in the sun.

I very much welcome the FCC's Judgment. Overall budgetary responsibility is part of Germany's constitutional identity and decisions with budgetary implications are taken in the Bundestag. By instructing the German Government and parliament to comply with the German Constitution and by requesting a proportionality test, the FCC was able to ensure that the ECB remained within its mandate. For following cases it is important whether the authorities will take the Court's instruction and thus their responsibilities sufficiently seriously. The financial losses that are now coming to light could become a very important point in upcoming proceedings.

4.4. The Pandemic Emergency Purchase Programme (PEPP)

When in February/March 2020 Europe was hit by the corona virus, the GC at its meeting of 12 March, decided on a comprehensive package of monetary policy measures including its new Pandemic Emergency Purchase Programme (PEPP) with an initial total envelope of EUR 750 billion. As the crisis deepened, this amount was eventually increased to EUR 1.850 billion. PEPP was called by Executive Board Member Yves Mersch the ECB's most far-reaching and exceptional monetary policy decision (Mersch, 2020).

The purpose of PEPP was twofold: to address serious risks to the monetary transmission mechanism, and to deal with the specific, extraordinary and acute economic crisis, which could jeopardize the objective of price stability. The PEPP decision explicitly states that this new programme required a high degree of flexibility in its design (over time, across asset classes and among jurisdictions), and moreover that its

monetary objectives are not identical to that of APP. PEPP, it was said, should be seen as a kind of add-on to APP, and did not have to be fully used if favorable financing conditions could be maintained with purchases under APP. PEPP was also expressly intended to be temporary and linked solely to the pandemic.

An (initial) evaluation of PEPP by the ECB concluded that this tool had been successful in effectively stabilizing markets under extremely difficult. As to its macro-economic impact, it was concluded that, on a conservative estimate, that the pandemic related measures supported growth by a cumulative 1.8 %-points and inflation by 1.2 %-points over the period 2020–2023. These growth and inflation estimates are based on a comparison with a counterfactual scenario in which the ECB did not ease its monetary policy stance (Böninghausen et al., 2022). I am quite skeptical of numerical model results of counterfactual scenarios in such extreme circumstances. I have also from the outset wondered how the ECB could ever get rid of its exploding monetary portfolio and whether other side effects, such as a reduction in the degrees of freedom with respect to its future monetary policy, as well as significant financial losses during a monetary tightening process, should also not have been considered more thoroughly. After all, a proportionality test, taking into account all possible side effects, was one of the requirements of the German Supreme Court in the PSPP case.

Compared to previous programmes, PEPP pushes further in several ways the boundaries set by the legal constraints on asset purchases. Grund (2020) concludes that the legality of the programme can be very well defended given the extraordinary economic circumstances and the Court's assessment of previous bond purchases programmes. Nor does PEPP, according to him, undermine incentives for sound fiscal policies because of the resetting of fiscal parameters (a relaxation) by the European Governments and the Commission.

PEPP was, unsurprisingly, legally challenged. A group led by Professor Markus Kerber, filed a lawsuit in March 2021. Some flexibility would be justified due to the extraordinary pandemic circumstances and the far-reaching measures taken by governments. The apologetic keyword is "pandemic related". But for various reasons, the outcome of legal procedures is not 100 % sure. A proportionate deviation from the issue(r) limits would be unlikely to render the PEPP unlawful. But questions may arise as to whether PEPP's implementation adequately meets the criteria set forth by the FCC in its 2020 Judgment on PSPP. In 2020, as a percentage of newly issued debt, the ECB purchased 95,5 % of euro area government debt and 117,1 % of Italian debt. In 2021, the ECB continued to buy bonds massively, predominantly under PEPP. Financial market participants (and governments) knew of course with almost 100 % certainty that they could resell government bonds (albeit not those newly issued bonds) to the ECB. Given the total size of the purchases (a quarter of the government debt is now on the balance sheet of the Eurosystem), it is difficult to maintain that no monetary financing of government deficits has taken place.

Net purchases under PEPP were halted at the end of March 2022, meaning that the GC considered the COVID-19 crisis over. It is hard to understand that at the same meeting the GC announced an extension of the PEPP reinvestment horizon from the end of 2022 to at least 2024. Ongoing reinvestments weaken the link with the pandemic as well as the transitory nature of PEPP. The extension of the initial date for ending reinvestments of PEPP from 2022 was undoubtedly a step towards decoupling PEPP from the pandemic. This decision does not appear to be in line with the spirit and the text of the GC's Pandemic Decision. So even if the German Court were to agree with PEPP as a monetary policy tool, it could still have major problems with the actual use of this instrument. Recently, Brooks and Marsh (2023) put forward a completely new argument to end PEPP reinvestments soon. These reinvestments blur the true costs of public debt in the euro area and, thereby, undermine the reliability of the debt sustainability analyses. These analyses are a crucial part of the EU Committee's reform proposals for a new budgetary framework.

4.5. A new anti-fragmentation instrument

In late 2021 and the first half of 2022 it became increasingly clear that the ECB had underestimated underlying inflationary pressures, and that monetary policy would need to be tightened. Monetary transmission problems once again appeared. At the GC meeting of 21 July 2022, the ECB launched the Transmission Protection Instrument (TPI), to address these problems. The availability of this new instrument enabled in the GC's view a more rapid increase in policy rates (0,5 % instead of the expected 0,25 %). The new tool can be used to counter disorderly market dynamics that threaten the monetary transmission process, at least insofar as they are not the result of country-specific fundamentals.

A decisive criterion in previous court proceedings has been sound public finances and sound macro-economic policies. Strict conditionality, aimed at achieving this goal, was a condition sine qua non

for the activation of OMT. The mere fact that it was considered necessary to develop a much more flexible and permanent anti-fragmentation instrument suggests that the ECB has given way to those who do not accept the strict conditions attached to OMT. In the same direction points that in TPI, when the GC decides on its activation, meeting certain criteria is an input and no longer a necessary condition. The TPI eligibility criteria are also not watertight (Buiter, 2022).

Moreover, the relation between TIP and PEPP raises serious questions. During the press conference at which TPI was launched, Lagarde said that flexible reinvestments of maturing purchases under PEPP remain the first line of defence to counter unjustified risks to the transmission mechanism, a remark echoed (among others) by the governor of Italy's central bank, Ignazio Visco, at an OMFIF meeting on 3 November 2022 (Williams and Pearce, 2022). The (weak) argument for this seems to be that insofar as high debts are at the root of the transmission problems, these debts are partly related to the pandemic. It is hard to take this argument seriously.

Several other issues regarding TIP are not resolved or perhaps resolved but not communicated transparently, as required by the FCC (Wellink, 2022). The press release is silent on the capital key as a benchmark for the asset purchases. This is in my opinion unacceptable for accountability and legal reasons. Not mentioning this benchmark raises questions about loss sharing. It has reportedly been decided that there will be no risk-sharing at all. If true, this will make this tool less effective in the eyes of market participants, as countries already in trouble would have to bear even more risks.

Lack of clarity also exists with respect to sterilisation. The press release on TPI makes it clear that the purchases will not have a persistent impact on the overall balance sheet of the Eurosystem. This formulation vaguely refers to sterilisation, but the use of the word persistent in practice leaves all options open in terms of timing, and deviates from the straightforward sterilisation promise under SMP and OMT.

The ECB will end purchases under TPI, either upon a sustained improvement in transmission or on an assessment that continued tensions are due to country specific fundamentals. The latter is a two-edged sword. Ending purchases because tensions are home-made, for example during a political crisis, is tantamount to blowing up the system. Therefore, safeguards should be built in, and therefore OMT is a better instrument to cope with fragmentation problems.

At some point, markets will test the ECB's tolerance for widening spreads. The ECB then must decide whether transmission problems are justified or not, and to what extent. This is a tough, almost impossible job. Moreover, the ECB would have to decide on whether they are still pandemic-related or whether OMT or TPI should be activated. Different criteria apply to each of the three anti-fragmentation instruments. Three instruments to choose from is too much of a good thing.

In my opinion, the ECB is with this new instrument, if applied (which has not been the case so far), entering a legal minefield and should be very concerned about its legality, just as it should be concerned about using PEPP to solve non-pandemic related problems.

5. Reinvestment policy, financial and accounting issues

5.1. The ECB's reinvestment policies

On 25 January 2018, the GC confirmed that maturing securities would be reinvested "for an extended period of time" after the end of the ECB's net asset purchases. According to Draghi this was set in stone. At the press conference 9 months later, in September 2018, a journalist rightly complained about the lack of information on the reinvestment policy. Draghi promised to come back to this topic at one of the next meetings but was very explicit that the capital key "remains our anchor in what we do on reinvestments, just to clear the slate from any doubt". In December of that year some further clarity was offered. The GC had unanimously decided to fully reinvest principal payments from maturing APP securities for an extended period of time beyond the date when it starts raising interest rates.

The ECB discontinued net asset purchases under the APP as of 1 July 2022 and raised its policy rates that same month. This marked the beginning of the so-called "extended period of time" for reinvestments under the APP portfolio. For PEPP securities (not existing in 2018) it was decided to extend full reinvestments until at least the end of 2024. Net asset purchases under this programme were discontinued at the end of March 2022.

As of March 1, 2023, the ECB stopped fully reinvesting the maturing securities purchased under APP. The run-down of the APP portfolio remains a slow process considering the ECB's monetary portfolio of almost EUR 5 trillion in March 2023 (EUR 3.2 trillion under APP and EUR 1.7 trillion under PEPP). The much later phase-out of PEPP is motivated by the ECB by the greater flexibility of this instrument. However, this ignores the fact that this flexibility was justified by the unpredictability of the corona crisis

that is now behind us. It also ignores that PEPP was seen as a flexible add-on of APP, whereas in practice APP has become a kind of add-on to PEPP.

The ECB's reinvestment policy has always amazed me, although of course I understand that market conditions need to be closely monitored and considered. But it is hard to understand how fairly specific forward guidance could be given (for APP: "…extended period of time past…" respectively for PEPP: "…. until at least 2024") long before the start of a monetary tightening cycle, with the ECB not knowing at that time anything about the specifics of such a cycle and seemingly ignoring potential losses that could result from an inevitable future hike in key ECB interest rates. The earlier in the tightening cycle, the greater the likelihood of additional losses on reinvestments. Once the monetary tightening process has progressed, reinvestments will of course start to become profitable, but non-monetary considerations should never be a reason to continue with these reinvestments.

Not reinvesting maturing securities and/or selling securities means that government bonds move from the balance sheet of central banks to private investors, putting them at risk that interest rates may change over the life of bonds. This will push the term premium upwards and contribute to the tightening process. Admittedly, it may be more complex to assess the consequences of such a strategy than of an interest rate hike (particularly in the European context where fragmentation problems resurface time and again), but that is what the ECB could have realized earlier and certainly before its monetary portfolio "exploded".

Therefore, transparency is needed about how the ECB balances the monetary implications of a reduction of its securities portfolio against an increase in its key interest rates. Other considerations also need to be made transparent, including the possible financial consequences associated with the very slow run-down of the monetary asset portfolio.

5.2. Significant losses on monetary portfolios

On September 9, 2022, Governor Knot of De Nederlandsche Bank (DNB) wrote to the Dutch Minister of Finance that DNB expects cumulative losses in the coming years of the order of EUR 9 billion (or more). As a consequence of the increase in key ECB interest rates, no profit could be transferred in 2022 by DNB to the government for the first time in many decades.

Since 2015, DNB has gradually built up a special provision for losses on asset purchase programmes and had also slightly strengthened its capital and reserves (up to EUR 8.5 billion). Against this special provision of EUR 2.3 billion in 2022, there is a risk estimated at EUR 23.4 billion (Annual Report DNB 2022). This does not bode well for the future. The Dutch Minister of Finance has informed Parliament about the establishment of a Working Group to assess DNB's capital position (Kamerdossier 32013, 2023).

DNB is of course not the only central bank to record financial losses. The ECB recently published a loss for last year of EUR 1.6 billion and the Bundesbank had to post its first loss in more than 40 years. These losses were covered by the release of provisions. Other NCBs will follow, if not in 2022 then in later years. To what extent future losses can be covered by existing buffers is not clear, as the situation varies from country to country. "The disclosure of public risks is not harmonized across the Eurosystem's central banks, as the disclosure is affected by the different circumstances applicable to each central bank, such as the existence of private shareholders or public guarantees, the different approaches towards building up financial buffers against financial risks, and even the different disclosure traditions and cultures across central banks" (ECB, July 2015). After 25 years it is high time to address these issues.

Given the securities held by the Eurosystem for monetary policy purposes and the level of the renumerated excess reserves of banks, cumulative financial losses on the asset purchase programmes in the order of EUR 400–600 billion (for the system as a whole), would not surprise me. These losses are the result of low yields on the assets purchased and the rising costs of financing them (interest paid on bank deposits with the central bank) and will eat into the capital and reserves of the Eurosystem, affecting remittances to governments and, in some cases, forcing governments to replenish the capital of their central bank. According to a recent IMF Working Paper (Belhocine et al., 2023) one should not worry too much about financial losses, because – although these losses are material – they will be temporary and recoupable (IMF Working Paper, 2023). The calculations cover 10 years in which a return to the "steady state" takes place and central banks, of course, will generate profits again. The findings indicate two years of loss-making for the Eurosystem as a whole, five years for the Bundesbank, and zero annual losses for the Banca d'Italia. It will take much longer (until 2027) to recoup the consequences for the capital, reserves and general provisions of the Eurosystem as a whole. For some central banks full replenishment is reached earlier, for others (e.g. the Bundesbank) this may take much longer. For central banks, such as the

Bundesbank, that have bought bonds from (their own) governments with a relatively high credit rating, the losses on monetary portfolios are relatively high.

In theory losses of central banks are nothing to fear, but in practice they can spark heated debates about the wisdom of central bank policies and ultimately their independence, in the eurozone not only because of the size of the losses but also because of the distribution among NCBs. The ECB can reduce the risks associated with such debates by being highly transparent about possible losses in a timely manner and clearly explaining that the purchases were necessary to fulfill its mandate (Bell et al., 2023).

Reducing the size of excess reserves (e.g. by increasing obligatory reserves) and/or reducing the remuneration on excess reserves could lower the financial losses but must of course be compatible with the ECB's monetary policy. Selling/not reinvesting its securities holdings is one option for the central bank to reduce excess reserves, converting these reserves into long-term bonds is another. Selling, of course, would immediately reveal losses.

The question arises of how to steer interest rates in the future – when excess reserves are expected to remain quite high and the demand for reserves is uncertain for various reasons towards levels consistent with the ECB's price stability mandate, while minimizing potential losses. (…The ECB aims to achieve its policy objectives with the lowest possible risk…."; "…. any financial loss incurred by a central bank is a loss of public funds…" (ECB, July, 29015). In a speech, Isabel Schnabel, Member of the Executive Board of the ECB, discusses challenges and solutions related to the existence of large reserves (Schnabel, 2023). She reiterated the GC's intention to decide on its future operational framework before the end of 2023. It is not clear why this should take so long.

5.3. The accounting veil.

Until recently potential losses on asset purchases have attracted limited attention, although central banks have resorted to instruments that are financially far more risky than any other. Ten years ago, the BIS already ("now that many central banks are operating far beyond traditional policy limits") produced a paper drawing attention to this (Archer and Moser-Boehm, 2013). Of the many aspects covered in this document, I focus on accounting issues.

ECB assets related to monetary policy operations are not measured at fair value (through profit and loss or equity) but recorded at amortized cost. They are held to maturity and not revalued. Thus, unrealized losses remain unrealized as long as the securities are not sold. However, a rise in interest rates affects the net income position of the ECB and NCBs negatively.

The idea behind this accounting is that a fair value approach could lead to significant fluctuations in profits/capital and potentially hamper monetary policy. However, this approach goes against what is required for transparency reasons from banks. Monetary assets that should be available for sale at any moment, are locked in until maturity. For good reasons, the FCC has decided that purchased bonds can only be held in exceptional circumstances until maturity and that these bonds must be sold when continuing the interventions is no longer necessary (FCC, 2016). Kerber recently pointed out that this accounting methodology limits the ECB's monetary policy options (Kerber, 2023). However, it may be arguable to hold purchases under SMP and OMT until maturity (at amortized costs) because of the relatively small size and monetary neutrality because of the sterilisation commitment.

According to most central banks, their unique position would justify the amortized cost approach for all QE purchases. I am not convinced. The amortized cost approach and the resulting lack of transparency may have misled even the central bankers themselves. Treating the monetary portfolio as available for sale and thus on a fair value basis would perhaps have acted as a brake on the very large asset purchases and on the ECB's decision to make asset purchases part of its conventional monetary toolbox.

NCBs have been provisioning (insufficiently) for possible future losses related to QE for some years now, but certainly not on an adequate scale and it is striking how little attention, until recently and with exceptions, is paid by central banks to interest rate risk, as opposed to (relatively small) other risks. This is despite the commitment that "the Eurosystem aims to assure adequate protection of its balance sheet over the economic cycle" and the realization "that any financial loss incurred by a central bank is a loss of public funds" (ECB, July 2015). One would expect the ECB and NCBs to regularly conduct serious interest rate stress tests, as banks are required to do. If these tests have taken place, the question arises as to how serious they were and whether the results, for accountability reasons, should not have been published, as DNB has done in its 2022 Annual Report. Without such information it is difficult to determine whether purchases on such a large scale as in recent years are "proportionate to the legitimate interests" of the ECB.

Either way, a fundamental reflection on the asset purchases policy, including accounting aspects and communication, seems urgently needed. Too easily, in its strategy review of 2021, the ECB has included

this instrument, to be used for broad monetary policy purposes, in its conventional monetary toolbox. I agree with Gros (2022) that "In hindsight, it is clear that central banks made a colossal mistake in continuing massive bond-buying programs over the last few years". Since private financial institutions followed suit by purchasing also high-priced government bonds at a huge scale. De Larosière - referring to banking problems in the US - cynically concluded that central banks "have thus delivered a masterclass in how to organize a financial crisis" (De Larosière, 2023).

6. Forward guidance as part of the non-conventional toolbox

Central banks have always given some kind of Forward Guidance (FG), but before the Financial Crisis in 2008 usually in a weak form. "Real" FG by the ECB started with rate forward guidance, but gradually expanded to other monetary policy instruments. The logic is that the use of all monetary instruments must be seen in relation to each other. This immediately raises questions about the sequence and to what extent mutually reinforcing effects can/will occur (Committee on the Global Financial System, 2019). FG is part of the central bank's broader communication strategy. A comprehensive overview of all related aspects, including the now very extensive literature, can be found in De Haan and Hoogduin (2022).

The first ECB FG in 2013 reads as follows: "The Governing Council expects the key ECB interest rates to remain at present or lower levels for an extended period of time. This expectation is based on the overall subdued outlook for inflation extending into the medium term [….] In the period ahead we will monitor all incoming information…and assess any impact on the outlook for price stability". Draghi called the statement "an unprecedented step of giving forward guidance in a rather more specific way than the ECB has ever done in the past". It was indeed again a quantum leap, because until then the ECB never "pre-committed".

6.1. Forward guidance after the strategy review

The FG wording has changed since 2013 and broadened over time, but these changes were (not irrelevant) modifications around essentially the same messages. A more fundamental change took place following the introduction of the ECB's new monetary policy strategy in July 2021.

Philip Lane, Chief Economist of the ECB and member of the Executive Board explained in a blog its consequences (Lane, 2021). Based on two strategy innovations (the definition of price stability as a symmetric point target of 2 % and the commitment to take into account the implications of the ZLB) he concluded that under the prevailing circumstances, the FG language should be strengthened. And that is what happened as of the GC July 2021 meeting. This turned out to be a major policy mistake. The three explicit conditions that should be met before raising interest rates, were all aimed at preventing too early a monetary tightening, based on fears that inflation would remain too low. Lane's speech on the ECB's monetary policy roadmap (Lane, Berlin 2022). also emphasizes this.

As reasonable as these conditions may look on paper, in practice they are a successful recipe for being constantly behind the curve with interest rate hikes. Or, as De Haan and Hoogduin (2022) put it: "Forward guidance seems to have hindered rather than promoted an adequate response to the recent rapid increase in inflation". Reinforcing the language, being too explicit, entails dangers. GC members do not know the future either, at least not better than market participants. As Mervyn King said in an interview with Martin Wolf in the Financial Times (14 June 2013): "I suppose the thing I hadn't really appreciated was a key part of the work of Keynes. It was the idea that the future is unknowable". If a central bank's FG is too specific and outspoken, especially for somewhat longer periods, and reality behaves differently, such a central bank loses credibility. Credibility is about finding the right balance between the clarity of the message and the flexibility left to the central bank. That balance had been lost since the strategy review in 2021 and throughout the first half of 2022. At the beginning of November 2021, the President of the ECB firmly stated (repeating this message a month later) that a rate hike in 2022 was highly unlikely.

Until February 2022 (for 9 years in a row) the guidance on interest rates did not change. Interest rates were expected "… to remain at their present or lower levels until …." (Press release, 3 February 2022). This even though core and headline inflation in the euro area had been rising already strongly before the Russian invasion of Ukraine on 24 February 2022. According to an ECB paper on recent errors in the Eurosystem's inflation projections, some underestimation had started to occur in the first quarter of 2021. This underestimation gradually increased over the year and reached a size that was the largest since the projections began in 1998 (Chahad et al., 2022).

In the press release of March 10, 2022, the words "or lower" were finally removed, but surprisingly still contained: "remain at their present levels". In April 2022, the GC considered it increasingly likely that inflation will stabilize at the two percent target over the medium term. "Under this pathway, the degree of

monetary stimulus […] can be normalized in a gradual fashion towards a more neutral setting" (Lane, Paris 2022). In the June meeting of the Council, it was decided to maintain during the normalization process optionality, data dependence, gradualism, and flexibility. These assessments and criteria translated into the decision not to raise key ECB interest rates until a month and a half later. A sense of urgency was clearly missing.

It is hard to understand why the GC was so slow to respond to the rapidly rising prices. Governors apparently still viewed the upward pressure on prices as temporary and based their policies on the criteria of the 2021 strategy review. I think there was perhaps also another reason. Some GC members saw the two ECB rate hikes in 2011 as a major policy mistake, contributing to the European debt crisis in 2012. They had forgotten that it wasn't the ECB's two rate hikes that eventually triggered the full-fledged outbreak of the debt crisis in 2012, but the tedious, time-consuming and often controversial decision-making process at the national and European level regarding the rescue of troubled Euro countries.

Once bitten, twice shy. The ECB completely scrapped FG when it announced a rate increase in July 2022. President Lagarde: "…and therefore the combined forward guidance that existed for September is no longer applicable. From now on, we will take our monetary policy decisions on a data-dependent basis- we will operate month by month and step by step".

In my view, the ECB has gone from one extreme (a reinforced FG in July 2021) to –initially at least - an unclear other (in June 2022), by emphasizing in its communication also the importance of optionality and gradualism. These words were not very helpful in an environment of accelerating inflation. Fortunately, they already seem obsolete and are no longer mentioned. Without these additions and relying on Lagarde's precise wording, the ECB is back to square one, being the FG language used before 2013. In addition, it has taken seriously Mervyn King's reference to Keynes, as witnessed by a speech by President (Lagarde, 2023): "It would be foolish, in forming our expectations, to attach great weight to matters, which are very uncertain" (Keynes), and: "Uncertainty is an uncomfortable position. But certainty is an absurd one" (Voltaire). Hopefully the lessons learned will stick.

7. Micro-prudential supervision and financial stability: Major changes in the ECB's responsibilities

Since the establishment of the ECB in 1998, major changes have been enacted in the field of supervision and financial stability. A landmark was to entrust the ECB with micro- and macro prudential supervision from 2014 (ECB, 2014).

Coming from a country with traditionally monetary policy and prudential supervision under one roof (DNB), I am fully aware of the potential informational advantages and economies of scale of such a model. But there are also arguments against. That institution could become too powerful, especially if it has been given an independent status. Moreover, the involvement of central banks is not only a source of synergies but also of potential conflicts of interests between monetary policy and supervision. Moreover, policy failures regarding one of the two responsibilities can jeopardize the other.

Since in practice the political risks of supervisory failure are greater than those of monetary failure, some central bankers were highly skeptical of the "one-roof" model. The strong German views on this issue were based on the fear that monetary policy and central bank independence could be endangered by the responsibility for micro-prudential supervision. The Statute of the ECB should be seen as a compromise, but nevertheless strongly reflects the German views. According to this Statute, the E(S)CB shall contribute to "the smooth conduct of policies pursued by the competent authorities relating to the prudential supervision of credit institutions and the stability of the financial system". In addition, the ECB "may perform specific tasks concerning policies relating to the prudential supervision of credit institutions and other financial institutions with the exception of insurance undertakings". The words "competence" and "specific" must be seen in conjunction, meaning that "specific" indicates a limitation of the scope of the supervisory tasks that can be assigned to the ECB. The supervisory task is also not mentioned as one of the basic tasks of the ECB in Art. 127, 2 of TFEU. Smits (1997) provides insight into the course of the legal discussions on this.

7.1. A quantum leap for supervision

In October 2008 the EC President, José Manuel Barroso, asked Jacques de Larosière to chair a High-Level Group (HLG) to put forward proposals for "strengthening European supervisory arrangements covering all financial sectors, with the objective to establish a more efficient, integrated and sustainable European system of supervision". The HLG report, published on 25 February 2009 (de Larosière et al., 2009), contained many recommendations, including a greater role for the ECB in macroprudential oversight. The HLG rejected the idea of entrusting the ECB with micro-prudential supervision as

conferring a micro-prudential task on the ECB would thwart its monetary responsibility and jeopardize its independence.

The EU took almost all the recommendations on board and decided on a complete overhaul of the supervisory architecture in Europe, including the establishment of a European banking supervisor ("a single supervisory mechanism (SSM)") and a single resolution mechanism (SRM). Contrary to the advice of the HLG, the ECB became the micro-prudential supervisor. Its supervisory role is based on a Council Regulation (of 15 October 2013) "conferring specific tasks on the European Central Bank concerning policies relating to prudential supervision of credit institutions". From a legal perspective the attribution of specific supervisory tasks to the ECB appears to be in line with the text of the ECB Statute. The "trick" is that the Council Resolution uses the word "specific" repeatedly, referring to the Treaty and the Statute of the ECB. But assigning specific tasks is different from entrusting more or less full supervisory responsibility to the ECB. Article 4 places all major prudential tools in the hands of the ECB, which has exclusive competence over all supervised institutions, small or large (Judgment of the General Court of 16 May 2016).

By basing the SSM on Art. 127(6) TFEU, the Union legislator has opted for a "broad" interpretation. Ter Kuile et al., (2015) seem to suggest that the legislator had a choice between a broad and narrow interpretation, but the text of the Statute is, in my opinion, crystal clear. The ECB took over all crucial responsibilities of the hitherto competent authorities.

7.2. Necessity knows no law

Necessity knows no law. The quantum leap in supervision in Europe can only be welcomed, as it was a major step in the right direction, and speed with respect to strengthening supervision was of the essence. But it is always good to reflect after a crisis on whether the right measures have been taken.

The Council Regulation seeks to avoid conflicts of interests as much as possible by requesting the ECB to "ensure that the operation of the Governing Council is completely differentiated as regards monetary and supervisory functions. Such differentiation shall include strictly separated meetings and agendas". To minimize the risks of conflicts of interests, clear and precise organizational and procedural instructions are given to the monetary and supervisory staff of the ECB. There are all kinds of checks and balances built in, but in the end the GC is the ultimate decision-making body with regard to monetary policy and micro-prudential supervision. It is interesting to note that only a small number of the jurisdictions analyzed in a 2018 FSI report, appear to have assigned the monetary and supervisory responsibilities to different decision-making bodies within the same organization. The focus was more on exploiting synergies than on preventing conflicts of interest (Calvo et al., 2018).

The first evaluation of the new system was published in 2017 (Report Commission, 2017). The Commission was rightly very positive about the functioning of SSM, had not identified any major issues regarding the independence of the ECB, and considered the single supervisor a solid and reliable part of the banking union. The fundamental objections to the "under one roof" model (overly powerful organization, democratic legitimacy, conflict of interest, threat to independence) had been addressed as best as possible. Yet they have not completely disappeared. To mitigate remaining conflict of interest- and reputational risks, it would be good if the GC would cease to be the ultimate decision-making body on micro-prudential issues. Under normal circumstances this role does not cause any problems. Problems surface in real crises, but then it is too late and the damage done.

7.3. A greater focus on financial stability

Since the beginning of this millennium more and more central banks have come to the conclusion that financial stability is a core task and that price stability cannot be achieved without financial stability. It was a return to the days in which – to quote Tommaso Padoa-Schioppa, a prominent member of the Executive Board of the ECB – "the role of central banks in financial stability was part of their genetic code" (Padoa-Schioppa, 2002). According to the Treaty, the ECB must contribute, together with other authorities, to achieving financial stability (same wording as used with respect to micro-prudential supervision). Financial stability cannot take precedence over price stability (Mersch, 2018). In the same vein President Lagarde (Lagarde, 2023). This is easier said than done. Making a distinction between the price and financial stability objective is theoretically straightforward, but under financial (or other) stress conditions it remains in practice a major challenge.

Although financial stability is seen as a prerequisite for an effective monetary policy, there is no legal definition of financial stability in the Treaty or Statute. The ECB defined financial stability as a state in which the financial system can withstand shocks and unravel financial imbalances. In December 2004, the ECB began publishing financial stability reports, long before it got a legally more precisely defined role. Since 2014, the ECB has been obliged to closely cooperate with the European Securities and Markets Authority (ESMA), the European Systemic Risk Board (ESRB) and other authorities that are part of the European System of Financial Supervisors. None of these institutions have exclusive competence for financial stability. This also applies to the ECB, but it nevertheless plays a sort of overarching, steering role.

The ECB's relationship with the authority responsible for macroprudential supervision, the ESRB, is very close. The President of the ECB presides over this Board, which includes national central bank governors and the chairs of the ESAs as members. The Board of the ESRB is based at the ECB's offices in Frankfurt and the ECB provides the secretariat. It follows from the above that in practice the ECB is doing more than just contributing to the smooth functioning of the competent authorities. It could be seen as a kind of competent authority itself, but - unlike in micro-prudential supervision – the GC is not the ultimate deciding body.

The ECB is fully aware of its prominent role regarding financial stability and has made this an integral part of its new analytical framework. The full integration of financial stability in the ECB's policy framework, as announced in the ECB's 2021 strategy review, remains an extremely complex and challenging task. Financial, monetary, and business cycles have different lengths. Monetary cycles are longer than business cycles. Also, there is no synchronized financial cycle across the euro area countries (Zsolt and Martins, 2021). That's why the ECB started with a two-pillar approach (economic and monetary analysis). Fully integrating the two pillars was seen as very problematic in the past, integrating three pillars into a general equilibrium framework will even be more complicated.

8. Concluding remarks

Europe embarked on the Economic and Monetary Union (EMU) without sufficiently safeguarding some of the essential conditions that must be to run a monetary union smoothly. The full consequences of this omission came to light during the unprecedented crises the ECB has faced since its inception. The singleness of the ECB's monetary policy was threatened by recurring problems in the transmission mechanism. The lack of harmonized supervision and with it of a supra-national supervisor, seriously hampered the solution of problems that had arisen in the banking sector and threatened financial stability. System risks did not appear sufficiently on the radar screen of policymakers due to underdeveloped macro-prudential policies and insufficient cooperation between the supervisors on the financial sector.

All these issues had to be addressed in a highly complex economic and institutional environment by a young central bank whose top priority is price stability. This priority is cast in Treaty stone and its precise definition is left to the Governing Council (GC). The original definition ("close to, but below 2 %) was maintained for about 20 years. At the core of the new definition is the message that 2 % is not a ceiling, that (temporary) deviations are allowed, and that the ECB is aiming at 2 % inflation over the medium term. A fierce symmetry discussion has been waged to weaken the price stability objective. Whether the formal change in 2021 in the definition is incremental or more fundamental depends entirely on the GC's uncertain future interpretation of its own new definition, in particular regarding the bandwidth around the inflation target and the timeframe ("medium term") within which price stability must be achieved. The pressure to weaken the inflation target will be great.

Mission creep threatens the priority the ECB should give to price stability. Mission creep is a step-by-step process, inspired by the best of intentions (climate, inequality, unemployment). Every step seems acceptable ("while maintaining price stability as its overriding priority"), but at the end of the journey one has arrived at the wrong address and undermined its independence. "A central bank in a democracy is not an all-purpose do-good agency" (Cochrane, 2020), but an institution with a deliberately very narrowly defined mandate. The more broadly this task is interpreted, the stronger the argument for ending independence.

When it comes to monetary policy the GC's view was the unusual external circumstances necessitated the use of non-conventional monetary policy instruments, including forward guidance (FG) and asset purchases.

FG has been part and parcel of the ECB's toolbox since 2013. There had been some (weak) forward guidance before. The use of strong FG, in uncertain circumstances, carries the risk of losing the right balance between the clarity of the message and the necessary flexibility that should be left to the central

bank. That balance was lost in the last months of 2021 and throughout the first half of 2022. From July 2022, the ECB completely changed tack and announced to make its monetary policy decisions "on a data-dependent basis- we will operate month by month and step by step". With this decision, the ECB is back to square one ("not pre-committing"; "relying on incoming data"). The lesson: be careful with FG. Credibility is easily lost, but hard to regain.

Asset purchases have been the ECB's most important non-conventional monetary policy instrument. The Eurosystem's asset purchases are subject to several Treaty conditions. These conditions have been legally tested time and again. I see them, in the politically and institutionally complex European environment, as part of the necessary checks and balances rather than unpleasant interference in the activities of the ECB.

The evolution of asset purchases shows that from initially addressing monetary transmission problems, they took on a much broader application after 2014. There has been endless debate about whether this is in accordance with the intent of the articles in the Treaty/Statute relating to the purchases of securities on the secondary market. I think the ECB has gone too far with QE, if not for legal reasons than for financial and monetary reasons. The huge financial losses that have now come to light raise serious questions about the size of the purchases deemed necessary, whether alternatives were not available, and whether the ECB has communicated with sufficient transparency about the coming losses.

QE is largely one-way (as the Japanese experience has shown). It is an inherently asymmetric instrument: buying assets is easier than selling them. Keeping these assets on the balance sheet until maturity (at amortized costs), which is the current policy, is to some extent an expression of this asymmetry. The accounting approach may have led both bankers and central banks to erroneous policies. Large-scale QE creates many undesirable side effects, amongst them serious distortions in many market segments and potentially huge financial losses for central banks. It should only be used – apart from dealing with short-lived temporary market disturbances in accordance with its traditional usage – in very exceptional circumstances, and then on a limited scale. Placing this instrument in a central bank's conventional toolbox to actively use it for broad monetary policy, is a recipe for trouble.

Triggered by the corona crisis, the ECB introduced in 2020/2021 a new instrument, PEPP. Initially this instrument was "sold" as a relatively modest, not necessarily fully utilized add-on to existing programmes. However, PEPP became stealthily the main component of the ECB's net purchases and reinvestment policy, not an add-on. In addition, PEPP became increasingly disconnected from the pandemic, which increased the legal vulnerability of this instrument.

Legally vulnerable seems also the new ant-fragmentation tool (TPI) that was approved by the GC in July 2022. In the euro area monetary transmission problems are a recurring phenomenon. But that is not enough argument to create a completely new anti-fragmentation tool. OMT is the appropriate (but by some governments disliked) instrument to address deep-seated problems. For incidental and temporary market disruptions a new instrument does not seem necessary. As with FG and PEPP, the decision-making with respect to TPI seems to have been a bit messy lately.

The same applies to monetary policy, at least in 2021 and the first half of 2022. In 2021 the ECB underestimated inflationary developments and the already built-up inflationary potential, with the serious consequence that its strategy review (published mid-year) was retrospective. This left the ECB behind other central banks when it became necessary to tighten monetary policy. The 2021 strategy came way too late and was outdated. The current strategy is said to be thoroughly reviewed in 2025, but this should be brought forward. Learning in time from what went wrong in the past, is part of a healthy growth process.

Much progress has been made in several important areas over the past 25 years. In particular, the framework for financial stability and supervision has been significantly strengthened. However, the integration of financial stability into the monetary policy framework still leaves room for further improvement. More attention should especially be paid to the ECB's own role in the build-up of potential financial stability problems.

A huge leap forward has also been made in the field of supervision. The very careful way in which this task is organized, prevents as much as possible conflicts of interest with monetary policy. However, the question remains whether the role of the Governing Council as the ultimate decision-making body, also in the field of micro-prudential supervision, should not be reconsidered.

Like other central banks the ECB had to navigate – especially since the corona crisis - in thick fog and the fog is sometimes thicker in Europe than elsewhere. Weaknesses in the design of the EMU and unforeseen economic developments have led the ECB to make a disproportionate contribution to necessary adjustment processes. It cannot continue to do so without jeopardizing its own mandate and without

violating the legal framework within it must operate. In addition to the completion of the banking union and the capital markets union, there is an urgent need to adjust prudential regulation with regard to investment in government bonds. These measures would reduce bank's home bias and make the financial system in general and the monetary union more resilient to shocks. However, the weakest point regarding the EMU remains insufficient control of public finances. At the start of EMU, 2 in 11 participants had a government debt of more than 100 %, in 2022 there were 7 in 20, including three large countries (Italy, France and Spain). Therefore, the vulnerability of the monetary union has increased. To avoid accidents in the future, the (coming) new EU Commission's budgetary rules must be strict enough and enforceable.

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IMI International Monetary Review

Openness, Financial Structure and Bank Risk: International Evidence

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By MA YONG AND YAO CHI *

Abstract

Using panel data from a large cross-country sample covering 97 countries over the period 1996–2017, we combine 2SLS procedure with system GMM estimation to study the relationship between openness, financial structure and bank risk. The main contribution of the paper is that we identified a new channel, i.e. the financial structure channel, through which financial openness reduces bank risk. In particular, we find that as financial openness increases, a country's financial system tends to be more market-based, and a more market-based financial system is associated with higher bank market power, better information sharing and more revenue diversification, all of which contribute to the reduction in bank risk. We also find that the effect of inflow restrictions on bank risk is more pronounced than that of outflow restrictions. These results highlight the importance of an appropriate design of a country's opening-up strategy to match the evolution of its financial structure to increase bank stability.

JEL Classification: F36, G21, G28
Keywords: Openness, Financial structure, Bank risk

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1. Introduction

The past three decades have witnessed a notable increase in openness in most economies (see Fig. 1), which was accompanied by an evolution of the financial system moving toward a more market-based financial structure (see Fig. 2). At the same time, the frequently happened incidents of banking crises, especially the 2008 global financial crisis, had reignited the thinking of the roles of financial opening-up and financial system evolution in bank risk. Moreover, as one can reasonably imagine, because financial openness and financial structure are both part of the entire picture of the financial system evolution, exploring the relationship between openness, financial structure and bank risk also involves the consideration of the endogenous relationship between financial openness and financial structure. For one thing, financial openness can foster the development of domestic stock market and banking system as well as influence the substitution or complementary relationship between banks and stock markets, and thus affect the evolution of financial structure (e.g., Levine & Zervos, 1998; Baltagi et al., 2009; Cheng, 2012). For another, the evolution of financial structure also affects bank performance such as profitability and instability (e.g., Demirgüç-Kunt & Huizinga, 2000; Stulz, 2001; Song & Thakor, 2010; Qin and Zhou, 2019).

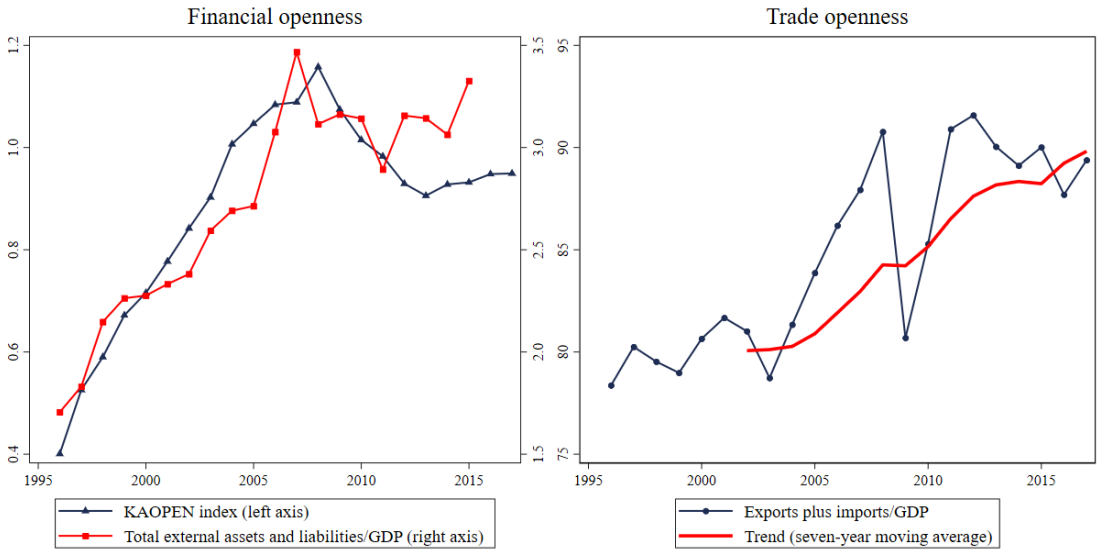

Fig. 1 The evolutions of financial openness and trade openness.

Notes: This figure presents the evolutions of financial openness and trade openness over the period 1996–2017, using data average of the 97 sample countries. The *KAOPEN* index is a *de jure* measure of financial openness with a larger value indicating a higher degree of financial openness. The ratio of total external assets and liabilities to GDP is a *de facto* measure of financial openness, also with a larger value indicating a higher degree of financial openness. Trade openness is measured by the percentage of exports plus imports to GDP (with a larger value indicating a higher degree of trade openness.), and the trend value is calculated as the seven-year moving average of trade openness.

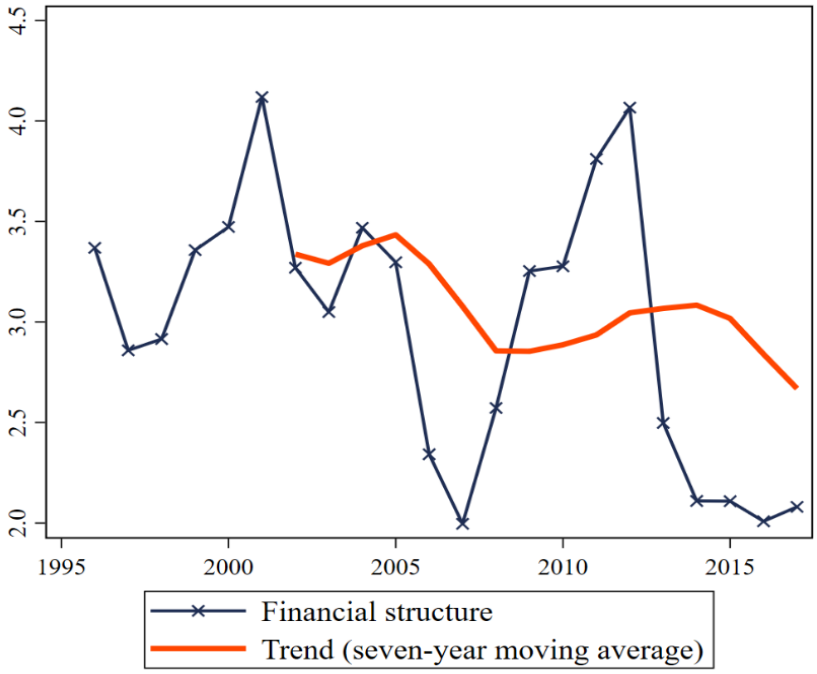

Fig. 2 The evolution of financial structure.
Notes: This figure presents the evolution of financial structure over the period 1996–2017, using data average of the 97 sample countries. The financial structure is measured by the ratio of private credit by deposit money banks to stock market capitalization, with a smaller value indicating a more market-based financial system. The trend is calculated as the seven-year moving average of financial structure.

Meanwhile, despite the extensive literature on the relationship between openness and bank stability, whether and how openness may affect bank stability is far from being conclusive up to the present, and the underlying channels are still waiting to be better understood. Up to the present, most studies focus predominantly on the "competition hypothesis" and the "diversification hypothesis" (e.g., Repullo, 2004; Gulamhussen et al., 2014; Cubillas & González, 2014; Berger et al., 2017). However, the contradictory findings in these studies indicate that these two channels cannot entirely explain how financial openness affects bank risk. More importantly, although financial openness can influence bank risk directly through these channels, it can also indirectly affect bank risk via the financial structure channel, as shown in Figure 3.

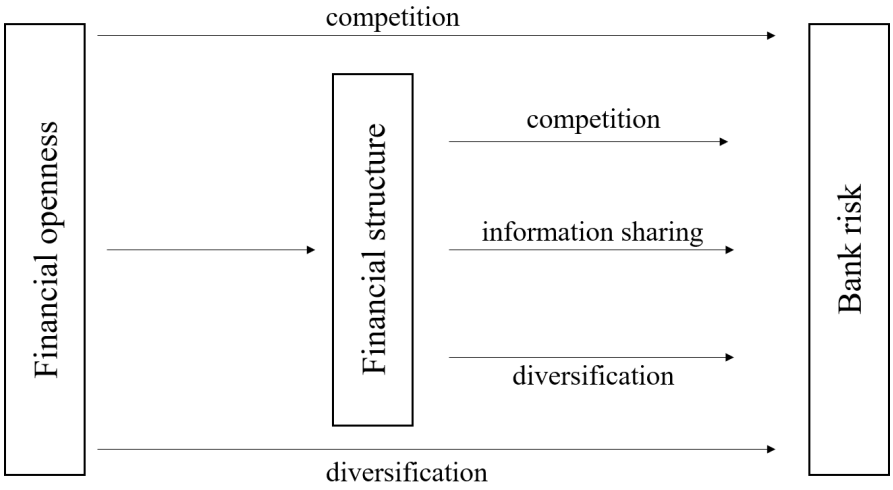

Fig. 3 The channels through which financial openness affects bank risk.
Notes: This figure provides an intuitive illustration for the underlying channels through which financial openness affects bank risk, in which we highlight a new role played by financial structure.

Having these considerations in mind, in this paper we aim to shed new light on the relationship between financial openness and bank risk by highlighting a new role played by financial structure. To do so, this paper adopts a new empirical strategy to study the effects of openness on bank risk, with a particular focus on the role of financial structure as a potential transmission channel. Based on robust results from a large panel dataset of 97 countries over the period 1996–2017, the main contributions of this paper can be summarized as follows:

First, to the best of our knowledge, this paper is the first to separate and identify the financial structure channel of openness on bank risk from other alternative channels. In particular, we set up a model of two simultaneous equations and combine 2SLS procedure with GMM estimation to examine this issue, which controls for the potential endogeneity problem arising from reverse causality between financial structure and bank risk as well as their potential simultaneous dependence on openness. We find robust evidences that while the overall effect of financial openness on bank stability is negative, financial openness can also reduce bank risk through its impact on financial structure.

Second, our paper also extends the literature by further examining the transmission channels through which financial structure affects bank risk. To do this, we conduct an ARDL model and employ Granger causality test to identify the potential transmission channels. The results show that: (1) a more market-based financial system is in general associated with higher bank market power in banking system, which in turn lead to an enhancement of bank stability; (2) a more market-based financial system is associated with better information sharing about companies, which alleviates information asymmetry and allows banks to monitor borrowers more easily and therefore improving bank stability by reducing adverse selection and moral hazard; (3) a more market-based financial system with a well-developed financial market provides more diversification opportunities, which allows banks to reduce risks by better diversifying their portfolios.

Third, our paper is perhaps among the few of its kind to explore the possible differences between inflow and outflow restrictions in the effect of financial openness on bank risk, especially the differences associated with the financial structure channel. In particular, we find that the effect of inflow restrictions on bank risk is more significant and quantitatively larger than that of outflow restrictions, no matter in terms of overall effect or the marginal effect associated with the financial structure channel.

The rest of the paper is structured as follows. Section 2 reviews the literature. Section 3 explains the research design and data. Section 4 reports and analyzes the empirical results. Section 5 concludes and provides some policy implications.

2. Literature review

A number of literatures has examined the impact of openness on financial stability both theoretically (Cordella & Yeyati, 2002; Daniel & Jones, 2007; Broner & Ventura, 2011; Bourgain et al., 2012) and empirically (Gulamhussen et al., 2014; Cubillas & González, 2014; Lee et al., 2016; Luo et al., 2016), but not reached a consensus. In general, there are two strands of literature explaining how openness may affect bank risk.

The supporting view is that opening to global goods and financial markets helps to reduce bank risk. This is because, the spillover of advanced techniques and expertise from foreign firms and financial institutions can lead to an improvement in efficiency as well as risk management capability of domestic banks and therefore enhance the soundness of domestic banking system (Lensink & Hermes, 2004; Wu et al., 2017). In addition, the so-called “diversification hypothesis” suggests that opening the financial market allows banks to reduce risk by diversifying their investment portfolios (Berger et al., 2017). As multinational firms are more integrated with global markets and thus less affected by domestic economic fluctuations (Wagner, 2012), they are less likely to default on bank loans. Consequently, the overall bank risk can be reduced in economies with higher trade and financial openness. Similar conclusions are also reached in Ashraf et al. (2017) and Bui & Bui (2020).

On the contrary, there are also studies arguing that higher openness is associated with greater bank risk. For example, the “competition-fragility” hypothesis suggests that opening goods and financial markets will increase bank competition, resulting in a shrink of market power as well as a decrease in profit margin and charter value (Hellmann et al., 2000; Repullo, 2004). This induces banks to lower credit standard and invest in more risky portfolios to make up for the profit losses. As a result, banks behave less prudently and the risk of banking system increases. Meanwhile, the reduction of restrictions in international capital movement during the process of financial openness allows banks to broaden their activities and participate in unfamiliar businesses related to foreign markets. However, the lack of sufficient expertise, as well as

more serious information asymmetries, would make banks more exposed to external shocks and risks (Kaminsky & Reinhart, 1999; Stiglitz, 2000; Fang et al., 2014; Ashraf et al., 2017).

From the empirical front, numerous researches provide evidence for the effect of openness on bank risk. For example, Anginer & Demirgüç-Kunt (2014) find that financial openness has a negative effect on banking stability, but this negative effect can be mitigated in a strong institutional environment. Similar results are also found in Ali & Iness (2020), who argue that macro-prudential policies can mitigate the negative effect of financial openness on bank stability. Gulamhussen et al. (2014) find robust evidences that internationalization diversification causes an increase in bank risk. Cubillas & González (2014) investigate the relationship between financial liberation and bank risk-taking in 83 countries, and find that financial liberalization increases bank risk-taking through promoting bank competition in developed countries but by expanding opportunities to invest in riskier portfolios in developing countries. Luo et al. (2016) provide evidence that financial openness can increase bank risk indirectly through the profit efficiency channel. In contrast, Ashraf et al. (2017) as well as Bui & Bui (2020) both provide evidence that trade openness helps to reduce bank risk via the diversification channel.

It should be noted that, despite the numerous studies on the effects of openness on bank risk, there are several major inadequacies in the existing literature. First, the results for whether and how openness affects bank risk is largely mixed and no consensus has been reached up to the present. Some researches hold the view that opening up to global goods or financial markets will reduce bank risk (Lensink & Hermes, 2004; Wu et al., 2017; Ashraf et al., 2017; Bui & Bui, 2020), while others suggest the opposite is true (Cubillas & González, 2014; Anginer & Demirgüç-Kunt, 2014; Luo et al., 2016; Ali & Iness, 2020). In light of this, more efforts are needed to verify the relationship between openness and bank risk.

Second, a deep understanding of the relationship between openness and bank risk requires identifying the associated channels through which openness affects bank risk. However, there are only two main channels that have been documented in the existing literature, i.e. the "competition-fragility hypothesis" (Hellmann et al., 2000; Repullo, 2004) and the "diversification hypothesis" (Berger et al., 2017), which arrive at very different conclusions about the effect of openness on bank stability. Moreover, the effect of openness on bank stability may also depend on financial system characteristics such as financial structure, as mentioned in the introduction section, which have not been discussed and fully understood in the existing literature.

To sum up, despite the enormous literature on both theoretical and empirical grounds traditionally assume that openness has an effect on bank stability, the openness-bank stability nexus is still open to debate and the underlying channels through which openness affects bank risk are still not very clear. Meanwhile, there is no study (to the best of our knowledge) up to now which has discussed the role played by financial structure in the link between openness and bank risk. In light of these considerations, this paper aims to revisit the relationship between openness and bank risk, with a particular focus on the role of financial structure as a transmission channel between openness and bank risk. These analyses will further enhance our understanding of the relationship between openness and bank risk as well as the differentiated effects associated with different transmission channels.

3. Methodology and data

3.1 Empirical strategy

As mentioned in the introduction section, considering the possibility that openness may affect financial structure and bank risk simultaneously and financial structure may be a potential channel through which openness affects bank risk, we combine 2SLS procedure with GMM estimation to investigate whether and how openness affect bank risk. This estimation methodology has the benefit of controlling for endogeneity problems arising from reverse causality between financial structure and bank risk as well as their potential simultaneous dependence on openness. The model of two simultaneous equations is as follows:

$$FS_{it} = \alpha_0 + \alpha_1 FS_{it-1} + \alpha_2 ZSCORE_{it} + \alpha_3 FO_{it} + \alpha_4 TO_{it} + \alpha_5 LEGOR_{it} + \alpha_6 CONTROLS_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (1)$$

$$ZSCORE_{it} = \beta_0 + \beta_1 ZSCORE_{it-1} + \beta_2 FS_{it} + \beta_3 FO_{it} + \beta_4 TO_{it} + \beta_5 DEPOSIT_{it} + \beta_6 CONTROLS_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (2)$$

where *i* and *t* denote country and year, respectively. *FS* denotes financial structure. *ZSCORE* is the proxy variable for bank risk. *FO* and *TO* refer to financial openness and trade openness, respectively. To implement the method of 2SLS procedure with GMM estimation, we include an instrumental variable in each equation: legal origin (*LEGOR*) of country *i* in year *t* for Eq. (1) and deposit insurance (*DEPOSIT*) for Eq. (2). In addition, we also control for bank-specific factors and macroeconomic indicators which may

influence bank risk or financial structure. Following the previous studies (e.g., Camara et al., 2013; Cubillas & González, 2014; Köhler, 2015; Luo et al., 2016), we include overhead costs to total assets (*OVERHEAD*), noninterest income to total income (*NI*), net interest margin (*NIM*), and cost to income ratio (*CTI*) as bank-specific controls and GDP growth rate (*GDPR*) as well as inflation rate (*INFLATION*) as macroeconomic controls. At last, μ_i and λ_t are the unobservable country- and time-specific effects, respectively; ε_{it} is the error term.

We use 2SLS procedure with GMM to estimate our model. Specifically, in the first-stage regressions, we apply two-step system GMM to estimate Eqs. (1) and (2) in which observed values of *FS* and *ZSCORE* are used as the dependent variables so as to calculate the predicted values of *FS* and *ZSCORE*. Then in the estimation of the second-stage regressions, the fitted values of these two variables (i.e. *FS* and *ZSCORE)* are used as explanatory variables to estimate Eqs. (1) and (2), also by using two-step system GMM. Following this procedure, if financial openness (*FO*) or trade openness (*TO*) does increase (or decrease) financial structure (*FS*, the relative importance of banking sector to stock market), a significantly positive (or negative) coefficient for α_3 or α_4 is expected. More importantly, this procedure allows us to separate the different effects of openness on bank risk. Taking financial openness for example, β_2 in the *ZSCORE* equation captures the effect of financial openness on bank risk through its impact on financial structure (the "financial structure channel" hereafter), while β_3 refers to the effect of financial openness on bank risk through other potential channels other than the financial structure channel.

In the estimation, the GMM method developed by Arellano & Bond (1991) and Blundell & Bond (1998) helps to address several econometric issues of particular concerns. First, by including a lagged-dependent-variable in the dynamic model estimated by GMM, the likely autoregressive process in the data of dependent variable can be captured (i.e., the dynamic nature of financial structure and bank risk). Second, by taking first differences of variables, GMM allows for controlling the possibility of bias caused by time-invariant or country-specific effect. Third, by using lags of explanatory variables as instruments, GMM can effectively address the potential endogeneity of the explanatory variables in the regressions. However, numerous instruments are frequently encountered with over-identification problems (Roodman, 2009). To overcome this problem, Hansen test is performed to confirm the overall validity of instruments, under which not rejecting the null hypothesis means the instruments are valid. Meanwhile, to check for the potential misspecification of the model, we also perform AR(2) test to ensure that the first differenced error term is not second-order serially correlated.

As in Cubillas & González (2014), besides the lagged value of the dependent variable, we additionally include an instrumental variable in each equation, which is chosen based on both economic and statistical arguments. Specifically, we include legal origin (*LEGOR*) as instrument in Eq. (1), because legal origin is an important determinant of a county's financial structure, as suggested in the theory of "Law and Finance" (La Porta et al., 1997, 1998). As for Eq. (2), we include a dummy variable of explicit deposit insurance scheme as instrument, since there are evidences that deposit insurance may induce greater bank risk by reducing the incentive of depositors to monitor bank activities (Anginer et al., 2014). Meanwhile, we also use the first-stage Wald test and Hansen test to ensure the relevance (correlation with the endogenous variable) and validity (orthogonality to the residual) of the instruments.

3.2 Data and variables

3.2.1 Bank risk

We use Z-score as our main measure of bank risk, which is commonly used in the literature as a measure of bank risk (e.g., Cubillas & González, 2014; Luo et al., 2016; Bui & Bui, 2020). Z-score reflects bank's insolvency risk. Since we collect the Z-score variable from Global Financial Development Database, we follow the World Bank's definition of Z-score as follows:

$$Z\text{-}score = \frac{ROA+E/A}{sd(ROA)} \quad (3)$$

where *ROA* is the rate of return on assets, *E/A* is the equity to asset ratio, and *sd*(*ROA*) is the standard deviation of *ROA*. Z-score captures the default probability of a country's banking system, with a higher Z-score indicating lower bank risk. Meanwhile, because Z-score is highly skewed, we follow the literature (e.g., Houston et al., 2010; Bui & Bui, 2020) by using the natural logarithm of Z-score (which is normally distributed) as the dependent variable. For brevity, we use the label "*ZSCORE*" in referring to this variable in the remainder of the paper.

On top of that, as part of robustness check, we also employ the volatility of ROA as an alternative measure of bank risk, as in Laeven & Levine (2009) and Houston et al. (2010), where the volatility is measured as the standard deviation of ROA (*SD_ROA*) calculated over a 3-year moving window

(including the one previous year and the one subsequent year). Quite straightforwardly, a higher volatility of ROA is positively associated with bank risk.

3.2.2 Trade and financial openness

As mentioned earlier, as one of our main variables of interest, openness is measured in two aspects: trade openness and financial openness. The measure of trade openness is quite standard. As suggested by Kim et al. (2010), the total volume of imports and exports to GDP ratio (i.e. $trade\ openness = \frac{imports+exports}{GDP}$) provides a straightforward measure of trade openness. Such a measure is also employed in numerous researches examining the impact of trade openness on bank risk (e.g., Ashraf et al., 2017; Bui & Bui, 2020). Therefore, in our study trade openness (*TO*) is also measured by this ratio.

As for financial openness, there are two main approaches to measure financial openness, namely *de jure* measure and *de facto* measure. For robustness, in this paper, financial openness is measured by several proxies, including both *de jure* and *de facto* indicators. Specifically, the *de jure* financial openness indicator that we use is the Chinn-Ito index (*KAOPEN*), which measures the degree of capital account openness across countries and is constructed and updated by Chinn & Ito (2006). A larger value of the *KAOPEN* index indicates a higher degree of financial openness.

Our second proxy for financial openness is the *de facto* indicator proposed by Lane & Milesi-Ferretti (2007) and later updated in Lane & Milesi-Ferretti (2017), which is also widely used in studies related to financial openness (e.g., Kose et al., 2009; Bui & Bui, 2020). Flowing Lane & Milesi-Ferretti (2007, 2017), our second proxy for financial openness (*FI*) is given by:

$$FI_{it} = \frac{FA_{it}+FL_{it}}{GDP_{it}} \tag{4}$$

where *FA* and *FL* denote the stock of external assets and liabilities respectively, including foreign direct investments, portfolio equity, foreign debt and financial derivatives, plus foreign exchange reserves other than gold holding on the asset side. Moreover, as in Lane & Milesi-Ferretti (2008) and Kose et al. (2009), we also employ the ratio of total external liabilities to GDP and the ratio of total external assets to GDP as two alternative measures of financial openness in the robustness checks.

In addition to the above two widely used indicators, we also use the Fernández-Klein-Rebucci-Schindler-Uribe (FKRSU, hereafter) index proposed by Schindler (2009) and later updated by Fernández et al. (2016) as alternative proxies for financial openness. The FKRSU index is also constructed based on the information of the IMF's AREAER. But unlike the Chinn-Ito index, the FKRSU index not only sum up the overall capital control restrictions but also provide disaggregation of capital control restrictions on both capital inflows (*KAI*) and capital outflows (*KAO*), which allows us to explore the potential differences in the impact of financial openness on bank risk with regard to inflow and outflow restrictions.

3.2.3 Financial structure

Following Beck & Levine (2002) and Levine (2002), we use a continuous variable to measure the relative importance of bank-based finance over market-based finance, which can be defined as:

$$FS = \frac{Private\ credit\ by\ deposit\ money\ banks}{Stock\ market\ capitalization} \tag{5}$$

where stock market capitalization refers to the total value of all listed shares in a country's stock market. This measure of financial structure captures the relative size of banking system to stock market and is widely used in related researches (e.g., Tan et al., 2015; Ye et al., 2021). According to Eq. (5), a higher value of *FS* indicates a more bank-based financial system.

3.2.4 Control variables

As usual, we also include a set of control variables including both bank-specific factors and macroeconomic indicators. In line with the literature related to the determinants of bank risk (e.g., Camara et al., 2013; Cubillas & González, 2014; Köhler, 2015; Luo et al., 2016), we include overhead costs to total assets (*OVERHEAD*), net interest margin (*NIM*), noninterest income to total income (*NI*) and cost to income ratio (*CTI*) as bank-specific control variables. For macroeconomic indicators, we control for GDP growth rate (*GDPR*) and inflation rate (*INFLATION*), as in Demirgüç-Kunt & Huizinga (2010), Mirzaei et al. (2013) and Ali & Iness (2020). A more detailed description of the regression variables is presented in Table A1 in the Appendix.

3.2.5 Data

We construct our sample by first considering all the economies in World Bank's Global Financial Development Database, and then exclude: firstly country-year observations with no information on either of the two main proxies for financial openness (*KAOPEN* and *FI*) mentioned above; secondly country-year

observations for which at least one of the bank-specific variables is missing; thirdly country-year observations with the lack of data on country-specific variables. After that, we trim all variables except dummy variables (*LEGOR*, *DEPOSIT*) or variables based on the binary dummy variables (*KAOPEN*, *KAI*, *KAO*) at the 1% and 99% quantile to address the issue of extreme values or outliers. This process leads to an unbalanced panel data covering 97 countries over the period 1996–2017.[1]

Several main data sources are used. The raw data for calculating financial structure and bank-specific variables are collected from the World Bank's Global Financial Development Database. Data for trade openness and country-specific controls are collected from the World Bank's World Development Indicators. The proxies for financial openness are collected from several major databases as mentioned before. Information for sample countries' deposit insurance scheme and legal origin are taken from Demirgüç-Kunt et al. (2014) and La Porta et al. (1997, 1998), respectively. Table 1 reports the descriptive statistics for all variables.

Table 1 Summary statistics of variables.

Variable	Obs.	Mean	Std. Dev.	Min	Max
ZSCORE	1456	2.4897	0.5945	0.4725	3.7500
FS	1456	2.8355	5.7640	0.1650	77.5123
KAOPEN	1456	0.9161	1.4495	-1.9203	2.3336
FI	1328	2.6282	3.3984	0.3861	27.9376
KAI	1282	0.3394	0.3125	0.0000	1.0000
KAO	1282	0.3849	0.3812	0.0000	1.0000
TO	1456	84.6406	45.5447	22.7722	336.4848
GDPR	1456	3.7192	3.0370	-7.3594	13.7000
INFLATION	1456	4.8504	5.1122	-1.3528	45.8038
OVERHEAD	1456	3.1479	2.1566	0.4101	14.5191
NI	1456	36.4067	11.1426	10.8827	78.0822
NIM	1456	3.9864	2.5287	0.5355	16.5020
CTI	1456	56.7543	11.7173	25.6984	94.3387
LEGOR	1456	0.3221	0.4674	0.0000	1.0000
DEPOSIT	1456	0.6786	0.4672	0.0000	1.0000

Notes: This table provides the summary statistics of the variables used in this paper. The sample consists of 97 countries over the period 1996–2017. *ZSCORE* is the nature logarithm of Z-score, as defined in Section 3.2.1. *FS* is the proxy for financial structure calculated as the ratio of private credit by deposit money banks to stock market capitalization. *KAOPEN*, *FI*, *KAI*, *KAO* are alternative proxies for financial openness. *KAOPEN* is the Chinn-Ito index. *FI* is the ratio of total external assets and liabilities to GDP. *KAI* and *KAO* are indices in the FKRSU index, which measure control restrictions on capital inflow and outflow, respectively. *GDPR* is GDP growth rate. *INFLATION* is inflation rate. *OVERHEAD* is overhead costs as a percentage of total assets. *NI* is noninterest income as a percentage of total bank income. *NIM* is net interest margin. *CTI* is cost to income ratio. *LEGOR* is a dummy variable for legal origin which equals 1 if the law system of a country is common law and 0 otherwise. *DEPOSIT* is a dummy variable that equals 1 if a country has explicit deposit insurance scheme and 0 otherwise. The data sources are reported in Table A1 in the Appendix.

4. Empirical results

4.1 Baseline results

In this section, we empirically analyze the relationship between openness, financial structure and bank risk. The 2SLS regression results for the two simultaneous equations specified in models (1) and (2) are reported in Table 2. As described above, the twostep system GMM estimation is applied in both the first and second stages of 2SLS procedure.

Columns (1) and (2) report the results for the financial structure equation using the two alternative proxies for financial openness, in which the predicted value of *ZSCORE* obtained from the first stage by regressing *ZSCORE* on all explanatory variables in Eq. (2) are used. As the results show, the coefficients for both of the two proxies for financial openness (*KAOPEN* and *FI*) are estimated to be significantly

1 The sample countries included are listed in Table A2 in the Appendix.

negative. This means that, a country's financial system would become more market-based (i.e., the relative importance of banks to stock markets decreases) as financial openness increases. At the same time, the impact of financial openness on financial structure is also economically important. Taking the estimation in Column (1) for example, a one-standard deviation increase in the index of *KAOPEN* will cause a decrease in *FS* of 19.75% of its standard deviation. Such effect of financial openness on financial structure can be partially attributed the fact that, financial system is more likely to be bank-dominated in its infancy, but bank lending tends to be diminished with the increasing financial market sophistication and development, and financial openness will accelerate this process as liberalizing capital control can bring spillover effect and foster the development of stock market by enhancing the liquidity and improving the size of the stock market (Boot & Thakor, 1997; Levine & Zervos, 1998; Levine, 2001; Chinn & Ito, 2006). However, although financial opening up can promote the development of stock market and banking sector simultaneously, it may also strengthen the substitution effect between credit and equity markets (Baltagi et al., 2009; Cheng, 2012). As a result, the relative importance of stock market to bank sector tends to be improved at a higher level of financial openness.

However, the coefficients for trade openness are insignificant in both Columns (1) and (2), indicating that trade openness has no obvious impact on financial structure in our study. As for the macroeconomic controls, the significantly negative coefficient for *GDPR* in Column (1) indicates that the relative importance of banks to stock markets decreases with a higher GDP growth rate. Also, the expected negative and significant coefficient for *LEGOR* in Column (1) confirms that common law countries are more likely to breed a more market-based financial system, consistent with La Porta et al. (1997, 1998).

Columns (3) and (4) report the results for Eq. (2), in which the predicted value of *FS* obtained from the first stage by regressing *FS* on all explanatory variables in Eq. (1) are used. As discussed in Section 3, in this approach, the coefficient for *FS* captures how financial openness affects bank risk through its impact on financial structure, while the coefficient for financial openness captures the effect of financial openness on bank risk through all other channels other than the financial structure channel. As shown in Columns (3) and (4), the coefficients for *FS* are estimated to be significantly negative in both regressions, indicating that a decrease in financial structure (corresponding to a reduction in the relative importance of banks to stock markets) on average reduces bank risk. One possible explanation is that banks face tougher competition in a more bank-based financial system (Demirgüç-Kunt & Huizinga, 2000) while the stock market development could enhance bank market power (Samarasinghe & Uylangco, 2021), and as the "competition-fragility" hypothesis suggests, tougher competition reduces banks' charter value and increases banks' incentive to undertake higher risk to compensate for the lost revenue induced by more competition (Keeley, 1990; Hellmann et al., 2000; Repullo, 2004). As a result, banks behave less prudently and take on greater risks. On the contrary, a more market-based financial system with well-developed stock market would provide more diversification opportunities and better cross-sectional risk sharing (Song & Thakor, 2010; Vithessonthi, 2014), which allows banks to reduce risks by diversifying their portfolios (Berger et al., 2017). In addition, more and better information on publicly traded companies is available in a more market-based financial system, which helps to alleviate the information asymmetry and enables banks to better evaluate credit risks (Beck et al., 2013, Mirzaei et al., 2013).

Turning to the impact of openness, our two proxies for financial openness both have negative and statistically significant coefficients while the coefficients for trade openness are insignificant after controlling for financial structure in Columns (3) and (4). This indicates that, while trade openness shows no significant influence on bank risk, financial openness can also increase bank risk through alternative channels (e.g., the competition channel as discussed in Section 2) other than the financial structure channel. In short, while we identify the financial structure channel indeed exists in the relationship between financial openness and bank risk, it is not the only channel through which financial openness affects bank risk.

In addition, the impact of financial openness on bank risk is also economically important. Taking *KAOPEN* for example, as shown in the path analysis in Figure 4, a one-standard deviation increase in the *KAOPEN* index will cause a decrease of 20.16% of the standard deviation of *ZSCORE* through all potential channels other than the financial structure channel. Furthermore, the result in Figure 4 also suggests that a one-standard deviation increase in the *KAOPEN* index will lead to an increase of 4.65% of the standard deviation of *ZSCORE* through the financial structure channel. This means that, the positive effect of financial openness on bank stability through the financial structure channel can offset 23.07% of the negative effects through all other potential channels. When financial openness is measured by *FI*, such

offsetting effect is even greater: the positive effect of financial openness on bank stability through the financial structure channel can offset 33.56% of the negative effects through all other potential channels.

With regard to control variables, the negative and statistically significant coefficients for *GDPR* in Columns (3) and (4) indicate that banks have incentives to behave imprudently in countries or in periods with higher economic growth, which is consistent with Cubillas & González (2014) and Ali & Iness (2020). The positive and statistically significant coefficient for *NI* in Column (3) indicates that banks with a higher ratio of noninterest income to total income tend to behave more prudently, which is in line with "diversification-stability" hypothesis. The coefficient for *NIM* is negative but only statistically significant in Column (4), suggesting that banks with higher net interest margin are likely to behave less prudently. The coefficient for *CTI* is negative and statistically significant in Column (4), which indicates that a higher level of cost to income ratio is associated with lower bank stability. As *CTI* is negatively related to bank efficiency, this result indicates that less efficient banks are more likely to take on higher risk to offset the decreasing return incurred by higher bank competition or tougher capital regulation.

At last, the coefficients for the lagged dependent variable ($FS_{i,t-1}$ in the first two columns and $ZSCORE_{i,t-1}$ in the last two columns) are positive and statistically significant in all regressions, suggesting that financial structure and bank risk both exhibit persistence and thus supporting for the reasonability of using a partial adjustment model to explain the evolution of financial structure and bank risk. Also, from the model tests at the bottom of Table 2, the Wald test suggests that the instruments used are jointly significant. Meanwhile, both Hansen test and AR (2) test do not reject their null hypotheses, indicating that the instruments used in our regressions are valid and there are no second-order autocorrelations in the estimation.

Table 2 Openness, financial structure and bank risk.

	(1)	(2)	(3)	(4)
	FS	*FS*	*ZSCORE*	*ZSCORE*
L.FS	0.5739***	0.4548***		
	(0.0953)	(0.1373)		
L.ZSCORE			0.6177***	0.4378**
			(0.1517)	(0.1715)
ZSCORE	-0.1367	-0.1298		
	(0.8973)	(1.5664)		
FS			-0.0243**	-0.0242*
			(0.0121)	(0.0143)
KAOPEN	-0.7853**		-0.0827**	
	(0.3833)		(0.0381)	
FI		-0.2762**		-0.0199**
		(0.1336)		(0.0093)
TO	0.0089	0.0006	0.0027	-0.0003
	(0.0076)	(0.0126)	(0.0023)	(0.0018)
LEGOR	-1.0243*	-0.2017		
	(0.5882)	(0.4333)		
DEPOSIT			-0.0118	-0.1301*
			(0.0803)	(0.0787)
GDPR	-0.1041**	-0.0698	-0.0142*	-0.0158*
	(0.0475)	(0.0427)	(0.0079)	(0.0081)
INFLATION	-0.0244	0.0256	-0.0010	-0.0064
	(0.0448)	(0.0406)	(0.0052)	(0.0050)
OVERHEAD	-0.0354	0.0832	0.0048	0.0831*
	(0.4350)	(0.5468)	(0.0635)	(0.0504)
NI	0.0049	0.0274	0.0093**	0.0050
	(0.0248)	(0.0308)	(0.0043)	(0.0049)
NIM	0.0936	-0.1727	-0.0143	-0.0625*
	(0.2620)	(0.4585)	(0.0424)	(0.0357)
CTI	0.0020	-0.0445	-0.0082	-0.0105**
	(0.0413)	(0.0575)	(0.0081)	(0.0048)
Year	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes

AR (1) *p*-value	0.6213	0.7255	0.0019	0.0056
AR (2) *p*-value	0.9892	0.7771	0.8871	0.5628
Hansen test *p*-value	0.5303	0.7152	0.3861	0.7044
First stage Wald statistic	720.135***	273.812***	357.498***	360.268***
Countries	97	97	97	97
Observations	1456	1328	1456	1328

Notes: The dependent variable in Columns (1) and (2) is financial structure (*FS*). The dependent variable in Columns (3) and (4) is *ZSCORE*, which is the natural logarithm of Z-score. As for explanatory variables, we include one lag of the dependent variables *(FS_{t-1}* and *$ZSCORE_{t-1}$*, respectively) and the predicted value of *ZSCORE* (*FS*) obtained in the first stage when *ZSCORE* (*FS*) is the dependent variable. *KAOPEN* and *FI* refer to *de jure* and *de facto* measures of financial openness, respectively. *TO* is trade openness. These variables are defined in Table A1 in the Appendix. All models are estimated by combining 2SLS procedure with system GMM estimation. *L* is an abbreviation to denote the first lag of the respective variables. GMM estimates for variables with standard errors (in parenthesis) using Windmeijer (2005) finite-sample robust standard error correction are reported. All estimations control for country- and time-specific effects, though not reported. The sample size of estimations in Columns (2) and (4) is curtailed due to the availability of data for calculating *FI*. Hansen tests the null hypothesis of instrument validity and AR(2) tests the null hypothesis of the absence of second-order autocorrelation. ***, **, * indicate statistical significance at 1%, 5%, 10% level, respectively.

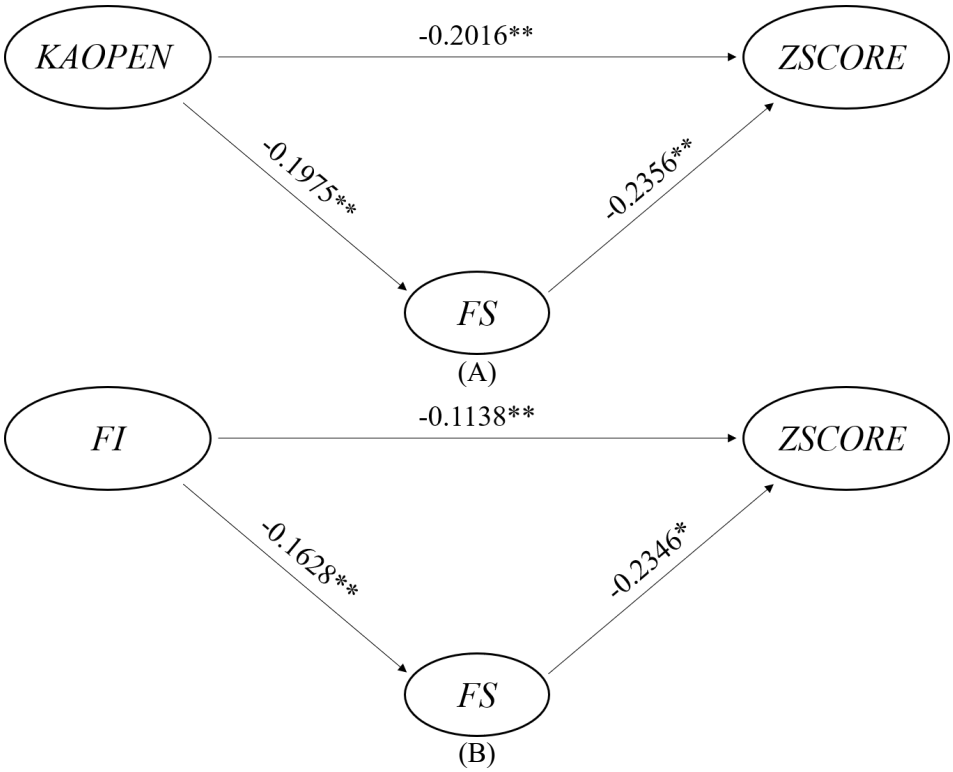

Fig. 4 Path analysis.

Notes: This figure presents a valid demonstrable path of association between financial openness, financial structure, and bank risk. Standardized beta coefficients are shown above the arrows, which are calculated based on the results in Table 2. *ZSCORE* is the nature logarithm of Z-score. *FS* is the proxy for financial structure measured by the ratio of private credit by deposit money banks to stock market capitalization. *KAOPEN* and *FI* refer to de jure and de facto measures of financial openness, respectively. ***, **, * indicate statistical significance at 1%, 5%, 10% level, respectively.

4.2 Inflow restrictions versus outflow restrictions

An interesting issue related to the impact of financial openness on bank risk is whether such impact differs with respect to inflow restrictions and outflow restrictions. To do this, we replace financial

openness with separate inflow and outflow measures and re-estimate the regressions. Table 3 reports the results with inflow restrictions (*KAI*) and outflow restrictions (*KAO*) as measures of financial openness.

First of all, the positive and statistically significant coefficients for *KAI* and *KAO* in Eq. (1) as well as the negative and statistically significant coefficients for financial structure (*FS*) in Eq. (2) indicate that higher financial openness would reduce bank risk as the financial system becomes more market-based. This can be seen as additional evidence for the robustness of our baseline results.

As for the differences that we are more interested in, the result gives a more significant and quantitatively larger estimated coefficient for *KAI* in Column (1) than that for *KAO* in Column (2), implying that inflow restriction has a more pronounced effect on financial structure. Note also that the coefficient for predicted *FS* (derived from the first stage regression of Eq. (1) with *KAI* included) in Column (3) is also larger in magnitude and more significant as compared to that for predicted *FS* (derived from the first stage regression of Eq. (1) with *KAO* included) in Column (4). This means that the financial structure channel of inflow restrictions in the relationship between financial openness and bank risk is more pronounced than that of outflow restrictions. It can be explained that, on the one hand, capital inflow is more close to the notion of opening to international capital that is associated with advanced techniques and other spillovers (Kose et al., 2009), which provide advanced experience as well as pressures to improve the domestic financial market such as enriching securities traded and enhancing institutional quality, therefore boosting the development of domestic financial market. On the other hand, inflow restrictions are more effective in determining the movement of capital flows (Pasricha et al., 2018) and thus liberalizing restrictions on capital inflows would lead to a larger change in domestic financial structure caused by the capital flows. Also, while the liberalization of capital inflows can induce a stronger demand for assets in domestic markets (which improves liquidity and promotes the growth of the market), the liberalization of capital outflows may lead to a substitution between assets in domestic and external markets. As a result, compared to outflow restrictions, inflow restrictions exhibit a more pronounced effect on bank risk via the financial structure channel.

In addition, the quantitatively larger coefficient for *KAI* in Column (3) as compared to that for *KAO* in Column (4) also indicates that the positive effect of inflow restrictions on bank stability through other potential channels is more pronounced than that of outflow restrictions. One possible explanation for this result is that inflow restrictions are more related to "competition-fragility" effect: the liberalization of capital inflows increases bank competition in domestic financial market as it offers an alternative source for corporate financing with a competitively low interest, which induces banks to invest more in risky portfolios to compensate for decreasing profit margins, whilst outflow restrictions are more closely related to the "diversification-stability" effect: since less outflow restrictions would provide banks with easier access into international financial markets and thus more opportunities to reduce risk by diversifying their investment portfolios.

Table 3 Openness, financial structure and bank risk: inflow vs. outflow restrictions.

	(1) *FS*	(2) *FS*	(3) *ZSCORE*	(4) *ZSCORE*
L.FS	0.5780***	0.3316**		
	(0.2077)	(0.1399)		
L.ZSCORE			0.4100***	0.3250**
			(0.1374)	(0.1520)
ZSCORE	-1.3369	-1.5219*		
	(0.9468)	(0.9028)		
FS			-0.1269***	-0.1173*
			(0.0460)	(0.0664)
KAI	4.5465**		0.7369*	
	(1.9271)		(0.4130)	
KAO		4.2464**		0.6225*
		(2.1050)		(0.3742)
TO	0.0075	0.0033	0.0009	0.0037*
	(0.0086)	(0.0275)	(0.0012)	(0.0021)
LEGOR	-1.4474*	-0.7443		
	(0.8231)	(0.6026)		
DEPOSIT			-0.0251	-0.0053
			(0.0943)	(0.1299)

GDPR	-0.0453	-0.1274	-0.0077	-0.0187
	(0.0730)	(0.0871)	(0.0128)	(0.0128)
INFLATION	0.0112	-0.0144	0.0063	0.0152*
	(0.0526)	(0.0541)	(0.0061)	(0.0090)
OVERHEAD	0.5491	0.1478	0.0172	0.0144
	(0.5263)	(0.4153)	(0.0479)	(0.0562)
NI	-0.0784*	-0.0191	0.0073**	-0.0029
	(0.0409)	(0.0237)	(0.0036)	(0.0043)
NIM	-0.2906	-0.1805	-0.0072	0.0194
	(0.3523)	(0.3376)	(0.0316)	(0.0447)
CTI	-0.0398	-0.0341	-0.0138**	-0.0032
	(0.0626)	(0.0297)	(0.0057)	(0.0065)
Year	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes
AR (1) *p*-value	0.3994	0.7451	0.0114	0.0239
AR (2) *p*-value	0.3827	0.2725	0.9468	0.9601
Hansen test *p*-value	0.9497	0.8913	0.9987	0.8952
First stage Wald statistic	212.2703***	316.2987***	105.0982***	324.3964***
Countries	83	83	83	83
Observations	1282	1282	1282	1282

Notes: The dependent variable in Columns (1) and (2) is financial structure (*FS*). The dependent variable in Columns (3) and (4) is *ZSCORE*, which is the natural logarithm of Z-score. As for explanatory variables, we include one lag of the dependent variables *(FS_{t-1}* and *$ZSCORE_{t-1}$*, respectively) and the predicted value of *ZSCORE* (*FS*) obtained in the first stage when *ZSCORE* (*FS*) is the dependent variable. *KAI* measures the degree of capital inflow restrictions. *KAO* measures the degree of capital outflow restrictions. *TO* is trade openness. These variables are defined in Table A1 in the Appendix. All models are estimated by combining 2SLS procedure with system GMM estimation. *L* is an abbreviation to denote the first lag of the respective variables. GMM estimates for variables with standard errors (in parenthesis) using Windmeijer (2005) finite-sample robust standard error correction are reported. All estimations control for country- and time-specific effects, though not reported. Hansen tests the null hypothesis of instrument validity and AR(2) tests the null hypothesis of the absence of second-order autocorrelation. ***, **, * indicate statistical significance at 1%, 5%, 10% level, respectively.

4.3 Transmission channels

After the financial structure channel is identified as a new channel through which financial openness affects bank risk, it would be a worthwhile exercise to further discuss the potential transmission channels associated with this relationship. To do this, we explore the roles of competition, information sharing and revenue diversification in the relationship between financial structure and bank risk. It is worth noting that, as the direct influence of financial openness on bank risk via competition and diversification channels has already been discussed in the previous literature (e.g., Repullo, 2004; Gulamhussen et al., 2014; Cubillas & González, 2014; Berger et al., 2017), here we mainly focus on the indirect influence via the financial structure channel. Figure 3 provides a more intuitive illustration for the differences regarding the underlying channels through which financial openness can affect bank risk, in which we highlight a new role played by financial structure.

In order to conduct empirical analysis, we construct an autoregressive distributed lag (ARDL) system to conduct Granger-causality tests among the variables of interest. Specifically, following Casu & Girardone (2009), Fiordelisi et al. (2011) and Luo et al. (2016), we estimate a system of two simultaneously equations of ARDL model by using dynamic panel GMM estimations:

$$TC_{it} = f_1\left(TC_{i,lag}, ZSCORE_{i,lag}, FS_{i,lag}\right) + \alpha_0 + \mu_i + \lambda_t + \varepsilon_{it} \quad (6)$$

$$ZSCORE_{it} = f_2\left(ZSCORE_{i,lag}, TC_{i,lag}, FS_{i,lag}\right) + \alpha_0 + \mu_i + \lambda_t + \varepsilon_{it} \quad (7)$$

where *TC* refers to specific variables for the several potential transmission channels (*LERNER*, *INFO* and *NI*). *ZSCORE* denotes the logarithm of Z-score and *FS* denotes financial structure. α_0 is the intercept, λ_t represents time effect, μ_i represents country-specific effect, and ε_{it} is the error term.

Econometrically, Eq. (6) tests whether changes in financial structure precede variations in *TC* while Eq. (7) tests whether changes in *TC* precede variations in bank risk. For example, to investigate the effect of

financial structure on bank risk via the competition channel, we can use the proxy for bank's competition *LERNER* as the dependent variable *TC* in Eqs. (6) and (7). Moreover, using GMM to estimate the above system of two simultaneously equations allows us to account for potential endogeneity or simultaneity in the dynamics of bank competition, information sharing, revenue diversification and bank risk, which may be jointly influenced by financial structure. As in Casu & Girardone (2009), Fiordelisi et al. (2011) and Luo et al. (2016), we include two lags for the variables of interest and estimate an AR(2) process. As for the Granger causality analysis, we use a Wald test with the null hypothesis that "the two lags of the causal variable *X* are jointly equal to zero" to test whether *X* is the Granger cause of *Y*, where the sum of the coefficients for the two lagged causal variable *X* represents the "total effect".

Table 4 reports the results. The first two columns analyze whether financial structure affects bank risk through the competition channel, where the Lerner index (*LERNER*) is used as the proxy for bank market power to replace *TC* in the model. From Column (1) in Table 4, we can see that the total effect of financial structure on bank market power is negative and statistically significant, suggesting that a decrease in financial structure (corresponding to a more market-based financial system) would lead to an enhancement of bank market power. On the one hand, stock market development expands banks' lending scope as stock market development reduces banks' cost of equity capital and further opens up segments of the credit market that were previously inaccessible to the banks (Song & Thakor, 2010). On the other hand, banks operating in countries with developed stock markets can receive greater benefits from enhancements in aggregate stock markets since well-developed markets are better positioned to assist bank business through activities such as facilitating banks' monitoring and screening processes and providing a platform to trade securitized instruments (Samarasinghe & Uylangco, 2021). Meanwhile, the results in Column (2) shows that the total effect of *LERNER* on *ZSCORE* is positive and statistically significant, implying that greater bank competition leads to ("Granger causes") lower bank stability, in line with the "competition-fragile" hypothesis. Therefore, the results in Columns (1) and (2) suggest that financial structure can affect bank risk via the bank competition channel.

Turning to the information sharing channel, we use the depth of credit information (*INFO*) to capture the differences in information sharing across countries and replace *TC* by *INFO* in the model for estimation. The data for *INFO* are taken from the World Bank "Doing Business" dataset. As shown in Column (3) of Table 4, the negative and statistically significant coefficient for the total effect of *FS* on *INFO* indicates that a more market-based financial system is associated with more and better information about companies. Meanwhile, the positive and statistically significant coefficient for the total effect of *INFO* on *ZSCORE* in Column (4) indicates that less information asymmetry alleviated by information sharing would benefit bank's stability. This means that, the information sharing channel through which financial structure affect bank risk is evidenced. Specifically, better information sharing in a more-market based financial system helps to alleviate information asymmetry, which allows banks to monitor borrowers more easily and thus reduce bank risk caused by adverse selection and moral hazard.

Regarding to the revenue diversification channel, following Luo et al. (2016) and Vithessonthi (2014), we use the ratio of noninterest income to total income (*NI*) as the proxy for revenue diversification, and then replace *TC* by *NI* in the model. As shown in the last two columns in Table 4, the negative and statistically significant coefficient for the total effect of *FS* on *NI* in Column (5) indicates that a more bank-based financial system (higher relative importance of bank to stock market in the financial system) leads to ("Granger causes") lower bank revenue diversification, while the positive and statistically significant coefficient of the total effect of *NI* on *ZSCORE* in Column (6) suggests that better bank revenue diversification leads to ("Granger causes") lower bank risk. These results suggest that moving toward a more market-based financial system (the improvement of relative importance of stock market to banking sector) would benefit bank stability by providing more opportunities for banks to diversify revenues. As noted by Demirgüç-Kunt & Huizinga (2010), banks can benefit from extending their business into non-interest income activities by increasing asset return and enjoying better risk diversification.

Table 4 Openness, financial structure and bank risk: transition channels.

	(1) *LERNER*	(2) *ZSCORE*	(3) *INFO*	(4) *ZSCORE*	(5) *NI*	(6) *ZSCORE*
L.LERNER	0.5572**	1.4982***				
	(0.2719)	(0.5237)				
L2.LERNER	0.1872	-1.0916**				
	(0.2479)	(0.4637)				

$\sum$ *LERNER*		0.4066**				
$Prob. > \chi^2$		0.0238				
L.INFO			0.6321**	0.0301		
			(0.2463)	(0.0512)		
L2.INFO			0.1792	-0.0138		
			(0.1706)	(0.0490)		
$\sum$ *INFO*				0.0163*		
$Prob. > \chi^2$				0.0517		
L.NI					0.6485***	0.0160**
					(0.0534)	(0.0074)
L2.NI					0.0925*	-0.0091*
					(0.0537)	(0.0047)
$\sum$ *NI*						0.0069*
$Prob. > \chi^2$						0.0683
L.ZSCORE	-0.0970*	0.5941**	0.9810*	0.5955***	-6.6055	0.5311*
	(0.0504)	(0.2824)	(0.5792)	(0.1238)	(5.5604)	(0.2857)
L2. ZSCORE	0.0107	0.3731*	-0.6753	0.3320***	3.2652	0.2376
	(0.0544)	(0.2087)	(0.5080)	(0.1025)	(4.5910)	(0.1619)
$\sum$ *ZSCORE*	-0.0863		0.3057		3.3403	
$Prob. > \chi^2$	0.1950		0.4065		0.3620	
L.FS	-0.0042**	0.0083	0.0127	0.0013	-0.0575	0.0269
	(0.0017)	(0.0054)	(0.0298)	(0.0114)	(0.1146)	(0.0378)
L2.FS	0.0017*	-0.0067*	-0.0443	0.0009	-0.2131*	-0.0324
	(0.0010)	(0.0036)	(0.0310)	(0.0138)	(0.1190)	(0.0356)
$\sum$ *FS*	-0.0025*	0.0016	-0.0316**	0.0022	-0.2706**	-0.0055
$Prob. > \chi^2$	0.0788	0.7037	0.0356	0.5647	0.0340	0.5106
Year	Yes	Yes	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes	Yes	Yes
AR (1) *p*-value	0.2604	0.1452	0.1965	0.1492	0.0000	0.1624
AR (2) *p*-value	0.4586	0.1859	0.2962	0.0433	0.1910	0.2048
Hansen test *p*-value	0.3157	0.2122	0.8661	0.2156	0.1794	0.2779
Countries	82	82	79	79	93	93
Observations	1034	1034	478	478	1293	1293

Notes: The dependent variable in Column (1) is *LERNER*, a proxy for bank competition. The dependent variable in Column (3) is *INFO*, a proxy for the level of information sharing. The dependent variable in Column (5) is *NI*, a proxy for bank's revenue diversification. The dependent variable in Columns (2), (4) and (6) is *ZSCORE*, which is the natural logarithm of Z-score. *FS* is financial structure, measured as the relative importance of bank-based finance over market-based finance. These variables are defined in Table A1 in the Appendix. All models are estimated using the ARDL dynamic panel system with two lags. *L* and *L2* are abbreviations to denote the first and second lags of the respective variables. GMM estimates for variables with standard errors (in parenthesis) using Windmeijer (2005) finite-sample robust standard error correction are reported. All estimations control for country- and time-specific effects, though not reported. The sample size of estimations is dependent on the availability of data. Hansen tests the null hypothesis of instrument validity and AR(2) tests the null hypothesis of the absence of second-order autocorrelation. ***, **, * indicate statistical significance at 1%, 5%, 10% level, respectively.

4.4 Subsample analysis

In this section, we proceed to check the sensitivity of our main results to various subsamples. First, we take into account country heterogeneities and investigate whether the results are robust in different groups of countries. To address this issue, we divide the entire sample countries into two subgroups (i.e., high-income countries vs. low- and middle-income countries) according to the World Bank's classification of countries and then re-estimate the regressions for each subsample separately.[2] The regression results are reported in Table 5, from which we can see that the sign and significance of the estimated coefficients for

[2] The sample countries divided by income groups are presented in Table A2 in the Appendix.

financial openness and financial structure remain consistent with the baseline results in both subsamples, supporting the robustness of our baseline results.

As for the differences between the two subgroups of countries, one can see that although the effect of financial openness on financial structure is larger in low- and middle-income countries than that in high-income countries (as the estimated coefficient for financial openness in Column 3 is larger than that in Column 1 in Table 5), the degree to which the positive effect of financial openness on bank stability through the financial structure channel offsets the negative effects through all other potential channels turns out to be lower in low- and middle-income countries (26.74% in low- and middle-income countries versus 56.84% in high-income countries). This result is probably due to the fact that high-income countries are more financially developed and banks are better-skilled, and more developed domestic financial markets not only provide better diversification opportunities but also allows stock markets to be better positioned to assist bank business through activities such as facilitating bank's monitoring and screening processes and providing a platform to trade securitized instruments (Samarasinghe & Uylangco, 2021). In other words, banks in financially more developed countries are less affected by external financial markets and rely more on domestic financial markets. As a result, the marginal impact associated with the financial structure channel increases while that through the competition or diversification channel decreases. On the contrary, the less-developed financial markets in low- and middle-income countries limit the complementary effect of stock market to banking sector on the one hand, and amplify the effect of financial openness on bank risk through other channels such as the competition channel on the other hand, since domestic banks are less competitive than their foreign counterparts.

Table 5 Openness, financial structure and bank risk: country heterogeneity.

	High-income countries		Low- and middle-income countries	
	(1)	(2)	(3)	(4)
	FS	*ZSCORE*	*FS*	*ZSCORE*
L.FS	0.7415***		0.7417***	
	(0.0737)		(0.2594)	
L.ZSCORE		0.4655*		0.6730***
		(0.2684)		(0.1910)
ZSCORE	-1.4681		-1.9094*	
	(1.2617)		(1.0432)	
FS		-0.1107***		-0.0276*
		(0.0365)		(0.0154)
KAOPEN	-0.9242*	-0.1800*	-1.1608*	-0.1198*
	(0.5334)	(0.1005)	(0.6660)	(0.0718)
TO	0.0188	0.0004	0.0226	0.0105**
	(0.0172)	(0.0041)	(0.0152)	(0.0052)
LEGOR	1.0291		-1.1556	
	(1.9988)		(1.0010)	
DEPOSIT		-0.0955		0.1615
		(0.1762)		(0.2816)
CONTROLS	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes
AR (1) *p*-value	0.4674	0.0827	0.2943	0.0255
AR (2) *p*-value	0.5177	0.6333	0.8303	0.4094
Hansen test *p*-value	0.7246	0.9830	0.9811	0.7761
First stage Wald statistic	652.218***	93.141***	308.575***	1512.762***
Countries	45	45	52	52
Observations	729	729	727	727

Notes: The dependent variable in Columns (1) and (3) is financial structure (*FS*). The dependent variable in Columns (2) and (4) is *ZSCORE*, which is the natural logarithm of Z-score. As for explanatory variables, we include one lag of the dependent variables *(FS_{t-1}* and *$ZSCORE_{t-1}$*, respectively) and the predicted value of *ZSCORE* (*FS*) obtained in the first stage when *ZSCORE* (*FS*) is the dependent variable. *KAOPEN* refers to *de jure* measure of financial openness. *TO* is trade openness. *CONTROLS* is a set of control variables including *GDPR*, *INFLATION*, *OVERHEAD*, *NI*, *NIM* and *CTI*. These variables are defined in Table A1 in the Appendix. All models are estimated by combining 2SLS procedure with system GMM estimation. *L* is

an abbreviation to denote the first lag of the respective variables. GMM estimates for variables with standard errors (in parenthesis) using Windmeijer (2005) finite-sample robust standard error correction are reported. All estimations control for country- and time-specific effects, though not reported. The sample countries used for the estimations in Columns (1) and (2) are high-income countries while the sample countries used for estimations in Columns (3) and (4) are low- and middle-income countries. The sample countries divided by income groups according to the World Bank's classification are presented in Table A2 in the Appendix. Hansen tests the null hypothesis of instrument validity and AR(2) tests the null hypothesis of the absence of second-order autocorrelation. ***, **, * indicate statistical significance at 1%, 5%, 10% level, respectively.

Second, as Figure 2 reveals, the decreasing trend of the relative importance of banking sector to stock market was interrupted by the 2008 global financial crisis, which reflects a likely influence of financial crisis on the evolution of financial system. Therefore, to account for the potential influence of the 2008 financial crisis, we also investigate whether the effect of openness on bank risk changes before and after the global financial crisis, as in Cubillas & González (2014) and Luo et al. (2016). To this end, we divide the entire sample into pre-crisis (1996–2007) and post-crisis (2008–2017) subperiods and re-estimate the regressions for each subperiod. The results are reported in Table 6. Obviously, the sign and significance of the estimated coefficients for financial openness and financial structure remain consistent in both the pre-crisis and post-crisis subperiods, suggesting that the baseline results do not change across time. However, it is very interesting that the positive effect of financial openness on bank stability through the financial structure channel is strengthened while the negative effect of financial openness on bank stability through other channels is weakened after the global financial crisis. This may be due to the fact that the global financial crisis improves supervisory authorities' awareness of bank risk, and the introduction of various regulatory policies (e.g., macro-prudential instruments suggested in Basel III). These policy efforts are very likely to be effective in controlling the negative effect of financial openness on bank stability. For example, Ali & Iness (2020) empirically find that the negative impacts of capital inflows are alleviated by the implementation of macro-prudential policies in domestic countries, especially through measures imposing limits on foreign currency loans.

Table 6 Openness, financial structure and bank risk: subperiods.

	1996–2007		2008–2017	
	(1)	(2)	(3)	(4)
	FS	*ZSCORE*	*FS*	*ZSCORE*
L.FS	0.5621***		0.5814***	
	(0.1560)		(0.1768)	
L.ZSCORE		0.6153***		0.7280***
		(0.1678)		(0.0906)
ZSCORE	-0.9090		-17.5070*	
	(0.8569)		(9.3386)	
FS		-0.0385*		-0.0781**
		(0.0218)		(0.0336)
KAOPEN	-0.7048*	-0.1114*	-0.8899*	-0.0840*
	(0.3925)	(0.0648)	(0.4749)	(0.0492)
TO	-0.0125	0.0017	0.2301*	0.0025**
	(0.0168)	(0.0032)	(0.1288)	(0.0012)
LEGOR	-0.8029		-0.0543	
	(0.7966)		(1.0993)	
DEPOSIT		-0.0271		0.0070
		(0.0946)		(0.0895)
CONTROLS	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes
AR (1) *p*-value	0.7997	0.0069	0.1702	0.0008
AR (2) *p*-value	0.9461	0.7452	0.1064	0.1611
Hansen test *p*-value	0.9560	0.8239	0.9700	0.7008
First stage Wald statistic	175.9191***	61.0807***	68.7204***	158.7121***

Countries	94	94	94	94
Observations	802	802	654	654

Notes: The dependent variable in Columns (1) and (3) is financial structure (*FS*). The dependent variable in Columns (2) and (4) is *ZSCORE*, which is the natural logarithm of Z-score. As for explanatory variables, we include one lag of the dependent variables (FS_{t-1} and $ZSCORE_{t-1}$, respectively) and the predicted value of *ZSCORE* (*FS*) obtained in the first stage when *ZSCORE* (*FS*) is the dependent variable. *KAOPEN* refers to *de jure* measure of financial openness. *TO* is trade openness. *CONTROLS* is a set of control variables including *GDPR*, *INFLATION*, *OVERHEAD*, *NI*, *NIM* and *CTI*. These variables are defined in Table A1 in the Appendix. All models are estimated by combining 2SLS procedure with system GMM estimation. *L* is an abbreviation to denote the first lag of the respective variables. GMM estimates for variables with standard errors (in parenthesis) using Windmeijer (2005) finite-sample robust standard error correction are reported. All estimations control for country- and time-specific effects, though not reported. The sample used for the estimations in Columns (1) and (2) is pre-crisis subperiod covering 1996–2007 while the sample used for estimations in Columns (3) and (4) is post-crisis subperiod covering 2008–2017. Hansen tests the null hypothesis of instrument validity and AR(2) tests the null hypothesis of the absence of second-order autocorrelation. ***, **, * indicate statistical significance at 1%, 5%, 10% level, respectively.

4.5 Additional robustness tests

In this section, we conduct several robustness tests to ensure the consistency of our main findings. First, following previous studies (e.g., Houston et al., 2010; Cubillas & González, 2014), we check the robustness of our baseline results by using the volatility of return on asset (*SD_ROA*) as an alternative proxy for bank risk. As the volatility of ROA is positively related to bank risk, we expect an opposite sign of the estimated coefficients for main explanatory variables when replacing *ZSCORE* by *SD_ROA*. Table 7 reports the results. Overall, the estimated coefficients for financial openness (*KAOPEN* or *FI*) in Columns (1) and (2) are negative and statistically significant while those for *FS* in Columns (3) and (4) are positive and statistically significant. This again supports the robustness of our baseline results.

Table 7 Robustness tests using *SD_ROA* as alternative proxy for bank risk.

	(1) *FS*	(2) *FS*	(3) *SD_ROA*	(4) *SD_ROA*
L.FS	0.3865**	0.5532***		
	(0.1536)	(0.1583)		
L.SD_ROA			0.2417***	0.1507
			(0.0745)	(0.2314)
SD_ROA	1.4640	1.0352		
	(1.4923)	(1.1745)		
FS			0.0203*	0.2611***
			(0.0104)	(0.0957)
KAOPEN	-1.0245*		0.1754*	
	(0.5502)		(0.0902)	
FI		-0.4525*		0.1252***
		(0.2643)		(0.0361)
TO	0.0125	0.0256*	-0.0042	0.0047
	(0.0078)	(0.0152)	(0.0034)	(0.0052)
LEGOR	-1.5200**	-0.5862		
	(0.6576)	(0.9306)		
DEPOSIT			-0.6853*	-0.0058
			(0.3748)	(0.1527)
CONTROLS	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes
AR (1) *p*-value	0.7864	0.7115	0.0030	0.6385
AR (2) *p*-value	0.6563	0.9976	0.8888	0.6416
Hansen test *p*-value	0.6127	0.6853	0.9985	0.1250
First stage Wald statistic	192.7248***	203.2230***	530.6002***	131.7406***
Countries	97	97	97	97

Observations	1321	1242	1321	1242

Notes: The dependent variable in Columns (1) and (2) is financial structure (*FS*). The dependent variable in Columns (3) and (4) is the volatility of return on asset (*SD_ROA*). As for explanatory variables, we include one lag of the dependent variables (FS_{t-1} and SD_ROA_{t-1}, respectively) and the predicted value of *SD_ROA* (*FS*) obtained in the first stage when *SD_ROA* (*FS*) is the dependent variable. *KAOPEN* and *FI* refer to *de jure* and *de facto* measures of financial openness, respectively. *TO* is trade openness. *CONTROLS* is a set of control variables including *GDPR*, *INFLATION*, *OVERHEAD*, *NI*, *NIM* and *CTI*. These variables are defined in Table A1 in the Appendix. All models are estimated by combining 2SLS procedure with system GMM estimation. *L* is an abbreviation to denote the first lag of the respective variables. GMM estimates for variables with standard errors (in parenthesis) using Windmeijer (2005) finite-sample robust standard error correction are reported. All estimations control for country- and time-specific effects, though not reported. The sample size of estimations in Columns (2) and (4) is curtailed due to the availability of data for calculating *FI*. Hansen tests the null hypothesis of instrument validity and AR(2) tests the null hypothesis of the absence of second-order autocorrelation. ***, **, * indicate statistical significance at 1%, 5%, 10% level, respectively.

Second, as in Lane & Milesi-Ferretti (2008) and Kose et al. (2009), apart from the aggregate stock of external liabilities and assets, we also separately consider the gross stock of external liabilities (*FL*, a cumulated measure of inflows) as well as the gross stock of external assets (*FA*, a cumulated measure of outflows) as alternative *de facto* measures of financial openness. This not only checks the robustness of the baseline results but also provides additional evidence for the differences in the effect of capital inflows and outflows on bank risk through the financial structure channel. From the estimation results in Table 8, we can see that both the sign and significance of the estimated coefficients for financial openness and financial structure variables remain consistent with the baseline results. With respect to the different effects associated with capital inflows and outflows, the results indicate that capital inflows would have a greater impact on bank risk through the financial structure channel than capital outflows.

Table 8 Robustness tests using *FL* and *FA* as alternative proxies for financial openness.

	(1) *FS*	(2) *FS*	(3) *ZSCORE*	(4) *ZSCORE*
L.FS	0.6220***	0.4752***		
	(0.1576)	(0.1421)		
L.ZSCORE			0.4979**	0.6283***
			(0.2371)	(0.1017)
ZSCORE	-0.8104	-0.8201		
	(1.2334)	(1.3676)		
FS			-0.1011**	-0.0278*
			(0.0478)	(0.0147)
FL	-0.8866*		-0.0387*	
	(0.4751)		(0.0206)	
FA		-0.3406*		-0.0367*
		(0.1850)		(0.0221)
TO	-0.0024	-0.0046	-0.0010	-0.0006
	(0.0181)	(0.0191)	(0.0016)	(0.0015)
LEGOR	-0.5740	-0.7617*		
	(0.7965)	(0.4625)		
DEPOSIT			-0.1221*	-0.1376**
			(0.0730)	(0.0583)
CONTROLS	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes
AR (1) *p*-value	0.3320	0.6667	0.0359	0.0004
AR (2) *p*-value	0.8728	0.8126	0.9646	0.6362
Hansen test *p*-value	0.3400	0.4943	0.5786	0.9709
First stage Wald statistic	206.4429***	445.5395***	92.7471***	689.8733***
Countries	97	97	97	97

Observations	1338	1323	1338	1323

Notes: The dependent variable in Columns (1) and (2) is financial structure (*FS*). The dependent variable in Columns (3) and (4) is *ZSCORE*, which is the natural logarithm of Z-score. As for explanatory variables, we include one lag of the dependent variables *(FS_{t-1}* and *$ZSCORE_{t-1}$*, respectively) and the predicted value of *ZSCORE* (*FS*) obtained in the first stage when *ZSCORE* (*FS*) is the dependent variable. *FL* and *FA* are the ratios of total external liabilities to GDP and total external assets to GDP, respectively. *TO* is trade openness. *CONTROLS* is a set of control variables including *GDPR*, *INFLATION*, *OVERHEAD*, *NI*, *NIM* and *CTI*. These variables are defined in Table A1 in the Appendix. All models are estimated by combining 2SLS procedure with system GMM estimation. *L* is an abbreviation to denote the first lag of the respective variables. GMM estimates for variables with standard errors (in parenthesis) using Windmeijer (2005) finite-sample robust standard error correction are reported. All estimations control for country- and time-specific effects, though not reported. The difference in sample size is due to the availability of data for calculating *FL* and *FA*. Hansen tests the null hypothesis of instrument validity and AR(2) tests the null hypothesis of the absence of second-order autocorrelation. ***, **, * indicate statistical significance at 1%, 5%, 10% level, respectively.

Finally, we also check the robustness of our baseline results by introducing additional control variables that may have an influence on bank risk. Specifically, we add macro-prudential policy index (*MPI*) to control for the impact of macro-prudential regulation and legal protection (LEGALRIGHTS) to control for the strength of institutions protecting lending in a country. As is evident in Table 9, after including these additional controls, the impact of financial openness (*KAOPEN* or *FI*) and financial structure (*FS*) on bank risk remains the same as the baseline results, which again supports the robustness of our main conclusions.

Table 9 Robustness tests including *MPI* and *LEGALRIGHT* as additional control variables.

	(1) *FS*	(2) *FS*	(3) *ZSCORE*	(4) *ZSCORE*
L.FS	0.6132***	0.4850***		
	(0.1398)	(0.1338)		
L.ZSCORE			0.3764**	0.0852
			(0.1586)	(0.1143)
ZSCORE	-3.1756*	-3.8349		
	(1.7673)	(2.3915)		
FS			-0.0641*	-0.1059**
			(0.0377)	(0.0537)
KAOPEN	-0.8644*		-0.1123**	
	(0.4996)		(0.0553)	
FI		-0.1053*		-0.0751**
		(0.0630)		(0.0319)
TO	0.0177	0.0176	0.0037**	0.0034
	(0.0113)	(0.0134)	(0.0017)	(0.0034)
LEGOR	-1.2010*	-0.4282		
	(0.6700)	(0.8530)		
DEPOSIT			-0.1014	-0.1277
			(0.0926)	(0.1255)
CONTROLS	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes
N	730	624	730	624
AR (1) *p*-value	0.3081	0.6429	0.0205	0.0530
AR (2) *p*-value	0.7614	0.7661	0.1304	0.4921
Hansen test *p*-value	0.4016	0.1853	0.4779	0.5296
First stage Wald statistic	297.166***	703.719***	216.611***	437.193***
Countries	87	85	87	85
Observations	730	624	730	624

Notes: The dependent variable in Columns (1) and (2) is financial structure (*FS*). The dependent variable in Columns (3) and (4) is *ZSCORE*, which is the natural logarithm of Z-score. As for explanatory variables, we include one lag of the dependent variables *(FS_{t-1}* and *$ZSCORE_{t-1}$*, respectively) and the predicted value

of *ZSCORE* (*FS*) obtained in the first stage when *ZSCORE* (*FS*) is the dependent variable. *KAOPEN* and *FI* refer to *de jure* and *de facto* measures of financial openness, respectively. *TO* is trade openness. *CONTROLS* is a set of control variables including *GDPR*, *INFLATION*, *OVERHEAD*, *NI*, *NIM*, *CTI*, *MPI* and *LEGALRIGHTS*. These variables are defined in Table A1 in the Appendix. All models are estimated by combining 2SLS procedure with system GMM estimation. *L* is an abbreviation to denote the first lag of the respective variables. GMM estimates for variables with standard errors (in parenthesis) using Windmeijer (2005) finite-sample robust standard error correction are reported. All estimations control for country- and time-specific effects, though not reported. The sample size of estimations in Columns (2) and (4) is curtailed due to the availability of data for calculating *FI*. Hansen tests the null hypothesis of instrument validity and AR(2) tests the null hypothesis of the absence of second-order autocorrelation. ***, **, * indicate statistical significance at 1%, 5%, 10% level, respectively.

5. Conclusions

Using panel data from a large cross-country sample covering 97 countries over the period 1996–2017, we combine 2SLS procedure with system GMM estimation to study the relationship between openness, financial structure and bank risk. The estimation strategy adopted in this paper has the benefit of controlling for endogeneity problems arising from reverse causality between financial structure and bank risk as well as their potential simultaneous dependence on openness. Besides estimation strategy, the main contributions of the paper lie in the following aspects:

First and most importantly, we have identified a new channel, i.e. the financial structure channel, through which financial openness affects bank risk. Specifically, we find that as financial openness increases, a country's financial system tends to be more market-based, and a more market-based financial system is generally associated with less bank risk. To the best of our knowledge, this paper is the first that has explicitly separated the financial structure channel from other alternative channels documented in the literature.

Second, we also further explore why banks in a more market-based financial system tend to undertake less risk. We find that moving toward a more market-based financial system would enhance bank market power, improve information sharing and facilitate revenue diversification, and all these effects would contribute to bank stability. Moreover, we also find that the effect of inflow restriction on bank risk is more pronounced than that of outflow restrictions.

Third, a direct policy implication that can be drawn from our analysis is that financial structure matters for the design of a country's opening-up strategy. In particular, in a bank-based financial system, speeding up financial opening-up may not be a wise choice. A more appropriate strategy is to balance the rhythm of financial opening-up with the development of domestic financial markets. In addition, policy makers should also be aware of the differentiated effects associated with different channels when promoting financial opening-up and adopt targeted policies in a well-designed policy framework to reduce bank risk.

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Appendix A
Table A1
Definitions and sources of variables.

Variable	Definition	Source
ZSCORE	The indicator of bank stability, calculated as the natural logarithm of $Z\text{-}score = (ROA + E/A)/sd(ROA)$, where ROA is the return on asset, E/A is the equity to asset ratio and $sd(ROA)$ is the standard deviation of return on asset.	GFDD*
FS	A measure reflects the relative importance of bank-based finance over market-based finance, calculated as the ratio of private credit by deposit money banks to stock market capitalization.	Authors' calculation using data from GFDD
KAOPEN	This index is developed and updated by Chinn & Ito (2006), which measures capital account openness based on four binary variables reported in the IMF's AREAER.	Chinn & Ito (2006)
FI	A *de facto* indicator of financial openness calculated as: $FI_{it} = (FA_{it} + FL_{it})/GDP_{it}$, where *FA* and *FL* are the stock of external assets and liabilities, respectively.	Lane & Milesi-Ferretti (2017)
KAI	This index measures the degree of control restrictions on capital inflows, constructed based on the information of the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER).	Fernández et al. (2016)
KAO	This index measures the degree of control restrictions on capital outflows, constructed based on the information of the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER).	Fernández et al. (2016)
TO	The ratio of the total volume of imports and exports to GDP.	WDI**
GDPR	Real annual GDP growth rate.	WDI
INFLATION	Consumer price inflation rate.	WDI
OVERHEAD	Operating expenses as a share of total bank asset.	GFDD
NI	Bank's income generated by noninterest related activities as a percentage of total income.	GFDD
NIM	Bank's net interest revenue as a share of interest-bearing assets.	GFDD
CTI	Operating expenses as a share of sum of net-interest revenue and other operating income.	GFDD
LERNER	A measure calculated as the difference between output prices and marginal costs, with a larger value indicating greater market power.	GFDD
LEGOR	A dummy variable for legal origin which takes the value of 1 if the law system of a country is based on common law and 0 otherwise.	La Porta et al. (1997, 1998)
DEPOSIT	A dummy variable for deposit insurance which takes the value of 1 if a country has established an explicit deposit insurance scheme and 0 otherwise.	Demirgüç-Kunt et al. (2014)
INFO	An index ranging from 0-6, with a higher value indicating better coverage, scope and accessibility of credit information.	World Bank's Doing Business database
MPI	The overall index of macroprudential policy by summing up dummy variables (0-1) for the use of 17 instruments.	Alam et al. (2019)
LEGALRIGHTS	The legal rights index measures whether certain features that facilitate lending exist within the applicable collateral and bankruptcy laws. The score ranges from 0-100, with a higher value indicating higher strength of legal rights.	World Bank's Doing Business database

Notes: (1) * GFDD refers to the World Bank's Global Financial Development Database; (2) ** WDI denotes World Bank's World Development Indicators.

Table A2
List of countries included in the study.

High-income countries		Low- and middle-income countries	
Australia	Netherlands	Algeria	Malaysia
Austria	New Zealand	Armenia	Mauritius
Bahrain	Norway	Bangladesh	Mexico
Barbados	Oman	Bolivia	Mongolia
Belgium	Panama	Bosnia and Herzegovina	Morocco
Canada	Poland	Botswana	Namibia
Chile	Portugal	Brazil	Nepal
Croatia	Qatar	Bulgaria	Nigeria
Cyprus	Saudi Arabia	China	North Macedonia
Czech Republic	Singapore	Colombia	Pakistan
Denmark	Slovak Republic	Costa Rica	Paraguay
Estonia	Slovenia	Côte d'Ivoire	Peru
Finland	Spain	Ecuador	Philippines
France	Sweden	Egypt, Arab Rep.	Romania
Germany	Switzerland	El Salvador	Russian Federation
Greece	United Arab Emirates	Eswatini	South Africa
Hungary	United Kingdom	Georgia	Sri Lanka
Ireland	United States	Ghana	Tanzania
Israel	Uruguay	India	Thailand
Italy		Indonesia	Tunisia
Japan		Jamaica	Turkey
Korea, Rep.		Jordan	Uganda
Kuwait		Kenya	Ukraine
Latvia		Kyrgyz Republic	Venezuela, RB
Lithuania		Lebanon	Vietnam
Malta		Malawi	Zambia

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