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The Recent History of Hungarian Monetary Policy and Future Challenges for Central Banks*

András Balogh  – Zsolt Kuti  – Annamária Sipos-Madarász 

The role of central banks in shaping economic processes has been a key issue since their existence. This has typically always been related to the challenges faced by monetary policy decision makers at the time, and from the 2000s onwards even more so in the decade in question. In our essay, we focus primarily on the challenges facing Hungarian monetary policy, briefly outlining the developments in the past decades and elaborating on the challenges ahead. In the longer term, as a small, open economy, Hungary must respond to the prevailing and often interconnected international megatrends of the decade, assessing which of these developments represent challenges and which of these provide opportunities for the Magyar Nemzeti Bank to solve the challenges. In an era of geopolitical change, the green transition, demographic change, high debt levels and digitalisation, one thing is certain: central banks cannot lose sight of their primary objective of ensuring price stability.

Journal of Economic Literature (JEL) codes: E31, E43, E52

Keywords: monetary policy, interest rate cutting cycle, price stability, inflation, financial stability, megatrends, geopolitics, green transition, demography, competitiveness

1. Introduction

Since the first central banks appeared (in the 17th century), economists have been concerned with the question of the role of monetary policy in shaping economic processes and achieving related goals (Tatay 2015). To summarise the theories broadly, the function of central banks was initially limited to issuing banknotes and conducting banking transactions, but as economic processes intensified, the range of tasks and objectives expanded. At the beginning of the 20th century, Keynes concluded that the only goal of monetary policy could be to steer the economy towards a state of full employment by setting interest rates (Dickens 2011). With the advance of monetarism in the 1970s, the theory already prevailed that because

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inflation was a monetary phenomenon, the central bank could control inflation by controlling money supply (*Friedman 1968*).

In the early 1990s, the forward-looking, expectation-based behaviour of financial markets led central banks to recognise that a rule-based strategy would give them a better chance of achieving their objectives, and thus inflation targeting (IT) came to the fore. Svensson (1997) argues that the IT regime reduces the volatility of inflation and, if the system is sufficiently flexible, it can even support output stabilisation. As a result of the 2008 crisis, the role of central banks has been redefined: central banks have recognised that, in addition to keeping price stability as a primary objective and the promotion of growth in mind, financial stability considerations must also be taken into account in monetary policy decisions (Ábel et al. 2014).

The 2010s and 2020s have also brought new challenges for central banks, and the signs of future challenges are already visible. In the centenary year of the Magyar Nemzeti Bank (the central bank of Hungary, MNB), it may be worth pausing for a moment to reflect on the challenges that the central bank may face, if not in the next 100 years, then looking ahead, as these may fundamentally change the role of monetary policy. This essay examines these issues with a Hungarian focus, briefly touching on the challenges of the recent past and presenting the challenges of the next decade for the central bank.

As a small, open country, the room for manoeuvre of Hungarian monetary policy is fundamentally influenced by international developments. Therefore, the analysis also focuses on international megatrends, in particular issues related to high levels of public debt, geopolitical tensions, the green transition of economies, digitalisation and demographic challenges.

2. The 2010s: a time of low interest rates and price stability

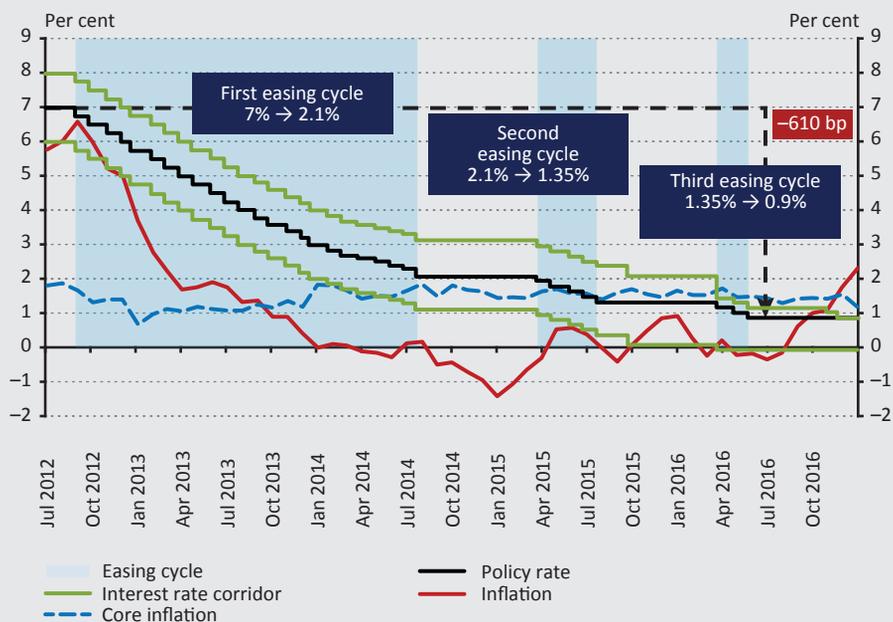
*Hungary entered the decade of 2010 carrying a heavy burden of consequences from the 2008 global financial crisis, with all its country-specific elements. The crisis placed Hungary among the world's riskiest economies, put severe constraints on the market financing of public debt, while developments in macroeconomic indicators highlighted the structural problems in the economy. Consequently, neither balance nor growth could be achieved in the Hungarian economy (*Matolcsy 2020*). It was under these circumstances that an economic policy turnaround had to be implemented from the beginning of the decade, accompanied by a monetary policy turnaround from 2013 onwards.*

2.1. The interest rate cutting cycle of the 2010s

Thanks to the economic policy turnaround, a sustained loose international interest rate environment and moderating underlying inflation, the gradual improvement in the country's risk assessment made it possible for the central bank to lower

interest rates by the summer of 2012 (Figure 1). At the start of the interest rate cutting cycle, the MNB lowered the base rate from an initial 7 per cent to 4 per cent by July 2013. The higher-than-target inflation at the beginning of the period was mostly due to one-off, transitory effects, which, as they faded out from the end of 2012, made the central bank face the challenge of a strong disinflationary process that kept inflation below the target of 3 per cent from the beginning of 2013. In the second half of the first phase, the strong disinflationary environment made it possible to continue monetary easing, while the stimulation of economic growth made it necessary, and thus the base rate continued to be lowered to 2.1 per cent until July 2014. The second interest rate cutting cycle from March 2015 was justified by underlying inflation rates falling below levels consistent with the price stability target, inflation expectations stabilising below the target and a persistent negative output gap. Achieving the inflation target in a sustainable manner required a further interest rate cut in the spring of 2016 in the third cycle, and the base rate was reduced to 0.9 per cent, the lowest level in the central bank's history. In this cycle, the central bank made the interest rate corridor asymmetric and narrower in several steps, in addition to lowering the base rate (MNB 2019a). The asymmetric interest rate corridor supported the use of the main policy instrument and thus the enforcement of the base rate, i.e. it served to improve monetary transmission.

Figure 1
Interest rate cutting cycles and inflation developments in the 2010s



Source: Based on Figure 3.2 (p. 18) of MNB (2019a), HCSO

2.2. Achieving permanent price stability

The interest rate cutting cycle set the stage for the period between 2017–2020, when the MNB reached its primary objective of ensuring price stability on a sustained basis for the first time since the change of regime. It was an exceptional result, also by international standards, that between the beginning of 2017 and the end of 2020, average inflation was just around 3 per cent, i.e. in line with the central bank's target, and in 44 out of 48 months of this period inflation was within a tolerance band of ± 1 per cent around the 3 per cent level (Matolcsy 2022).

In addition to achieving and steadily maintaining price stability, the monetary policy turnaround also served to fulfil the central bank's other mandates, which included financial stability following the financial crisis. The MNB also took a number of non-traditional measures, which, together with the interest rate cutting cycle, supported not only the primary mandate of the central bank, but also financial stability and the economic policies of the Government. These include the Funding for Growth Scheme (FGS), which was launched to address the protracted credit crunch and to encourage long-term lending to SMEs, and the Bond Funding for Growth Scheme (BFGS), which aimed to increase liquidity in the corporate bond market, the Self-Financing Programme to support self-financing and strengthen financial sovereignty, the integration of the central bank and financial supervision, the strengthening of macro-prudential policy and the central bank's resolution activities, and the forint conversion of foreign currency loans.

3. Return of inflation in the 2020s

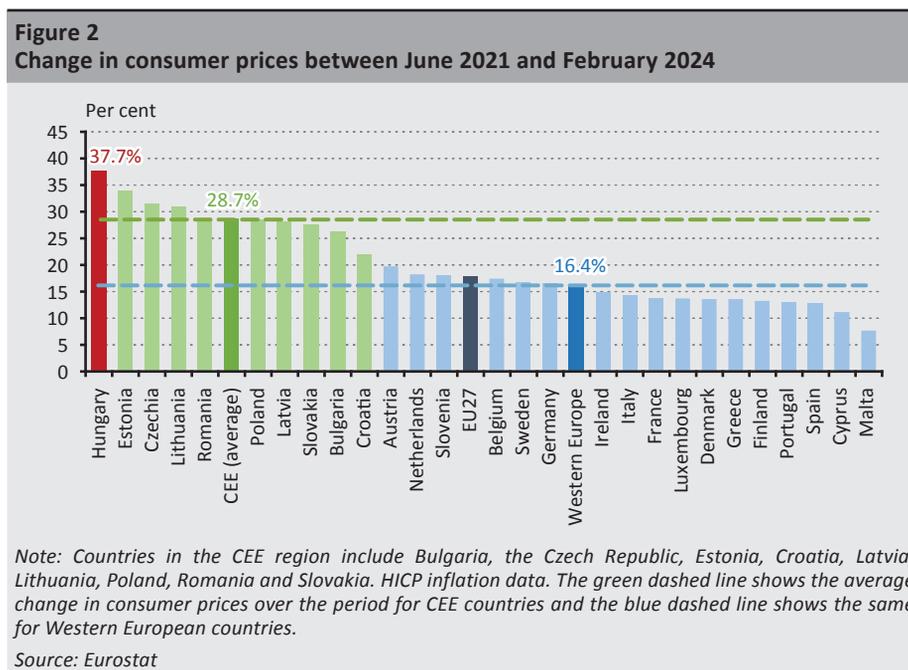
As we entered the 2020s, the world faced a coronavirus pandemic, with unprecedented health, social and, not least, economic impacts. To mitigate the negative economic effects and support growth, governments significantly increased their budget deficits, while central banks injected sufficient liquidity into the economies. In Hungary, between 2020 and 2021, economic policy coordination between the MNB and the Government resulted in appropriate crisis management: fiscal policy helped the central bank to efficiently allocate liquidity in the economy. The central bank provided more than HUF 11,000 billion (equivalent to nearly 20 per cent of GDP in 2021) in funding to economic operators until the end of 2021 to help them overcome the economic difficulties caused by the pandemic.

Hungary was one of the first countries to return to its pre-pandemic economic performance, but the recovery brought new challenges around the world. Global inflation rose to levels not seen since the 1970s, and fears of a stalled recovery and recession intensified.

3.1. The nature of inflation in the 2020s

The challenges of the new decade resulted in inflation around the world starting to rise again after a long period. In the period following the coronavirus crisis, a dual economic process began: the recovery in the economies was followed by a rapid increase in demand, while the fragmented supply side recovered at a much slower pace. Against this backdrop, energy and commodity prices, as well as global food prices, rose sharply in 2021, followed by the outbreak of the Russia-Ukraine war in early 2022, which gave a further boost to price increase for energy and commodities. As a result, inflation rates started to rise strongly and persistently.

The successive waves of inflation in 2021 and 2022 had the strongest impact on the economies of Central and Eastern Europe, and particularly Hungary. Due to the proximity of the Russia-Ukraine war and energy dependence, the Central and Eastern European region was more exposed to a deteriorating external inflation environment. As a result, consumer prices in the region as a whole increased by an average of 28.7 per cent between June 2021 and February 2024 (Figure 2), which was 12.3 percentage points more the price increases in Western European developed countries during the same period. Overall, prices in Hungary rose by 37.7 per cent, more than double the rate in Western Europe.



In addition to the general inflationary effects in the region, other country-specific factors besides higher energy exposure contributed to higher inflation in Hungary. Food and fuel price hikes accounted for 80 per cent of the rise in domestic price inflation, which was significant compared to the Western European average and also substantial compared to the region. Hungary's productivity in the food industry is the second lowest in the European Union, making the sector more vulnerable to cost shocks, and the contribution of fuel to the inflation surplus increased following the government's lifting of the fuel price cap. Moreover, the lack of competition allowed domestic companies to raise prices much more than their costs, leading to the strongest profit-led inflation in Europe (MNB 2024).

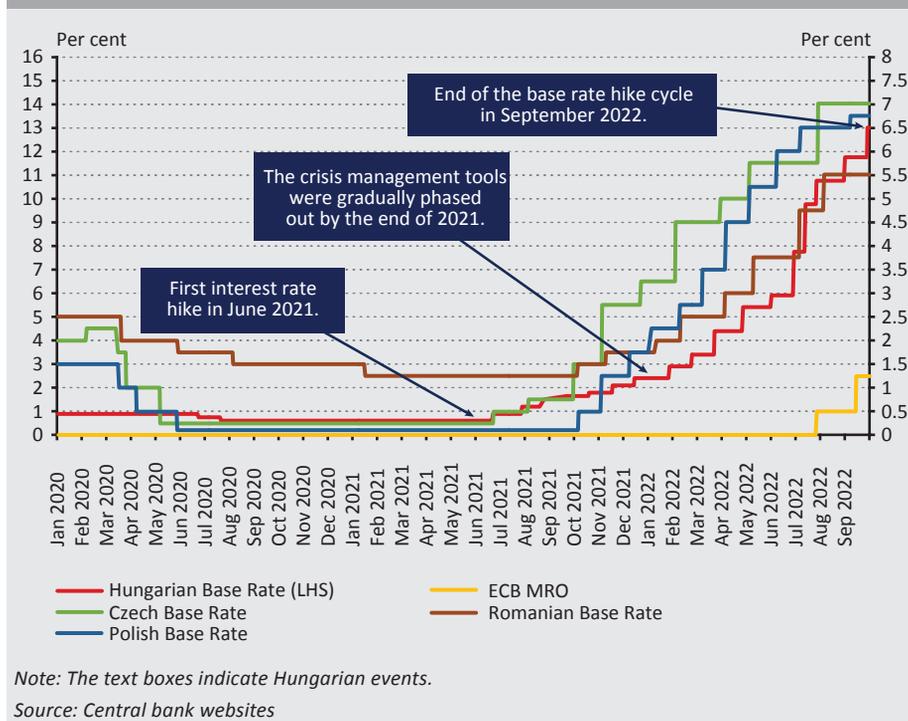
3.2. The fight against inflation and successful disinflation

The MNB was one of the first to recognise the change in inflation trends and actively communicated this. This is also supported by the results of a study by Nagy Mohácsi et al. (2024), which found that the Hungarian central bank was one of the best worldwide at formulating messages about the re-emergence of inflation.

The MNB gave a strong response to the rise in inflation. While some argue (Botos 2023) that the central bank started raising interest rates too late, the facts nevertheless show that the MNB was the first in the European Union to start its rate hike cycle in June 2021 (Figure 3). Tightening by the central bank continued until September 2022, with the base rate increasing by 1,240 basis points over a span of 16 consecutive months. At the September 2022 interest rate meeting, the Monetary Council set the base rate at a level (13 per cent) that adequately addressed the fundamental inflation risks. In parallel with the tightening of interest rate conditions, central bank instruments dealing with the coronavirus crisis were also phased out by the end of 2021.

In the early weeks of October 2022, international financial markets experienced an extraordinary deterioration in sentiment, and the MNB took strong action on 14 October to address the need to protect financial market stability. In the weeks following the September interest rate decision, the forint weakened steadily against the euro and the dollar, reaching a historic low; the forint purchases of the domestic sector were increasingly unable to offset the significant rise in foreign speculative holdings against the forint, and euroisation risks intensified substantially (for details, see Kuti 2023). Overall, the forint reached the limit of nonlinear depreciation. Taking into account the risks in the financial markets, the Monetary Council of the central bank significantly raised short-term yields by using two targeted instruments announced on a daily basis, and, in order to preserve the balance in the foreign exchange market, the MNB temporarily provided the foreign exchange liquidity directly that was required to meet the greater demand for net energy imports.

Figure 3
Hungarian cycle of interest rate hikes and interest rate hikes by the ECB and central banks in the region



By taking these exceptional measures, the MNB was able to stabilise domestic financial markets, buying time for economic policy to rebalance. By taking targeted measures, the central bank successfully ensured the stability of financial markets, which is both a necessary condition for the functioning of the economy and a necessary condition for achieving sustainable price stability.

Learning from the patterns of economic history, the MNB took a cautious approach and maintained tight monetary conditions over a sustained period, thus succeeding in curbing inflation. From its peak of 25.7 per cent in January 2023, Hungarian inflation dropped back to the central bank’s tolerance band by 2024 Q1, making Hungary the country with the largest decline in inflation in the EU in 2023, which is a significant achievement by historical standards (MNB 2023a).

4. Maintaining price stability as a challenge for the near future

The first major monetary policy challenge for the near future will be to maintain price stability. The MNB may be able to achieve its 3-per cent target in a sustainable manner during 2025. At the same time, geopolitical tensions, as well as new

disruptions in commodity and energy markets and global supply chains are creating risks to financial market stability and disinflation, not only in Hungary but also around the world. Given the risky environment, a disciplined, cautious and data-driven approach will guide central bank strategies in the period ahead.

Keeping inflation expectations anchored remains key. This requires central banks to use their extensive data and information base to continuously monitor the spillover effects of their actions into the real economy and the development of inflation expectations of economic actors. While monitoring the interest rate and inflation expectations of financial market participants is an obvious task for central banks through the evaluation of market prices and analysts' opinions, the inflation expectations of companies as price-setters and households as consumers can be mapped through questionnaires and sometimes through sectoral information. Companies, whose pricing practices play a key role in inflation developments, base their inflation expectations on price dynamics in their supply chains and industry information, rather than on current monetary policy or the expected evolution of the consumer price index (Coibion et al. 2018; Albagli et al. 2022). Some evidence suggests that actors in the household sector place a high weight on observed past price changes in formulating their inflation expectations, overweighting price increases and attaching particular importance to food price changes (D'Acunto et al. 2021). The latter result is particularly important in the Hungarian context, as food is a particularly large component in the Hungarian consumer basket compared to the EU (Bareith – Fertő 2023). In the context of the above, anchoring expectations also requires central banks to identify anomalies in corporate pricing, especially when they are found in key sectors such as the food industry. According to MNB calculations, between 2019 and 2022, net operating cost and mixed income in the food industry in Hungary showed the fourth highest growth in the EU, at nearly 65 per cent, while the top performer France recorded increases of nearly 250 per cent and Bulgaria 200 per cent, respectively (MNB 2024). These results indicate a much higher increase in corporate prices than cost increases in the sector. Inflation of price-profit origin can be a major impediment to anchoring inflation expectations to the inflation target through perceived price dynamics that are higher than fundamentally justified. In addition to presenting these processes to the public, central banks can make proposals to stimulate sectoral competition and work together with competition authorities to support pricing that better reflects real economic fundamentals, while anchoring expectations to inflation targets.

Particular attention should also be paid to inflation items that are mainly shaped by domestic pricing mechanisms, such as market services inflation. The disinflation occurring at the global level is clear, but price dynamics in the services sector are slowing down this process for several reasons: the higher degree of labour intensity of the sector means that wage dynamics are more dominant in pricing

than in more capital-intensive sectors, and accordingly the deceleration in price dynamics may be more moderate and protracted. It is important to highlight that the inherently more persistent services inflation is now proving to be more durable internationally compared to previous periods of high inflation, partly due to the evolution of demand for goods and services and their relative prices during and after the coronavirus crisis, and partly due to lower exposure to the energy market, as a consequence of which, falling energy prices are not contributing to services disinflation (Amatyakul et al. 2024). However, this also means that, compared to the past, price developments in the services sector are an increasingly strong driver of the incoming inflation data. Alongside slowing disinflation, these developments may justify a more sustained restrictive monetary stance worldwide in order to achieve and maintain price stability.

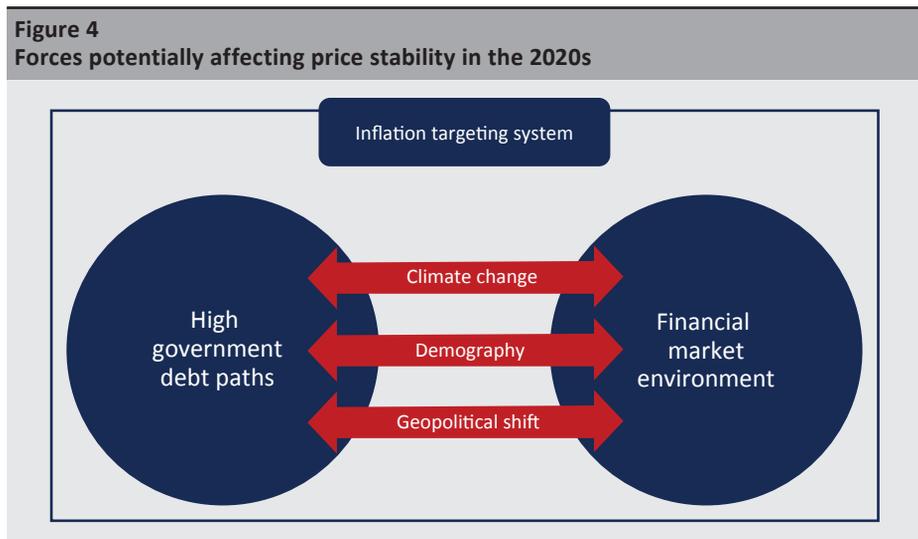
Financial market stability should also remain a priority in the MNB's monetary policy. Indeed, as a small, open economy, increasing geopolitical tensions, possible new energy shocks, news of tighter future interest rate policies by major central banks or deteriorating risk assessments due to other factors could threaten price stability from the financial market side. This is a particularly important aspect, since, compared to the 2010s, in the early 2020s the central bank estimated that a 1-per cent weakening of the exchange rate could have a double inflationary impact, i.e. the inflationary impact of the exchange rate in Hungary has increased (Balatoni – Soós 2023). Although exchange rate developments are influenced by many factors other than monetary policy, if a central bank pursues a predictable, credible monetary policy, it can contribute to the stability of the financial market environment, thus reducing the risk of exchange rate volatility and the resulting price effects from uncertainty. The relatively large size of Hungarian financial markets further increases the importance of financial market stability considerations: in 2022, the daily turnover of foreign exchange instruments as a share of annual GDP averaged nearly 15 per cent in Hungary, nearly 10 per cent in the Czech Republic, nearly 8 per cent in Poland and 3 per cent in Romania.

5. Medium-term challenges: megatrends affecting central bank policies

Looking ahead, like all others, central banks must face up to the medium- and long-term developments that require a transformation of the economic structure, which may also pose challenges in the maintenance of price stability. It is important to underline that these challenges also offer development opportunities for economies to become more competitive, flexible and resilient. On the central bank side, while price stability is a priority, today's monetary policy frameworks provide scope for flexible adjustment (Gillitzer – Simon 2015).

A focus on the price stability objective of central banks highlights the monetary policy-relevant structural effects that most central banks must anticipate during the decade: high public debt ratios and the likely further increase in fiscal pressures stemming from various structural factors, geopolitical tensions, the green transition, aging societies and, in parallel, a declining working-age population will all challenge the monetary policies of central banks.

For an inflation targeting, independent central bank, one important feature of the operating environment is the current and expected fiscal policy stance and, especially in small open economies, the evolution of the financial market environment. In this context, climate change, demographic challenges and the current shift towards a bipolar world order all have a lasting impact on these characteristics: they imply potential fiscal pressures in the future and create persistent uncertainty and increased volatility in financial markets. In such a situation, the independent central bank must be both inward and outward looking, because while a different fiscal stance than monetary policy can lead to a conflict of interest between economic policy branches and can also affect inflation expectations, an uncertain financial market environment in an open economy can cause disturbances in the flow of capital, which can also affect inflation through exchange rate developments (Figure 4).

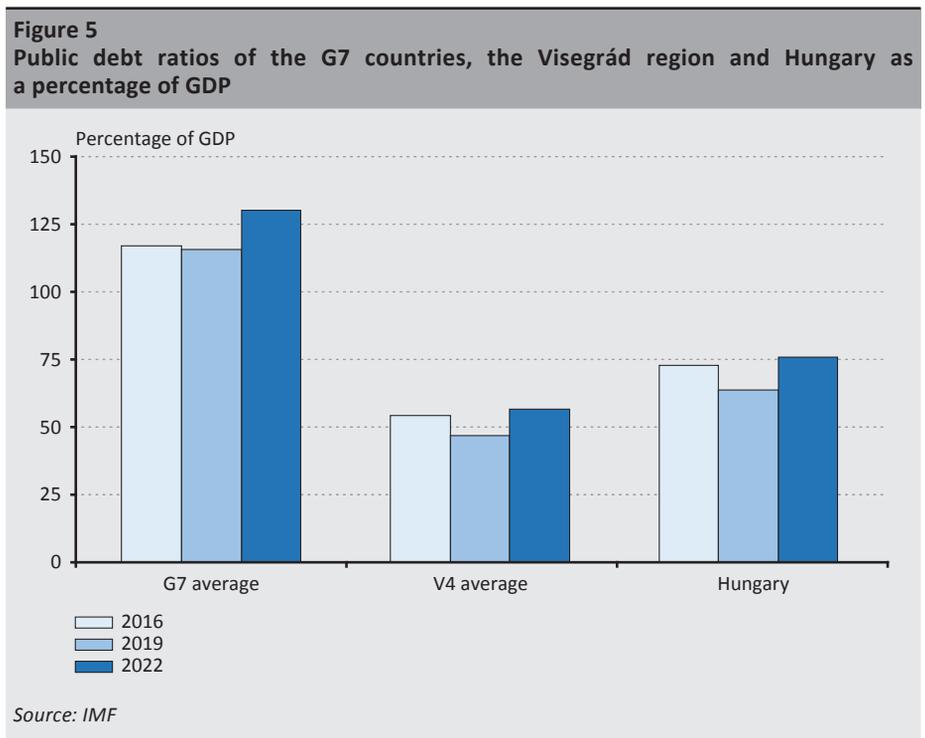


In the next section of this paper, we examine the central bank dimensions of these forces, and since these effects are broadly global, moving away from the domestic focus, we assess these developments from a general monetary policy perspective. However, where a distinction is justified, we also refer to the challenges that a given process poses for a central bank in a small, open economy.

5.1. The problem of high debt – monetary policy with shrinking fiscal space

In the coming years, the fiscal space is expected to be determined by high and only slowly declining public debt ratios. Globally, one of the main causes of the slow decline in the high debt ratios is the lingering effects of the coronavirus crisis, as it is in the case of the causes of elevated inflation. The extraordinary crisis was followed by decisive action around the world, with central banks and governments working together to channel huge amounts of liquidity into the real economy. A rapid recovery of the global economy did take place, but we were then faced with post-Covid symptoms like enormously high inflation developments resembling the 1970s along with high and fiscal space-constricting public debt ratios. The inflationary symptom has been easing steadily thanks to firm central bank actions, but resolving the debt problem seems to be a protracted challenge.

The coronavirus crisis slowed the reduction of high debt levels (Figure 5). Between 2019 and 2022, the debt ratios of advanced economies rose from 104 to 113 per cent of GDP, while those of emerging economies from 55 to 65 per cent (Brandao-Marques et al. 2023).



Higher debt levels are also accompanied by a subdued macroeconomic outlook, while the megatrends of our times may be putting increasing pressure on budgets. Weak productivity, demographic trends, low investment activity and the after-effects of the coronavirus crisis are all slowing debt reduction (Adrian et al. 2024). Among these, demographic trends pose a significant threat, including the fact that the sustainability of pension systems may become uncertain in the future. In addition, from a budgetary point of view, the fiscal space in the future may be limited by the endeavour to mitigate the effects of climate change and to achieve a green transition to ensure the long-term management of such effects. The social, economic and trading consequences of geopolitical tensions will certainly add to the budgetary challenges, to varying degrees depending on the geographical location. The OECD calculates that, based on the median projection for the G7 countries, the net public debt ratio may increase by around 70 percentage points by 2040. The OECD's further findings suggest that for a median OECD country, an annual increase in fiscal revenues of 3.5 percentage points of GDP would be required by 2040 to keep the debt ratio below the level expected by 2025. In the light of these findings, the OECD calls for action, stressing the need for labour market, health and pension reforms to alleviate growing fiscal pressures, with a particular focus on demographic trends (OECD 2023).

The need to put public debt on a credible, sustainable path is also of paramount importance for price stability, especially for emerging market economies (Adrian et al. 2024; Afrouzi et al. 2024; Brandao-Marques et al. 2023; Wyplosz 2023). Loose fiscal policy can also be directly inflationary and raise long-term inflation expectations. The literature suggests that there is a not too strong, but positive relationship between the changes in cyclically adjusted primary balance in the previous year and inflation in the given year (Wyplosz 2023). Another important result is that long-term inflation expectations 5 years ahead grow significantly following a surprise increase in the debt ratio of 10 percentage points, especially in emerging countries, and also for economies with high initial debt levels and those not having an inflation target (Brandao-Marques et al. 2023).

While maintaining a higher interest rate environment in order to curb inflation may lead to a short-term conflict between central banks and governments in a period of subdued growth, in the longer term, sustainable growth cannot be achieved without price stability. Fiscal consolidation is easier to implement under supportive financial conditions, but its credible implementation in itself contributes to a faster emergence of a lower interest rate environment (Adrian et al. 2024). In addition, "growing out" of debt may also be a good recipe for tackling the debt problem, so it is important to stress that competitiveness reforms help future growth (Adrian et al. 2024). But credibility is important: credible government commitment can

reassure economic actors that fiscal consolidation will not divert resources from future productivity-enhancing measures (OECD 2023).

5.2. Challenges for central banks in a world that is becoming bipolar

These are times with geopolitical tensions: while trade restrictions between the US and China were the leading news in the late 2010s, following the coronavirus crisis, the Russia-Ukraine war and the outbreak or potential for further conflicts from 2022 onwards have increased uncertainty worldwide.

Instead of a global economic and political order based on cooperation, an East-West dichotomy is emerging. These tensions may partly reverse the process of globalisation: the disruption of supply chains and uncertainty reinforce the process of protectionism and regional integration. Restructuring supply chains, or shortening them where necessary, may be a solution, but it is a time-consuming and costly process (Halmai 2023). As an extreme option, a policy of isolation, i.e. protectionism, could be taken into considerations, but in a given market that was previously competitive and partly or wholly an importer, this could lead to a reduction of competition as a result of various tariff- and non-tariff-like restrictive instruments. Overall, supply chain disruptions and the elimination of this fragmentation may lead to higher inflation for different reasons, and thus central banks cannot ignore these developments.

In addition to the effects of disruptive supply chains, the financial market consequences of geopolitical tensions may also pose inflationary risks. In a tense environment, the vulnerability of small, open economies may increase in financial markets: geographical proximity to conflicts, belonging to the same group of countries as the country under tension or greater exposure to supply chain fragmentation can easily trigger capital outflows through a deterioration in risk assessment, which can impede the achievement or endanger the maintenance of price stability through a significant depreciation of the exchange rate, which can also increase inflation. Central banks in these countries should therefore pay particular attention to preserving financial market stability (Nguyen-Huu – Örsal 2023).

5.3. The impact of climate change and green transition on price stability

We are facing the adverse effects of climate change more and more every day, but the green transition also brings risks. We are experiencing rising average temperatures, unpredictable weather conditions, mild winters and hot summers, and increasingly frequent natural disasters (Bacchiocchi et al. 2024). Further escalation of the effects already seen and the intensification of the physical risks of climate change can be curbed by the green transition process. At the same time, the transformation of existing social, economic and financial structures in accordance

with sustainability principles also entails costs, and the risks associated with such are called transition risks (Kiss – Raciborski 2024; Reboredo – Ugolini 2022).

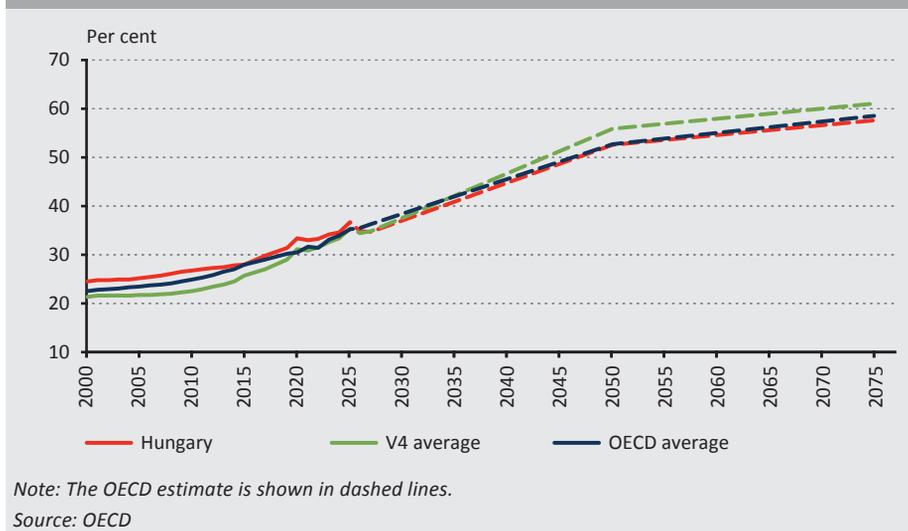
Viewed through the lens of the central bank, the key issue is the optimal level of central bank involvement in promoting the green transition. It is important to be aware of the fact that both climate change and the green transition can increase inflation (Kolozsi et al. 2022). Droughts and the proliferation of natural disasters make it difficult to maintain price stability due to higher agricultural prices and disruptions to supply chains. At the same time, the green transition is changing structures, so that the supply-demand balance and the market for products and solutions that promote sustainability can often be characterised by over-demand or, during the transition, by shortages in supply. Although the mechanisms of action are more difficult to specify in this case, it is clear that the transition also carries the potential of increasing inflation.

One thing is for certain: action is needed, but the institutional division of responsibilities and work is still evolving (Kolozsi et al. 2022). If a central bank were to opt out of promoting the green transition, it would also have to accept that it would have to navigate in an extremely volatile world, with potentially high inflation, while striving to protect price stability. On the other hand, by taking part in the fight against climate change, for example by supporting the greening of the financial system, perhaps through targeted lending programmes, it is helping to make the transition faster and smoother. One alternative could be to incorporate green aspects into the set of mandates of the central bank, but the extension of the set of mandates inherently carries the potential of conflict among objectives. However, the latter challenge can be mitigated by a clear prioritisation of objectives and credible and transparent communication from the central bank. The potential role of the central bank in the green transition is discussed in more detail in *Section 6*.

5.4. Uncertain inflationary impacts of demographic challenges

The problem of an aging society is a very important and relatively predictable challenge for policymakers: fertility rates are declining, while life expectancy is increasing (Broniatowska 2019). Looking ahead, the share of the elderly population in the total population is steadily increasing, while the share of the working-age population is decreasing. This can be seen in the evolution of the percentage of the population aged 65 and over to the working-age population, i.e. the old-age dependency rate: the average old-age dependency rate in OECD countries may rise from 33.9 per cent to 52.7 per cent by 2050 and 58.6 per cent by 2075 (*Figure 6*).

Figure 6
Trends in the old-age dependency rate in Hungary, the Visegrád region and OECD countries



Demographic trends pose challenges for the future sustainability of pension and health systems. As the working-age population declines, an increasing number of people will receive pensions at the same time, while higher life expectancy as global living standards rise will require a continued expansion of the capacity of health care systems. The challenge of an aging society puts a strain on fiscal policies, further reducing fiscal space.

The monetary policy implications of demographic changes are less clear, with the changing age composition carrying two-way inflation risks. The decline in the working-age population also implies a reduction in labour supply, which may lead to labour shortages and wage increases, which in turn have a pass-through inflationary effect. In turn, working-age people raise their savings in preparation for retirement, and if they are aware of the risks to the future sustainability of pension systems, this increase in savings may be more pronounced than if they do not have this information (Vlieghe 2022). Higher propensity to save means lower inflationary effects overall. The growing elderly population, in turn, is starting to allocate their previous savings to consumption based on traditional life-cycle models, which is

pushing up inflation, especially in a context of narrowing supply due to a shrinking labour force. At the same time, as life expectancy increases, the reduction of savings is more gradual than before, which may imply a more moderate inflationary impact (*Juselius – Takáts 2021*).

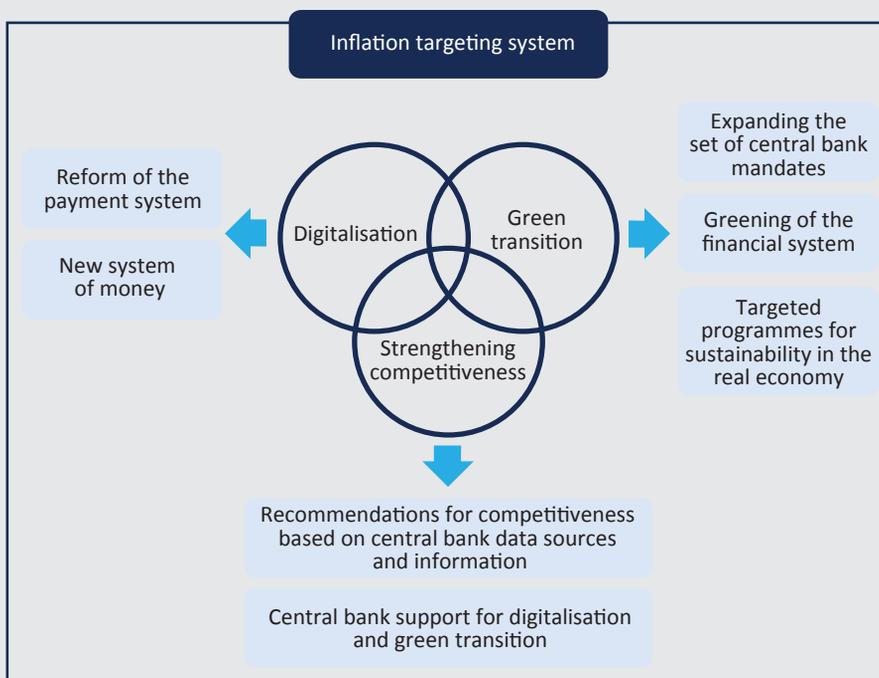
Governments are therefore expected to play an active role in demographic processes, as they have the right tools to do so. Central banks, on the other hand, need to monitor the long-term effects of demography on price stability.

6. Monetary policy options to effectively address the challenges of the 2020s

These challenges are not independent of each other. As we have seen, demographic trends affect the future sustainability of budgets. Climate change, in addition to calling for government programmes, can result in elevated geopolitical tensions in the wake of commodity shortages or supply chain disruptions, leading to isolated groups of countries and fragmentation of world trade, while also strongly increasing the vulnerability of small, open economies to financial market shocks. However, there are also achievements and opportunities that, when combined, can help address the challenges of the decade.

*While the inflation targeting system provides a flexible framework to address monetary policy challenges, digitalisation, green transition and strengthening competitiveness can provide interlinked, complementary and mutually reinforcing solutions for central banks, as well as at the macroeconomic level, if well managed. Together, these three factors lead to more efficient – and environmentally sustainable – economic functioning, mitigating the fiscal challenges posed by climate change risks and demographic challenges, and making the economy more resilient in times of turbulence and geopolitical stress. In the next section of this paper, we assess the correct application of these solutions from a central bank perspective, while the inflation targeting system continues to provide the analytical framework (*Figure 7*).*

Figure 7
Central bank options to respond to the challenges of the 2020s



6.1. A proven recipe: the inflation targeting framework

The inflation targeting framework has performed well worldwide over the past decades, as it provides a scope for adapting to the challenges of the times. A good example of this is the more flexible inflation targeting after the 2008–2009 crisis, which introduced financial stability considerations into monetary policymaking, alongside the primacy of price stability. An example of flexibility is the ± 1 percentage point tolerance band around a 3-per cent inflation target in Hungary from 2015 on, which is an effective element of the monetary policy framework. The appropriate use of a flexible framework contributes significantly to the strengthening of the credibility of the central bank.

The credibility of the central bank is critical to successfully address the challenges of the future. The effects of monetary policy mainly take shape through influencing inflation expectations. A central bank that has been credible and committed to price stability in the past will conduct a more effective monetary policy in the eyes of the public in the future, as credibility itself is a guarantee for the future.

The inflation targeting system has thus performed well, but central bankers need to keep an open mind. The framework is sufficiently flexible and, if shaped wisely, can be effective in addressing the monetary policy challenges of our time. While the expanding sets of mandates give central banks more room for manoeuvre than in the past, the relationship of the new mandates to the primary price stability objective needs to be kept under review. However, the mandates are not independent from one another: there is no sustainable growth without price stability, while meeting environmental sustainability targets can also lead to more stable price dynamics in the long run.

The primary role of price stability prevails. With the expanding set of mandates, central banks may find themselves more often in decision-making situations where compliance with one mandate violates the set of criteria of another mandate. The assessment of these trade-offs is of paramount importance, but as a general principle, if the primary mandate is involved in the dilemma, the decision should always be in favour of price stability. Along these lines, it can be argued that *in the future, preserving the credibility and independence of the central bank will play an increasingly important role in these decision-making situations.*

6.2. Options of the central bank to support structural policies, digitalisation and green transition

Competitive economies will effectively address the challenges of the decade. This requires supply-side policies and long-term structural measures. The solution to the global decline in productivity could be a shift from an extensive growth model based on quantity to an intensive growth model based on quality (Matolcsy 2022). In a world of geopolitical tensions and bipolarisation, quality-based growth offers a small, open economy the opportunity to build a capable, strong and crisis-resilient economy. The implementation of appropriate competitiveness reforms can help economies with characteristics similar to those of Hungary to catch up with developed economies in a sustainable way, which will indirectly also contribute to financial market stability through improved risk assessment.

Central banks can support competitiveness by maintaining price stability, through their set of mandates and by making proposals based on their extensive information and research base. The Hungarian example in this area is remarkable: the MNB has always been committed to strengthening Hungary's competitiveness and catching up successfully, and has been regularly and comprehensively engaged in competitiveness analysis for almost 10 years. The central bank has made use of its potential to make proposals on several occasions, one of which was the comprehensive 330-point competitiveness programme package presented in 2019 (MNB 2019b), and the MNB also assesses and monitors the development of Hungary's competitiveness position in the annual Competitiveness Report (MNB 2023b).

Central bank support for the green transition and digitalisation in itself strengthens competitiveness, and reinforcing competitiveness can accelerate and facilitate sustainability and digital transition. If an economy can successfully make these transitions and become more resilient to the challenges of our times, it can gain a competitive edge over economies that do not take as much advantage of the opportunities.

On the central bank side, the price stability risks of the green transition need to be understood. However, in the case of the green transition, the price effects arise from the shifting centres of gravity in a dynamically changing financial system and real economy, whereas the inflationary effects stemming from the physical risks of climate change are the consequences of unpredictable, uncertain and generally uncontrollable events. By contrast, active measures to support the green transition shorten the transition period and thus help to sustainably ensure price stability in the longer term, despite the risks of inflation (Aguila – Wullweber 2024).

If a central bank decides to actively support the green transition, it can, among other things: use the inflation targeting system to expand the set of mandates of the central bank in this direction; green the financial system through various regulatory and supervisory instruments; and support investments that enhance environmental sustainability through targeted lending programmes.

From a monetary policy perspective, from among the options above, the question of extending the set of mandates is of critical importance. An environmental sustainability mandate will, similarly to the financial stability and real economic objectives, be subordinate to the primary price stability objective in the central bank's targeting framework. This means that a specific, targeted effort in the spirit of these secondary objectives can only be made if it does not endanger price stability. If this is a possibility, the inflation targeter central bank should always opt for price stability. Apart from this, it is true that in flexible monetary policy frameworks, the increase in the number of mandates leads to an increasing number of conflicts of objectives, so that a new mandate may also mean more decision situations and, possibly, reputational risks for a central bank.

However, the extension of the set of mandates can be implemented with transparent communication and credibility, provided that the credibility of the central bank is proven in the eyes of economic actors and that the central bank can decide as an independent institution on the use of instruments to achieve price stability. The Hungarian example can also serve as an international benchmark: the MNB had the foresight to take a strong stance by the beginning of the decade and, with its extended set of mandates, laid the foundations for its future role in the implementation of the green turnaround (Lentner – Zsarnóczai 2022). In 2021, the Hungarian central bank became the first in Europe to include green

aspects in its mandates. In addition to maintaining the stability of the financial intermediary system, the MNB has committed to support the government's policy on sustainability without compromising its price stability mandate. Being proactive and acting first can in itself lend credibility to the central bank in the future, both in terms of its overall monetary policy and its sustainability mandate.

Once price stability is assured, a way is opening for the possibility of meeting secondary targets. These central bank mandates can then help to maintain price stability as well. Overall, supporting the green transition will steer the economy towards a more environmentally sustainable equilibrium, with more stable price dynamics in the longer term after the transition. In the same way, real economic and financial market stability is also conducive to more balanced price developments.

The focus of central banks, however, is still on achieving price stability. The fight against inflation is not over yet. Therefore, just like in the past decade when targeted central bank instruments were deployed to support growth, the sustained achievement of price stability will open the door to supporting the green transition through targeted programmes. In the current environment, the optimal strategy is for the central bank to do its utmost to achieve and maintain price stability, while at the same time continuously exploring the possibilities of actively supporting the green transition (Kolozsi et al. 2022).

Digitalisation should be seen as an opportunity to increase efficiency. A successful digital transition will make a major contribution to boosting competitiveness, while at the same time significantly supporting the green transition by reducing paper-based solutions. It can also alleviate tensions arising from the shrinking labour supply due to demographic trends through efficiency gains. Both robotisation and the rise of artificial intelligence point towards cost reductions, which could lead to more subdued price dynamics in industrial production, among others (Aldasoro et al. 2024; Acemoglu – Restrepo, 2020). As in all areas of life, we need to rethink what digitalisation can offer us in the field of central bank policies (Mishchenko – Naumenkova 2021).

From a central bank perspective, digitalisation offers an opportunity to innovate the payment system and could even be the gateway to the next chapter of the modern monetary system. Based on economic history, the epochal changes in the history of money have typically occurred in the unity of three factors: geopolitical changes, technological transformation and economic development (Balogh et al. 2022). The geopolitical changes are present, as we live in a world that is becoming bipolar; digitalisation fulfils the criterion of technological transformation, and the need for a green transition may correspond to a condition for economic development.

Central bank digital currency may mark a new era in the history of money. Combining the advantages of deposit and cash, it offers a safe and secure payment method for the public, while it can also enhance the efficiency of monetary policy by increasing the interconnectedness between the public and the central bank, which also helps to stimulate competition in commercial banking (Kóczyán 2022). This will lead to an expansion in the choice between different forms of money, as economic actors will be able to use cash, central bank digital currency, and, of course, commercial bank money for payments according to their individual preferences (Kóczyán et al. 2023). So the opportunity is there, and in line with this, more and more central banks are exploring future ways to reform the monetary system.

7. Summary

In this paper, after presenting the Hungarian monetary policy achievements of the past fifteen years, we outlined the challenges and opportunities that – looking ahead – will shape the central bank’s room for manoeuvre for this decade. Looking to the future necessarily implies broadening the focus of our analysis, as some of the effects discussed are likely to be generally present in the world. Accordingly, the challenges and opportunities were examined from a general central bank perspective. In each case, the analytical framework was provided by the inflation targeting framework, i.e. our starting point was a central bank whose primary objective is to achieve and maintain price stability. Where differentiation was justified, the challenges and opportunities were examined from the perspective of a central bank in a small, open economy, as in some cases the same effects may require different responses depending on the openness and level of development of the economy.

We pointed out that while the disinflationary process is still ongoing, the challenge for the near future will be to maintain the price stability achieved. In this area, a deep understanding of inflation expectations and the nature of inflation by the central bank is of particular importance. We noted that anchoring expectations to the inflation target also involves identifying and disclosing possible pricing anomalies, especially in sectors whose pricing practices have a strong impact on the public’s inflation expectations. The identification of market services as increasingly persistent items in inflation data underlines the need to maintain tighter monetary conditions for a longer period of time in order to achieve the inflation target sustainably. In small, open economies, ensuring financial market stability remains crucial given the volatile international financial market sentiment, as without stable financial market conditions, the inflationary impact of volatile exchange rates also poses a threat to maintaining price stability. Given the relatively large size of Hungary’s financial market, these aspects should continue to play an important role in Hungarian monetary policy.

In the longer term, the central bank's room for manoeuvre will be challenged by megatrends that often reinforce each other. For an inflation targeting central bank, the development of fiscal space and policy stance is an important factor in terms of its direct operating environment, as it also affects inflation expectations, while for the central bank of a small, open economy, the role of a volatile financial market environment is also important for inflation developments. In this context, the geopolitical tensions in a world order shifting towards a bipolar state, the effects of climate change and the green transition, and the consequences of the challenge of an aging society all imply a significant narrowing of future fiscal space and a more frequent, if not permanent, financial market turbulence, for which central banks need to be prepared. The best way to do this is by strengthening their commitment to the price stability objective and safeguarding central bank independence. While the operating environment of the central bank changes in response to megatrends, the more direct inflationary consequences of the effects must also be considered: geopolitical tensions in small, open economies may be inflationary through financial market effects, the inflationary effects of climate change are caused by unpredictability, while those of the green transition are caused by controlled processes of transition. At the same time, it is important to underline that it is precisely this transition period that the support for the green transition will accelerate, bringing a new, more environmentally sustainable balance closer. The inflationary impact of demographic change, while it is a predictable process, is uncertain, and central banks need to constantly review the weight of forces affecting price dynamics.

Just as the challenges are interlinked, so are the opportunities to address them, and these interact. Central banks can contribute to addressing the challenges of the decade by extending their set of mandates – if they deem it necessary –, by targeted measures, by appropriate regulation of the financial system, by a comprehensive reform of the payment and monetary system, and by making use of their vast information and research potential to formulate proposals. The inflation targeting system provides a flexible framework for this, but flexibility should not come at the expense of the primary objective. In the coming years, central bank credibility and independence will become even more important, ensuring that central banks remain the committed guardians of price stability.

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Sustainability Indicators – the Boundaries and Alternatives of GDP*

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To quantify economic performance, ‘gross domestic product’ – a measure created in the 1930s – is used worldwide. The indicator is suitable for measuring the performance of an economy and the welfare of individuals at a given point in time, but its capabilities are limited. The well-being of people, the impact of the environmental damage caused by production and the sustainability of economic performance are all issues that fall outside the scope of the metric. Since the 1970s, there has been a debate about the shortcomings of this indicator and its possible alternatives. Joining the dialogue, our goal was to present the principles of sustainability, to give an overview of the alternative indicators considered to be more relevant in Hungary and abroad, and to present the new sustainability indicator of the Hungarian central bank.

Journal of Economics Literature (JEL) codes: D60, O11, O44

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1. Introduction

The continuous increase in prosperity and welfare has always been one of the objectives of human activity. This is true both at the individual and the societal level. While at the individual level this can be perceived and measured through the quantitative and qualitative possession and ownership of various goods, at the community and societal level it is the performance of the economy that measures the success of a nation in this dimension. Designed to measure economic performance, the Gross Domestic Product (GDP) indicator has thus become one of the most important measures of our times. Although the concept of measuring national economic performance emerged as early as the 1700s (Lepenies 2016), its modern form was developed in the 1930s during the Great Depression and the Keynesian reform of economic thinking. Macroeconomic regulation has become

* The papers in this issue contain the views of the authors which are not necessarily the same as the official views of the Magyar Nemzeti Bank.

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the main objective to avoid a new recession. Consequently, measuring economic performance became a priority, for which Simon Kuznets, commissioned by the US Congress, developed a measurement methodology based on value added. The indicator is now used worldwide to measure and compare the economic performance of countries.

However, GDP's relative simplicity limits its ability to capture factors other than material welfare. Kuznets himself saw the limitation of the indicator, namely that the country-level analysis would result in material inequalities remaining below the surface, masking the extent of possible social inequalities between countries (*Kuznets 1934*). Like Kuznets, others have also recognised the limitations of GDP. The main claim of *Stiglitz et al. (2018)* is that what we measure affects what we do, and measuring the wrong thing may lead to the wrong action. If we focus only on material welfare, such as the production of goods, rather than health, education and the environment, we ourselves become more like the object of our measurement, and therefore more materialistic. While the authors acknowledge that GDP is a good measure of economic performance, they believe that conclusions about the well-being of a society beyond material welfare based on this indicator are wrong. Similarly, *Hoekstra (2019)* envisages a world where decisions are not based on GDP primarily, but neither he nor the authors mentioned above have proposed a specific measure.

Not only the capabilities of GDP, but also the sustainability of economic growth are increasingly being called into question today, as since the onset of the industrial revolution, the presence of humans has begun to consume, to an unprecedented extent, the planet's previously seemingly infinite resources. To illustrate this, in 2009 a team of scientists divided our planet into seven – and later, nine – ecosystems, and determined the thresholds at which human activity on Earth is considered sustainable in each system. By 2023, we had crossed six of the nine planetary boundaries (*Richardson et al. 2023*), which means that our presence places stress on several global systems such as climate, biosphere or biochemical flows which nature's regenerative capacity can no longer balance. One of the most cited definitions of sustainability, found in the Brundtland Report, reflects this overload: sustainable development is a form of development that meets the needs of the present without compromising the ability of future generations to meet their own needs (*Brundtland Commission 1987*). The problem is that our current widely-used GDP indicator does not take into account factors relating to the state of the environment and society; consequently, decisions are not taken with the primary objective of improving the state of the environment and society, or if they are, the results are not clearly measurable.

This is why we attempt to present and compare the alternatives to the GDP indicator that are available. The indicators are classified into three categories and then assessed on the basis of their relevance and resource requirements, taking into account the sustainability principles presented below. Where available, data for Hungary are also presented. At the end of the paper, we present the new sustainable GDP measure of the Hungarian central bank.

2. The framework for understanding sustainability

2.1. The principles of sustainability

Before presenting the various measures that complement GDP, we briefly introduce the theory of sustainable development. Among other things, *Solow (1974)* researched the possibility of infinite economic growth even under the assumption of exhaustible natural resources. Solow's macroeconomic model defines output as a function of three input factors.

$$Q = Q(L, K, N), \quad (1)$$

where Q is output, L is labour, K is man-made capital and N is natural capital. The defined output function had two important features. On the one hand, the author assumed that natural capital is indispensable in the function, since without natural capital there is no production; therefore, if $N = 0$, the result will be $Q = 0$. The second assumption is that there is no upper limit to the average product of natural capital.¹ Solow used the Cobb-Douglas production function, which ensured that the two desirable properties described above were satisfied. The first assumption was necessary because without that it would be assumed that production was conceivable without the use of natural capital. The second assumption is justified by the fact that if the average product of natural resources were finite, only finite amounts of output would be produced; consequently, the only infinitely sustainable level of per capita consumption would be zero. At this point, it is important to stress that the need to introduce this second attribute is directly related to the original aim of *Solow's (1974)* study, namely to find conditions under which a positive level of per capita consumption can be sustained indefinitely. For this reason, if natural resources are limited and substitution between resources is restricted, per capita consumption may not remain constant forever (*Cabeza Gutiérrez 1996*). Even though the first of the two criteria for sustainable development [*Equations (2)–(3)*]

¹ The average output produced by each input is called 'average product'. Average product is the method used to measure the total output produced by a firm from a given combination of inputs. It is defined as the output per unit factor input or the average of the total product input per unit input, which can be calculated by dividing the total product by the inputs (variable factors).

is precisely to increase, or at least maintain, welfare continuously. The second condition captures the constancy or growth of capital goods.

$$U_{t+1} \geq U_t, \quad (2)$$

where U_{t+1} is future welfare, U_t is current welfare, and

$$K_{t+1} \geq K_t, \quad (3)$$

where K_{t+1} is future capital and K_t is current capital.

Pearce and Atkinson (1993) formulated a number of criteria for weak sustainability, which they referred to as the Hicks-Page-Hartwick-Solow rule (*Kerekes 2012*). In their study, they distinguished three types of capital [*Equation (4)*].

$$\sum K = K_M + K_H + K_N, \quad (4)$$

where K_M is produced (man-made) capital, K_H is human capital, and K_N is natural capital (broadly defined, minerals, biodiversity, air).

Weak sustainability is the case where natural capital can be substituted without limit by the other two types of capital described. In this case, it is only necessary that our total capital does not decrease over time [*Equation (3)*]. Strong sustainability is when natural capital cannot be substituted by the other two and accordingly, the permanence of natural capital must be ensured.

$$K_{N_{t+1}} \geq K_{N_t}, \quad (5)$$

where K_{N_t} is the current value of natural capital and $K_{N_{t+1}}$ is the future value of natural capital.

The assumption of the permanence of natural capital raises complex questions. For example, classical environmental economics, created to protect the environment and reduce pollution, belongs to the category of weak sustainability, since it aims to associate a price with pollution and to internalise the costs (externalities) indirectly caused to third parties (having to pay for pollution). In other words, according to this concept it is acceptable to reduce natural capital in exchange for paying the price of pollution. This approach naturally raises numerous questions about the price we should attach to the destruction of our environment.

A good example to illustrate this difficult issue is when different actors try to quantify the social cost of carbon emission (SCC). The SCC aims to estimate the

monetary cost (in US dollars) of emitting one additional tonne of carbon. To a large extent, the result depends on the expected output, the expected damages and the discount rate applied to future damages (*Nordhaus 2017*). The SCC is mainly used by North American countries when making regulatory decisions. In the United States, under various administrations, the estimated value of the SCC has ranged from USD 1 to USD 7 for a while, while the current estimated value is around USD 51. It is apparent that its value can be strongly manipulated depending on the expectations. In the European Union, this practice mainly corresponds to the emissions trading scheme where various high carbon emitters are required to pay the cost of environmental damage. The value of allowances reached a historic high in February 2023, when the companies concerned had to pay EUR 107 per tonne of carbon emissions. Currently, the price of a tonne of carbon emissions ranges between EUR 60 and EUR 70.

3. Alternative indicators available

3.1. Comparison of specific indicators

Discussions about alternative indicators commenced in the 1970s, when numerous experts started to question the sustainability of the growth rates experienced theretofore. In addition, there were increasingly visible signs of environmental pressures around the world. The most important study of the time was a 1972 paper entitled 'The Limits to Growth' (*Meadows et al. 1972*), which outlined the social, economic and environmental problems humanity would face in the decades to follow. It was along these lines that experts started to think about creating a measure that was able to break the monopoly of GDP. The alternative sustainability indicators to be presented below have been classified into three categories: (i) inventory-type indicators, (ii) composite indicators, and (iii) GDP-adjusting indicators. There was a difference in what exactly was measured, the methodology used and the unit of measurement applied to interpret the result of the measurement. Indicators can be judged according to the sustainability concept in which they are developed (strong or weak), and also according to their producibility, resource requirements and relevance. We will start with the inventory-type indicators, which are the basic measures, then move on to the more abstract composite indicators that measure several factors at once, and finally – as a golden mean – we present GDP-modifying indicators.

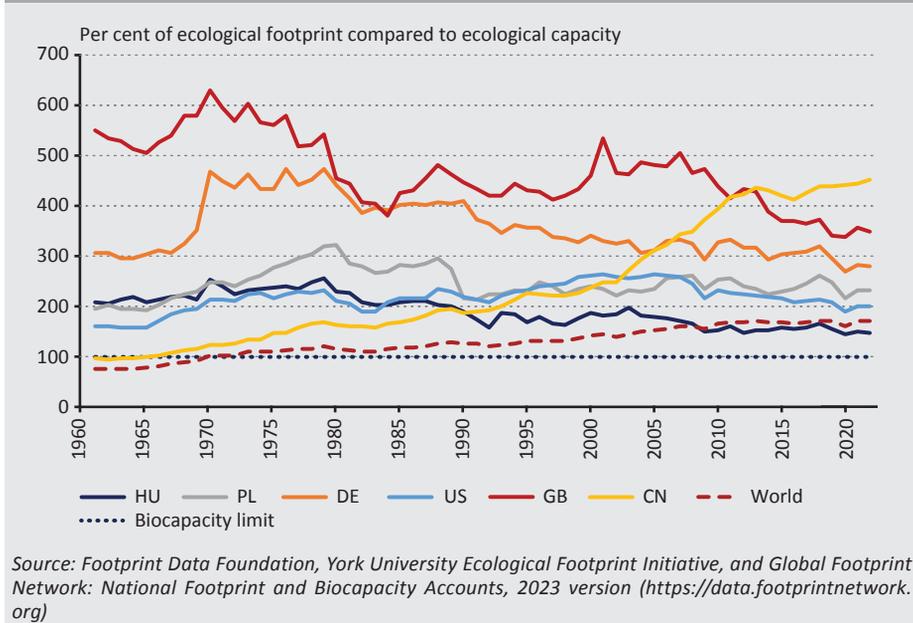
3.2. Inventory-type indicators

The more tangible group of sustainability indicators includes inventory-type indicators. Their purpose is to measure a resource, capital, or asset item in order to track changes over time, thereby indicating the degree of sustainability. The advantage of these measurements is that they measure a specific thing based on established methodologies. The disadvantage is that they only capture one phenomenon at a time, and since sustainability is a multi-factor process, it is difficult to assess a country's performance by analysing one indicator only. Two important inventory-type indicators are presented below: *ecological footprint* and *biocapacity*.

The ecological footprint indicator aims to measure how much biologically productive land and water an individual, population or activity needs in order to produce all the resources it consumes and absorb the waste it produces, using prevailing technological and resource management practices (*Wackernagel – Rees 1996*). Biocapacity measures the ability of ecosystems to produce the biological materials we use and absorb the wastes we produce under current management systems and extraction technologies. Biocapacity can vary from year to year depending on changes in climate, farming and factors considered as useful inputs for the human economy (*Wackernagel – Rees 1996*). Ecological footprint and biocapacity are both expressed in global hectares. The result of comparing the two is how many planet Earths, i.e. how much land area, humanity would need in order to maintain the present state of affairs in the long term, given the current quality of life.

Ecological deficit or *reserve* is the difference between biocapacity and the ecological footprint of a region or country. Ecological deficit is a situation where the footprint of a population exceeds the biocapacity of the area available to that population. By contrast, ecological reserve is defined as the biocapacity of a region in excess of the footprint of its population. When a regional or national ecological deficit occurs, it means that the region or country is importing biocapacity through trade, or is liquidating the ecological assets available there, or is releasing waste into global public assets, such as the atmosphere. In contrast to the national scale, the global ecological deficit cannot be compensated by trade, and therefore, by definition, it is equivalent to exceeding the Earth's carrying capacity (*Wackernagel – Rees 1996*).

Figure 1
Ecological footprint of Hungary, the world and selected countries vs. their biocapacity, 1961–2022



Similar to countries in the Western world, Hungary has been facing an ecological deficit since the beginning of the survey in the 1960s (*Figure 1*). Hungary currently has a smaller ecological deficit than the global average (71 percentage points overrun), but it is still almost one and a half times over its natural limits (47 percentage points overrun), stretching further than the blanket reaches. One of the most unfavourable trends and values is in China. Since the 1970s, the country's footprint has been increasingly diverging from its ecological capacity, and now exceeds it by four and a half times. However, the inclusion of population size can also help to provide a more accurate view of a country. For example, China scores better on almost all environmental indicators when measured in relation to its population. The situation is complicated further by the rise of global trade in goods and the separation of the places of production and consumption of products. While most developed countries can be identified as carbon exporters (i.e. the emissions of the products they consume occur elsewhere), numerous – mainly developing – countries are carbon importers and absorbers (i.e. they emit carbon from products they did not consume) (*Al-mulali – Sheau-Ting 2014; Malik – Lan 2016; Rahman 2020*). It is important to note that globalisation does not necessarily mean an increase in carbon emissions. There are cases where relocation of production, for example to a country with a cleaner energy mix, leads to a reduction in global

carbon emissions and thus in the ecological footprint (*Baumert et al. 2019*); usually, however, the opposite is true.

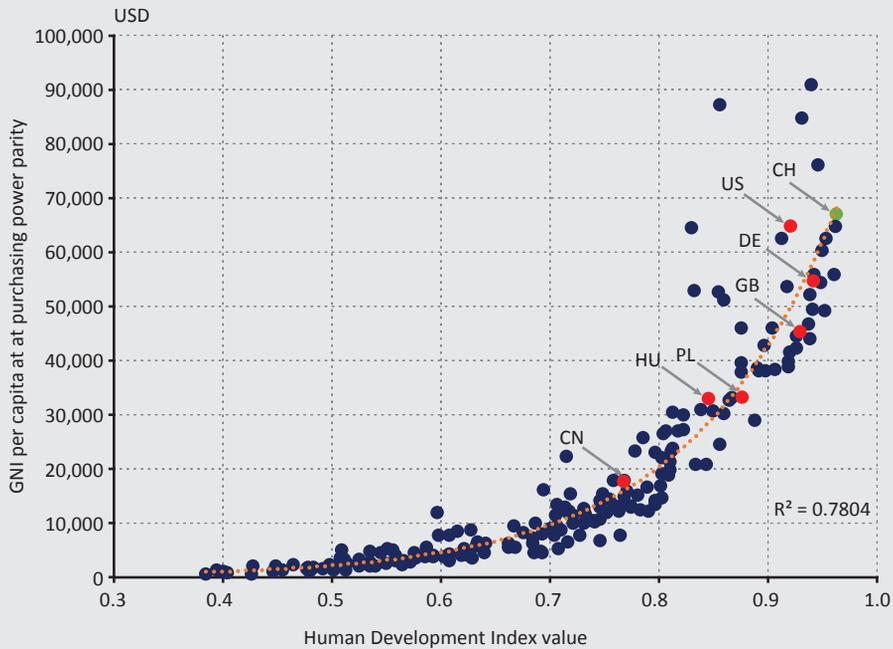
Of course, biocapacity and ecological footprint calculations have also been criticised. For example, biocapacity does not take into account the long-term depletion of arable land and water resources. The ecological footprint does not take into account technological change; indeed, it assumes that the consumption observed in the past will require at least the same amount of resources as before, even though production is becoming more intensive and efficient. It also places unrealistic expectations on small countries with high population density (*Fiala 2008*).

3.3. Composite metrics

The indices presented below provide a more abstract and difficult-to-grasp numerical value than inventory-type indicators. These indicators aim to measure sustainability in a broader sense. Today, the most commonly used composite indicators attempt to quantify different aspects of a country's sustainability and progress. Depending on the type of the indicator, they take into account a country's economic performance (welfare), educational, health, political factors (well-being) and the state of the environment. The biggest problem and criticism of composite indicators is precisely that they aggregate different factors into an elusive number, using different weighting methods, for example by conflating the state of the environment with less important factors. For this reason, the assumption of weak sustainability holds for almost all composite indicators. The result can only be interpreted in a broader context; therefore, efforts should be made to calculate the index for as many countries as possible.

One of the first and best-known composite indicators is the Human Development Index (HDI) developed by the United Nations Development Programme (UNDP) in 1990 (*UNDP 1990*). The aim of the indicator is to measure the development of countries not only in terms of their material welfare, but also in terms of the quality of life available there. The first version of the HDI consisted of three components: life expectancy, quality of education (mean years of completed schooling and expected years of schooling) and GNI per capita. Those who preferred alternative development indicators considered this indicator a good starting point, but felt that it lacked, *inter alia*, the inclusion of information on environmental sustainability. Apart from the fact that it captures few factors, most of the criticism of the indicator centred on the aspect that the HDI is overly influenced by the value of a country's national income per capita (*Sagar – Najam 1997*), as aptly shown in *Figure 2*. The latest 2021 results put Hungary in 46th place in the development ranking.

Figure 2
Relationship between HDI and GNI per capita



Note: Figure 2 is based on 2021 data. Liechtenstein was excluded due to its extremely high income value.
 Source: UNDP (2022)

In the following, we present two international and three national composite indices. Each of the selected indices relies on its own logic in approaching sustainability. One of the major shortcomings of the HDI was the fact that it ignored environmental factors, which *Hickel (2020)* addressed by modifying the methodology to create a Sustainable Development Index (SDI). In his study, the author found that per capita material footprint and CO₂ emissions moved relatively in line with changes in HDI. In his view, it is not the right message to have countries leading the list of development level when the same countries have serious deficiencies in environmental sustainability. Taking into account the limits of our planet is essential when considering long-term sustainability. This is why the SDI corrects the three components of the HDI for material use and CO₂ emissions. Thus, countries with a high environmental footprint are not able to compensate their pollution with high development values; consequently, the indicator belongs to the school of strong sustainability. All this shows a markedly different country ranking compared to the HDI ranking (*Table 1*). Based on the index, Hungary ranked 39th in the world, much better than the surrounding countries. This type of adjustment of the level of development is considered innovative and should be considered when designing a new index.

Table 1

Results for the best and worst performing countries in terms of HDI, SDG and SDI, and for Hungary and its immediate surroundings

| | Human Development Index (HDI) | | | Sustainable Development Goals (SDG) | | | Sustainable Development Index (SDI) | | |
|----------------------------|-------------------------------|-------------|-------------|-------------------------------------|--------------|-----------|-------------------------------------|-------------|-----------|
| | Country | Score | Ranking | Country | Score | Ranking | Country | Score | Ranking |
| Best performing countries | Switzerland | 0.96 | 1 | Finland | 86.76 | 1 | Costa Rica | 0.85 | 1 |
| | Norway | 0.96 | 2 | Sweden | 85.98 | 2 | Sri Lanka | 0.84 | 2 |
| | Iceland | 0.96 | 3 | Denmark | 85.68 | 3 | Georgia | 0.82 | 3 |
| | Hong Kong | 0.95 | 4 | Germany | 83.36 | 4 | Cuba | 0.81 | 4 |
| | Australia | 0.95 | 5 | Austria | 82.28 | 5 | Dominican Republic | 0.81 | 5 |
| Hungary and its neighbours | Austria | 0.92 | 25 | Austria | 82.28 | 5 | Hungary | 0.73 | 39 |
| | Poland | 0.88 | 34 | Poland | 81.80 | 9 | Croatia | 0.71 | 43 |
| | Croatia | 0.86 | 40 | Croatia | 81.50 | 12 | Romania | 0.69 | 53 |
| | Slovakia | 0.85 | 45 | Hungary | 79.39 | 22 | Poland | 0.42 | 128 |
| | Hungary | 0.85 | 46 | Slovakia | 79.12 | 23 | Slovakia | 0.29 | 149 |
| Worst performing countries | Romania | 0.82 | 53 | Romania | 77.46 | 35 | Austria | 0.24 | 155 |
| | Burundi | 0.43 | 187 | Somalia | 48.03 | 162 | Australia | 0.16 | 161 |
| | Central African Republic | 0.40 | 188 | Yemen | 46.85 | 163 | Qatar | 0.15 | 162 |
| | Niger | 0.40 | 189 | Chad | 45.34 | 164 | United Arab Emirates | 0.13 | 163 |
| | Chad | 0.39 | 190 | Central African Republic | 40.40 | 165 | Kuwait | 0.10 | 164 |
| South Sudan | 0.39 | 191 | South Sudan | 38.68 | 166 | Singapore | 0.10 | 165 | |

Note: The latest available data are 2021 for HDI, 2022 for SDG and 2019 for SDI.

Source: Edited based on UNDP (2022) for HDI, Sachs et al. (2023) for SDG, Hicckel (2020) for SDI

One of the most ambitious indicator projects is the UN's Sustainable Development Goals (SDG) indicator system, which is also classified as a composite indicator. The organisation first set out long-term development goals in 1992, and in autumn 2015 adopted its Agenda 2030, which includes the 17 SDGs that are still in effect (*UN 2015*). The objectives also cover balanced social development, sustainable economic growth and environmental protection. A total of 231 individual indicators are used to measure their achievement, which represents an enormous data collection effort. The results are published annually in the UN's Sustainable Development Report, which tracks changes in countries' performance on each SDG, as well as their aggregate performance on all SDGs. It has been repeatedly suggested that some SDGs may be more important than others (for example, climate action should take priority over other goals such as health and welfare), but no agreement has been reached on the different significance of each goal, and therefore each is given equal weight in the final index calculation, which is also suitable to rank countries. As the availability of basic data for the indicators varies, a total of 'only' 124 indicators are used to produce the ranking (*Sachs et al. 2023*). Hungary is ranked 22nd in the index and also ranks well in the region.

The problem with the SDGs is that they try to quantify a number of difficult-to-measure factors (e.g. freedom of the press), which are also incorporated into the composite indicator. Therefore, although one receives an index value covering a very large number of aspects, it can in fact be misleading as to how sustainable a country actually is. The indicator assesses socio-economic-environmental dimensions together; consequently, socio-economic performance may compensate for a weaker performance in the environmental dimension, and the indicator can therefore be classified as weak sustainability. Despite the problems, the breadth of both the calculation and the data collection is exemplary, and the metrics used are worth sampling when developing a new set of indicators.

After the international overview, we present three composite sustainability indicators developed in Hungary. In spring 2022, the HÉTFA Research Institute and Analysis Centre published its conceptual proposal for a Sustainable Performance Framework Index (SPFI). The composite indicator is intended to indicate changes in the state and quantity of factors of production, resources or capital goods; however, it is not aimed at measuring socio-economic welfare (*Bartus et al. 2022*). In contrast to the previous statement, however, the 35 indicators that are ultimately used include, for example, indicators on education, health and well-being which are also included in the SPFI.

The indicator not only provides an all-inclusive value as a result, but can also be interpreted at lower levels of aggregation. The indicators are classified according to 10 subcategories (e.g. education, biodiversity, quality of governance); this is the first level of aggregation. Related indicators were aggregated according to thematic themes by averaging, which is similar to the aggregation method used for indicators measuring each SDG goal. The second aggregate level shows the evolution of each resource (human, social, natural, economic) and finally, we can assess the country's performance according to the aggregate value. The role of each group in the index was determined using factor analysis.

The factor analysis is intended to classify the numerous, observed variables into factors, thus obtaining information on phenomena for which no specific data are available. For example, economic indicators such as GDP per capita and the number of hungry children per 1,000 persons are correlated and exhibit co-movement; consequently, some relationship is assumed between the two. Factor analysis groups these variables together, ideally reducing our multivariate analysis to 2–4 factors. The aim is to explain as much of the observed variance as possible using as few factor components as possible. Factor analysis therefore eliminates expert bias in the weighting of individual variables. By contrast, however, it makes it very difficult to understand the impact of each variable on the final outcome.

As with the SDGs, another problem is that only two of the 10 sub-category groups include information on the environment; therefore, it is easy to offset environmental degradation with good performance in the remaining 8 sub-categories, thereby measuring weak sustainability. The survey was carried out for only 10 countries,² making it difficult to assess the global situation of Hungary. Lagging behind the performance of its peers in the region, Hungary ranked 7th out of the countries surveyed. While it scored well in human and economic capital, it scored less well in natural and social capital, the latter being the worst. The SPFI and GDP, like the HDI, move closely together, which means that economic performance can excessively affect the overall value of an indicator designed to measure several aspects.

Also in 2022, the Makronóm Intézet, which studies economic development in Hungary, published its Harmonic Growth Index (HNI), which aims to assess the long-term equilibrium growth trajectories of countries around the world, taking into account not only economic development but also the factors necessary for the sustainability of such (*Makronóm Intézet 2022*). The indicator was calculated

² The 10 countries surveyed are Hungary, Poland, Slovakia, Czech Republic, Norway, Canada, Brazil, India, Singapore and Benin.

for the period of 2005–2019, with the selected 32 variables grouped along the lines of 6 dimensions: economic development; work and knowledge-based society; and economic, environmental, social and demographic sustainability. Similar to the SPFI indicator presented above, factor analysis was used to determine the weights assigned to each dimension. With HNI, we are able to get a more accurate picture of the extent³ to which each dimension affects the final result. Economic development and growth have the largest impact on the index value (25.8 per cent), while environmental sustainability has the second smallest impact (11.1 per cent).

The analysis was carried out on a broader scale, covering 87 countries, which is unprecedented by Hungarian standards. Countries are ranked according to their 2019 results, and those that perform similarly in terms of each dimension are grouped into 5 distinct clusters for easy comparison. The results show that developed countries dominate in 5 out of 6 dimensions, with the only one to fall out of the top 10 being demographic sustainability. Hungary stagnated between 2005 and 2012, then improved year by year after 2012, and the latest data for 2019 ranks Hungary in the 29th place. Looking at the individual dimensions, Hungary showed significant improvements in the components of economic sustainability and the work and knowledge-based society, while the other dimensions were characterised by stagnation and a slight decline can be observed in social sustainability.

Although the HNI is broad in terms of the countries covered, the time horizon and the number of variables included, the factor analysis makes it difficult to assess the impact of each indicator on the final result of the index. This compromises the extent to which the results can be communicated and interpreted. Due to the incomplete publication of the data, it is not possible to compare the results with those of the already presented other indicators. Hungary's overall ranking shows no marked difference (HNI: 29th, HDI: 46th, SDG: 22nd), although the HNI was calculated for far fewer countries.

In 2024, the experts of the Magyar Nemzeti Bank (the central bank of Hungary, MNB) also contributed to the wide range of composite indicators with their new sustainable growth index (SGI). The methodology was based on the Banking System Competitiveness Index presented in 2017 (*Asztalos et al. 2017*). The new composite indicator provides a view of sustainable development in European countries based on 64 indicators. The value of the index is composed of 4+1 pillars, with each pillar having a weight of 20 per cent in the final score: economic sustainability, financial

³ Economic development and growth: 25.8 per cent; Social sustainability: 19 per cent; Demographic sustainability: 17.6 per cent; Work and knowledge-based society: 17.5 per cent; Environmental sustainability: 11.1 per cent; Economic sustainability: 9.1 per cent.

sustainability, social sustainability and environmental sustainability. The last pillar is GDP itself, which is also weighted at 20 per cent (*MNB 2024*). The authors present each pillar and its indicators, detailing the trends suggested by each indicator. The results of the SGI are calculated by the MNB for the EU Member States. Based on data for 2022, Hungary ranked 20th out of 27 Member States. The MNB's experts found that Hungary was below the EU average in both GDP per capita and sustainability indicators. In addition, it is important to note that Hungary has seen the 4th highest increase in the value of the index since 2010 (*MNB 2024*). The SGI has the advantage of being based, to a large extent, on objective indicators and its weighting and calculation method is also transparent. The disadvantage is that the environmental-social dimensions only affect 40 per cent of the indicator's value; thus, a good performance in the economic-financial domain can compensate for weaker performance in the two aforementioned domains.

3.4. GDP-adjusting indicators

After describing easy-to-understand inventory-type indicators, the methodology of which is also relatively simple, and then hard-to-understand, complex indicator systems, which are often produced relying on complex and questionable methodologies, in the following we present a middle-ground solution. GDP became an indicator of the economic performance of countries worldwide after the Bretton Woods Conference in 1944. However, this most familiar economic indicator is not intended to measure the state of the environment, the sustainability of economic activity or health. It is no coincidence that the first pioneers of alternative indicators were various indicators that adjust GDP in order to take into account factors other than value added. The aim of any indicator of this type is to adjust the measure of welfare for the monetised value of sustainability factors.

The first major step in focusing on factors other than growth was the development of the Measures of Economic Welfare (MEW) by *Nordhaus and Tobin (1972)*. In addition to the Gross National Product (GNP), the indicator took into account the monetary value of leisure time and other economic activities not mediated by the market (e.g. household work). The aim was also to convert intermediate expenditure into consumption or investment (*Varga et al. 2019*). The changes resulted in a more accurate indicator of economic welfare. A sustainable version was also developed at the same time, which reduced the value of MEW by the value of the excessive exploitation of natural resources. The results showed that both sustainable and unsustainable MEW were higher than GNP, as MEW took into account the value of activities not previously quantified, while assigning a negligible value to the caused environmental damage. Nordhaus and his co-author conclude that MEW and GNP were well correlated in the United States between 1929 and 1965; therefore,

other than GNP, no other measure of welfare is needed (*Nordhaus – Tobin 1972*). Similar conclusions can be drawn for the HDI, SDG and SPFI composite indicators presented above.

The MEW index was developed further by *Daly and Cobb (1989)*, who formulated the Index of Sustainable Economic Welfare (ISEW). As part of the enhancement, the authors intended to adjust GNP to take into account the impact of consumption inequality on welfare and the present value of environmental degradation (*Varga et al. 2019*). Based on *Málovics (2012)*, the ISEW can be broken down into the following components:

$$ISEW = C_{adj} + P + G + W - D - E - N, \quad (6)$$

where C_{adj} is individual consumption expenditure adjusted for income inequality (Gini coefficient), P is the value of non-defensive public expenditures (e.g. infrastructure), G is the net change in capital formation and international (investment) position, W is the non-monetary items that increase welfare, D is private defensive expenditures⁴ (education and health), E is the cost of environmental degradation (e.g. water, air, sound pollution) and N is the depreciation of natural capital (e.g. the consequences of CO₂ emissions). In contrast to the MEW index presented above, the ISEW has had a strong global resonance. Several countries calculated the indicator for themselves in the 1990s. This notwithstanding, it failed to bring about a breakthrough or achieve lasting success. The lack of theoretical grounding and different calculation practices make the results difficult to compare. *Neumayer (1999)* negatively assessed the fact that many components in the calculations are based on assumptions. An example is the value of the loss of natural capital. The complexity of its estimation and the different ways of calculating it are illustrated by the SCC calculation presented above. Questions are raised by the application of weighting by income distribution, or estimating the rate of depletion of non-renewable resources; ignoring technological change and human capital growth is also questionable. Finally, since we wish to judge a country's performance by a metric, the dimensions of economic welfare and sustainability are inevitable to merge, which assumes the perfect substitutability of natural capital, and therefore the indicator follows the theory of weak sustainability.

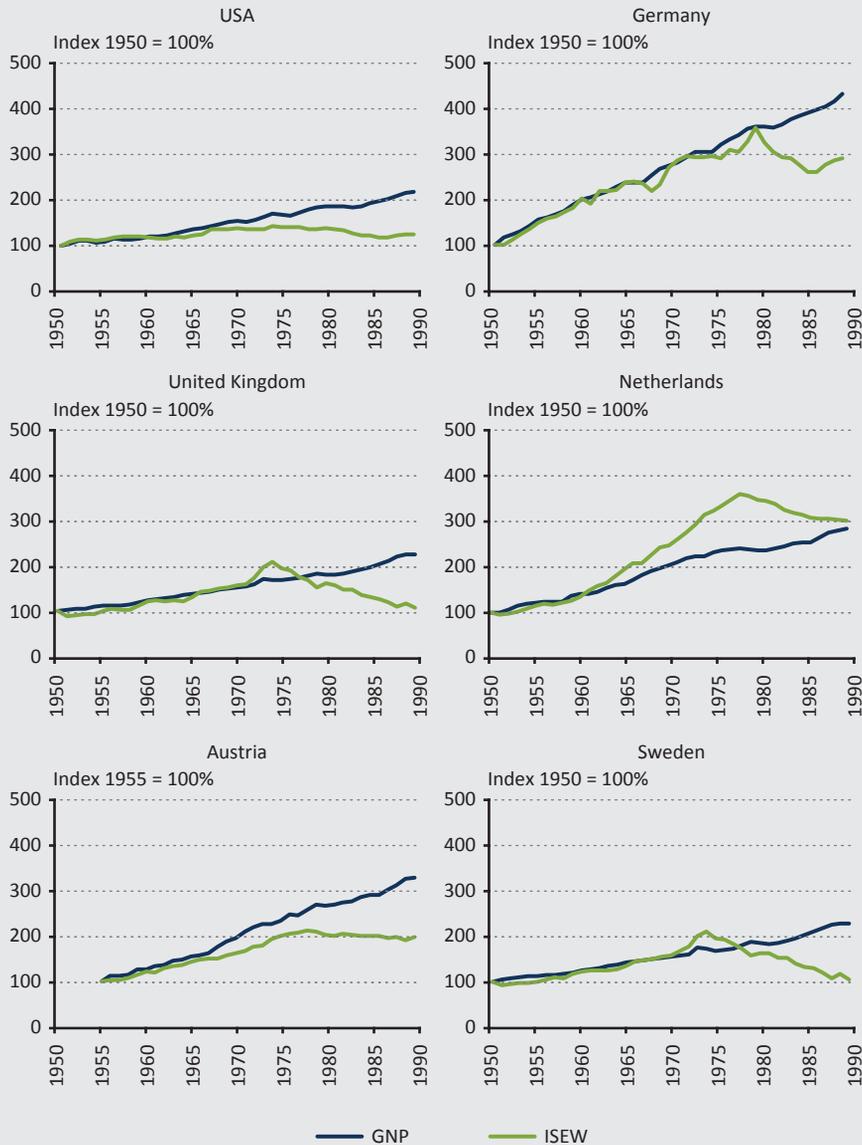
⁴ Private defensive expenditures refer to individual consumption decisions to protect against the negative externalities stemming from economic growth. Examples include crime, divorce, commuting, unequal income distribution, knowledge acquired at cost, and rising health costs due to road and workplace accidents, all of which lead to a deterioration in welfare.

Despite the inconsistent calculation methods (mainly due to the variation in the data available and the different weights), a similar trend emerges for the ISEW–GNP relationship in various countries. The ISEW rose at a much slower rate than GNP and then started to decline from the 1980s. *Max-Neef (1995:3)* referred to this phenomenon as a ‘threshold hypothesis’, whereby ‘for every society there seems to be a period in which economic growth (as conventionally measured) brings about an improvement in the quality of life, but only up to a point – the threshold point – beyond which, if there is more economic growth, the quality of life may begin to deteriorate’. The upward trend, followed by a point of decline, can be observed in several countries, such as the United States, the United Kingdom, the Netherlands, Sweden, Germany and Austria (*Figure 3*). In addition to these world-leading surveys, calculations have been carried out, among others, for Chile (*Castañeda 1999*), Spain (*O’Mahony et al. 2018*), Turkey (*Menegaki 2018*), Germany (*Held et al. 2018*), Japan (*Makino 2008*), France (*Nourry 2008*), and Italian and Belgian regions (*Pulselli et al. 2012, Bleys 2013*). The most recent European study on this topic was published in 2024 (*Van der Slycken – Bleys 2024*), which provides recent ISEW figures for the EU-15⁵ for the period of 1995–2018.

The ISEW indicator has been criticised for not taking into account the decline in environmental values in a sufficiently robust way to a sufficient extent. *Cobb et al. (1995)* elaborated further on the concept of ISEW to include a broader range of environmental factors, namely, the value of leisure activities and the value of voluntary work. As a result of their efforts, a new measure, the Genuine Progress Indicator (GPI), has been developed, but because of confusion between ISEW and GPI calculations in both the literature and practice, we refer to them collectively as ISEW.

⁵ The EU-15 includes Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and (historically) the United Kingdom.

Figure 3
Trends in GNP and ISEW per capita in the United States, the United Kingdom, Germany, the Netherlands, Austria and Sweden, 1950–1990



Note: The values are presented in indexed form for better comparability, following the Jackson – Stymne (1996) model.

Source: United States: Cobb et al. (1995), Germany: Diefenbacher (1994), United Kingdom: Jackson – Marks (1994), Netherlands: Rosenberg – Oegema (1995), Austria: Stockhammer et al. (1997), Sweden: Jackson – Stymne (1996)

Another measure, ‘green GDP’, was published in 1993 as an annex to the UN System of National Accounts. The organisation had developed an integrated System of Environmental-Economic Accounting (SEEA) to assess the value of environmental capital and ecosystems. Similar to the ISEW calculations, it seeks to monetise the environmental burden associated with each sector and economic activity. An important difference compared to the ISEW calculation is that green GDP focuses exclusively on environmental factors and does not include the measurement of socio-economic sustainability. The United Nations Statistical Commission adopted the SEEA as an official standard in 2012. However, the SEEA did not offer a solution to all of the criticisms of the ISEW calculations, as evidenced by the fact that several proposals have since been made to improve the indicator (*Lawn 2003, 2013; Beça – Santos 2010*).

3.5. The Magyar Nemzeti Bank’s sustainable GDP indicator

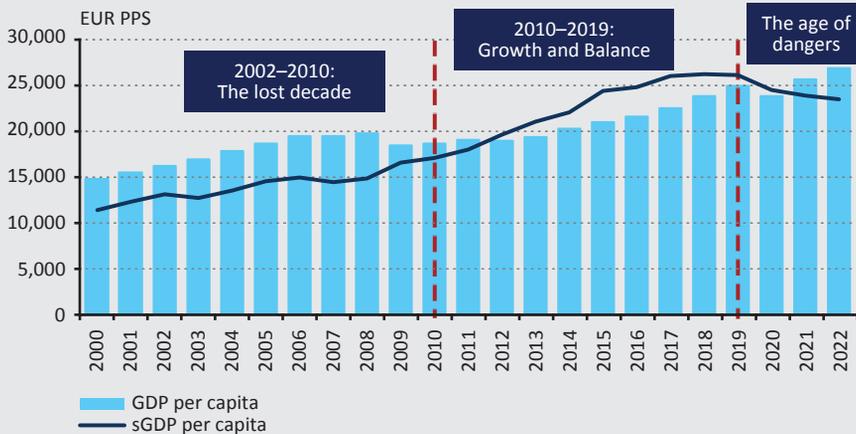
From the 2020s, an increasing number of central banks started to address financial risks of environmental origin in a structured way. Indeed, it is increasingly accepted that environmental changes have multiple effects on both price stability and financial stability, the two most important mandates of central banks. A sustainable financial system can play a key role in meeting the climate change challenge and in the transition to a low-carbon economy (*Halmai 2023*). This provides an opportunity for central banks to be involved, as an ancillary consequence, in the efforts to create an ideal indicator that focuses on sustainability.

The Magyar Nemzeti Bank has been working for several years to make the domestic financial system more sustainable and to facilitate ‘green’ economic thinking. In 2019, the Hungarian central bank published its textbook entitled ‘*Long-term sustainable econo-mix*’ (*MNB 2019a*), launching a series of publications on sustainable economics. The MNB declared that we needed to achieve progress that was financially, environmentally and socially sustainable over the long term. Also in 2019, in its capacity as a supervisory authority, the MNB launched its Green Programme, which aims to green the operation of the domestic financial system and the MNB’s own operations, as well as to build relevant social and professional relationships (*MNB 2019b*). In spring 2021, the MNB was the first European central bank to receive a green mandate from the parliament. The series of publications continued in 2022 with the publication of a global discussion paper entitled ‘*New Sustainable Economics*’ (*MNB 2022a*) and the accompanying expert background paper ‘*New Economics for Sustainability*’ (*MNB 2022b*), in which experts of the MNB declare that ‘without a fundamental transformation of economic thinking, the sustainability turnaround is unattainable’ (*MNB 2022b:7*).

After a thorough theoretical review of the new sustainable foundations of economics, a new global discussion paper, ‘*Sustainable GDP*’ (*MNB 2024*), was published by the MNB in 2024. In the volume, in addition to the SGI indicator

mentioned among the composite indicators, MNB experts also proposed a sustainable GDP (sGDP) indicator. According to the MNB definition, ‘GDP is sustainable if it has been or could have been generated while maintaining the balance of (i) the product and labour markets; (ii) the financial sector; and (iii) net lending, and it (iv) preserves ecological resources, and (v) ensures a fair distribution of the goods and services produced’ (MNB 2024:230). Each of these criteria is represented by a key indicator and accordingly, 5 indicators are used in total to adjust the original GDP value. The advantage of a methodology based on relatively few input indicators is that the results are comparable over time and space for all 27 countries of the European Union. With sGDP, the MNB examines the extent to which the 5 indicators described above deviate from what is considered to be an equilibrium situation. If a certain indicator falls below equilibrium, it reduces sGDP; i.e. GDP is not sustainable, while values above equilibrium increase sGDP, indicating that there is room for GDP growth. Since sGDP can be increased at the expense of environmental capital, this indicator also follows the theory of weak sustainability. The MNB’s results show that in Hungary, sGDP consistently underperformed GDP in the 2000s, which indicates that GDP performance at that time was based on unsustainable factors. Since 2012, sGDP has exceeded GDP; in other words, the conditions were right for further GDP growth. In 2021 and 2022, sGDP fell below actual GDP levels due to the impact of the crises (Figure 4).

Figure 4
Trends in GDP per capita and sGDP in Hungary, 2000–2022



Source: MNB (2024)

The advantage of sGDP is that it is produced using a common methodology for all 27 EU Member States; therefore, while the calculation of green GDP and ISEW indicators varies from country to country, sGDP is able to provide a view of country

performance on a common basis. In light of this, it is important to note that the methodology for sGDP was developed by the MNB based on a different approach from the GDP modification exercises presented earlier, and therefore the results of the exercise cannot be compared with the green GDP and ISEW calculations presented above.

In our view, based on the presentation of the calculation practices in the study (Table 2), the Hungarian scientific community should consider joining the set of green GDP and ISEW calculation practices. The advantage of this is that no such research has yet been performed in Hungary and accordingly, a unique calculation could be made, the results of which could be compared with ISEW practices in other countries, for which historical data and recent studies are available. If such a calculation is made, efforts should be made to ensure the transparency of the methodology and the results. The index requires a great deal of computing capacity, data and research and may also require the involvement of several institutions. For the new indicator, it is indispensable to aim for as long a time series as possible, preferably covering at least 30 years.

| Inventory-type metrics | GDP-adjusted indicators | Complex (composite) indicators |
|------------------------|--|--|
| Ecological footprint | Measures of economic welfare (MEW) | Human Development Index (HDI) |
| Biocapacity | Index of Sustainable Economic Welfare (ISEW) | Sustainable Development Index (SDI) |
| | Genuine Progress Indicator (GPI) | Sustainable Development Goals (SDG) |
| | Green GDP | Sustainable Performance Framework Index (SPFI) |
| | Sustainable GDP (sGDP) | Harmonic Growth Index (HNI) |
| | | Sustainable Growth Index (SGI) |

4. Summary

GDP is an excellent measure of economic welfare. However, it does not take into account factors that contribute to a large degree to people's quality of life. The focus on increasing GDP can undermine other factors that contribute to quality of life, such as the quality of the environment. This is why it is important to look beyond GDP when making decisions. For sustainable growth, we need to ensure not only that wealth increases, but also that environmental capital remains intact. There are three types of indicators available to assess sustainability. Inventory-type indicators describe changes in measurable phenomena such as biocapacity or ecological footprint. Composite indicators aim to condense the different dimensions

of sustainability (welfare, environment, society) into a single indicator. The green indicators that modify GDP are designed to correct economic performance by taking into account other factors, notably, environmental damage. It may be possible that central banks will find the key to the solution through their respective research.

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Deglobalisation and Decoupling Tendencies in the Visegrád Countries in the Wake of the Polycrisis*

Tamás Ginter  – Patrik Tischler 

After a number of shocks (including the Covid-19 pandemic and the war in Ukraine, in particular), global trade has undergone a transformation that is characterised by deglobalisation and decoupling tendencies. In this paper, we use descriptive statistics to analyse the short-term effects of exogenous shocks on international trade in the Visegrád countries. We find that between 2019 and 2022, deglobalisation tendencies were not persistent in the region. The trade-to-GDP ratio has exceeded the pre-pandemic levels (thus, the region is more globalised than in 2019), despite short-term declines induced by the various shocks. While the region trades mainly with politically-economically aligned partners, the proportion of international trade with non-Western partners has also grown over the past four years. Trade with Russia has declined significantly since the outbreak of the war in Ukraine, but decoupling from China has not started. However, certain country differences apply.

Journal of Economic Literature (JEL) codes: F02, F50, F62

Keywords: deglobalisation, decoupling, Central and Eastern Europe, Visegrád countries

1. Introduction

The global economy of the 2020s may be experiencing “the most difficult set of challenges of the 21st century”, the so-called “polycrisis”, during which nations must simultaneously tackle climate change, the Covid-19 pandemic, the threat of nuclear war and the war in Ukraine (Henig – Knight 2023:3). One of the key changes induced by the polycrisis is that exogenous shocks such as the pandemic and the war in Ukraine have evoked a need for a massive restructuring of global value chains (GVCs; see Hausmann 2020; Halmai 2023). Measures aimed to prevent the

* The papers in this issue contain the views of the authors which are not necessarily the same as the official views of the Magyar Nemzeti Bank.

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spread of the coronavirus included temporary closures of borders and businesses, causing trade disruptions on a global level and thus incentivising companies and governments to prioritise safety over (economic) efficiency (Simola 2021). From early 2022 on, war in Ukraine resulted in a further destabilisation of supply chains: sanctions and public pressure prompted Western companies and governments to sever trading ties with Moscow, transforming energy trade flows on a global scale, amongst other things (see e.g. Borin et al. 2023). The far-reaching effects of the pandemic and the war in Ukraine have led to a shift in the globalisation debate: due to the uncertainty caused by the exogenous shocks, the past years have reinforced the narrative of deglobalisation.

This paper aims to empirically analyse potential deglobalisation tendencies in CEE countries after the pandemic and the war in Ukraine, respectively. To do so, in the literature review, we first introduce the terminology used for describing different (de-)globalisation phenomena and present their brief theoretical development, with a particular focus on the CEE region. Based on this framework, we then conduct an empirical study of how the polycrisis of recent years has influenced deglobalisation (including a brief historical overview of globalisation tendencies in the past two decades) and decoupling tendencies in Central and Eastern Europe by examining international trade flows.

2. Theoretical background

In the course of developments in the past decade, a wide range of new concepts has emerged when describing phenomena related to globalisation. Therefore, in the first section of the literature review, we introduce a set of relevant concepts (such as deglobalisation, nearshoring, friendshoring, etc.). As this paper is not a systematic literature review, we do not aim to collect all available definitions and aspects, providing instead a taxonomical framework upon which we then base our empirical analysis.

Globalisation is commonly associated with international economic integration, multilateralism and interdependence among nations. Thus, globalisation is not characterised by a single factor, but is instead a complex *“process that encompasses the causes, course, and consequences of transnational and transcultural integration of human and non-human activities”* (Al-Rodhan – Stoudmann 2006:5; see also Halmai 2023). Therefore, globalisation has a cultural dimension with the transmission of different cultures, traditions and knowledge across borders. In the economic dimension, globalisation creates a highly interconnected economic environment through the establishment of global value chains, the enhancement of free trade, international capital flows, cross-border payments and the establishment

of international organisations (Kim et al. 2020; Irwin 2020). Globalisation also has a political dimension associated with global governance, meaning that states in hegemon positions provide a level of global order, which affects the functioning of every nation to a greater or lesser extent. This political globalisation comes hand in hand with global rivalry among hegemon, as they aim to maintain their authority over the global order by means of military and economic power as well, creating dependencies and vulnerabilities in GVCs. Thus, political (de-)globalisation is one of the key drivers of economic (de-)globalisation and vice versa: changes in power structures at certain intervals (as a result of rivalry) can initiate globalisation and deglobalisation trends (Chase-Dunn et al. 2023).

According to Jones (2005), a historical cyclical pattern can be observed between globalisation and deglobalisation forces. Jones argues that the first wave of globalisation lasted from 1840 to 1929. After that, the Great Depression caused the first deglobalisation wave from 1929 to 1979, during this period the negative consequences of the Second World War and the formation of the bipolar world order reversed globalisation. Then, globalisation gained ground again, as financial and trade integration developed quickly and peaked, until the Global Financial Crisis (GFC) in 2008. The GFC marked a turning point, as distrust in the global financial system and global companies emerged among citizens, pushing nations towards renationalisation, populism and financial fragmentation (James 2018; Kim et al. 2020). As Halmai (2023) stated, the GFC led to a temporary decline in global trade of over 10 per cent. Before the GFC, global trade had reached more than 60 per cent of global GDP, before falling to approximately 50 per cent by 2009. Subsequently, up to now, global trade has still not been able to recover to pre-GFC levels.

After the GFC, a new wave of deglobalisation emerged, marked by a significant drop in international trade and foreign direct investment (FDI; Witt 2019). Goldberg – Reed (2023) argue that recent deglobalisation processes can be clearly divided into three stages. Between 2015 and 2019, due amongst other things to Brexit and the emerging trade war between the USA and China, protectionist policies gained momentum, triggering a slowdown in globalisation, but not terminating it. With the outbreak of the pandemic, there appeared a growing need to enhance the resilience of value chains, and thus a justification for nearshoring (also known as reshoring or backshoring). Last but not least, the war in Ukraine compelled decoupling based on political alliance: demand for minimising trade with countries that are not considered friends resulted in the restructuring of GVCs in the form of friendshoring.

With the growing need to describe deglobalisation processes, a broad range of definitions and concepts has emerged. According to *Kandil et al. (2020)*, reshoring implies the geographical relocation of activities within a company back to a country close to the country of origin. Consequently, there is no significant difference between the meanings of reshoring and nearshoring, as nearshoring means relocating activities to a nearby country compared to the home country. Thus, we argue that the two terms are used interchangeably. Furthermore, while friendshoring (which is undeniably the most important component of decoupling) aims to reduce supply chain risks by shifting GVCs to trusted and friendly countries, the term backshoring used in Europe indicates relocating abroad activities back to the home country of the company. The term decoupling is used similarly to that of friendshoring (denoting the need to minimise trade with politically non-aligned countries; see *Maihold 2022*). In this paper, for the purposes of our analysis, we use the term “decoupling” as an equivalent of friendshoring.

Our analysis focuses on deglobalisation and decoupling tendencies in the Visegrád countries (i.e. the Czech Republic, Hungary, Poland and Slovakia). The reasons for our particular focus on the Visegrád countries as the subject of the analysis are manifold. First, the four Visegrád countries share a very similar historical development. After having been controlled (partially or entirely) by the Habsburg Empire and a short-lived independence between the two world wars, they were forced to be members of the Warsaw Pact. Since having regained their independence in the early 1990s, these countries have transitioned from a centrally planned to a market-oriented, open economy and become parts of Western structures (the EU and NATO, most notably) (*Gorynia – Wolniak 2009; Losoncz 2017*). This market transformation resulted in a significant increase in foreign trade and inward foreign direct investment. In addition, they also share a common political-cultural platform, the Visegrád Group (*Kazharski 2020; Pakulski et al. 2016*). Second, these countries’ geographical position is peculiar amidst the polycrisis of the early 2020s: with the global economy transforming into two blocks, these countries are the easternmost members of the Western bloc. This is of particular relevance not only because of geographical proximity to the war, but also due to the high level of energy-related links with Russia. Third, while they show very similar characteristics in terms of the structure of the economy and economic development, these countries are also among the most embedded in global trade and are thus particularly vulnerable to disturbances of global supply chains (*Chetverikova 2020; Darmo et al. 2020; Kordalska – Olczyk 2021*). Additional similarities among the Visegrád countries can also be detected in terms of trade relations, as they developed strong trade linkages with Germany in the 1990s. Moreover, these countries have gained a similar position in GVCs: their presence is more robust within the downstream segment of GVCs compared to developed countries (such as the USA, Germany, Japan) and

EU average. Thus, the Visegrád countries present lower added value in global trade, meaning that their economies tend to focus on assembly phases in manufacturing (Ciešlik *et al.* 2016).

The deglobalisation tendencies of the past decade have also been present in the four Visegrád countries (García-Herrero – Tan 2020; as cited by Bykova *et al.* 2021): the latest literature features conflicting findings as to whether the region has witnessed a decreased pace of globalisation (slowbalisation) or a decrease in the level of embeddedness in GVCs (deglobalisation). Bykova *et al.* (2021) also suggest that these trends are reinforced by the trade shifts caused by the pandemic. This is also confirmed by Kalotay – Sass (2021), who state however that the Visegrád countries were less affected by the reduction of FDI inflows than the global average. Kaarevirta *et al.* (2023) analysed decoupling tendencies in the CEE region as well.¹ The authors contend that on the one hand little evidence is available for decoupling on a global level and on the other hand the level of bilateral trade flows has grown even considerably between the USA and the CEE region and China and the CEE region, respectively. Thus, so far, on an aggregate level, the CEE region has not taken a demonstratable part in decoupling tendencies.

Based on the reviewed literature, we pose the following research questions:

- Has the polycrisis affected the level of globalisation of the Visegrád countries? Does the region align with the global trends in deglobalisation?
- Have the Visegrád countries started decoupling from non-aligned economies? If so, can the region be considered homogeneous in terms of the possible restructuring of trade flows?

3. Methods

3.1. The quantification of (de-)globalisation

To quantify the terms of deglobalisation and decoupling, we use international trade statistics as a proxy variable. Based on Vujakovic (2009) and Irwin (2020), we assume that a country's international trade as a share of GDP can be used as a proxy for the degree of globalisation. While this does not cover all dimensions of globalisation (see e.g. financial globalisation, capital flows, political-institutional globalisation, etc.), numerous authors (see above) consider this as a sufficient means for tracing (de-)globalisation tendencies.

¹ Kaarevirta *et al.* (2023) consider Poland, Romania, Bulgaria, Ukraine, Hungary and Czechia as Central Eastern Europe, thereby diverging from the Visegrád Four to a certain extent.

Data were retrieved from the “*Direction of Trade Statistics (DOTS)*” database of the IMF.² DOTS “presents the value of merchandise exports and imports disaggregated according to a country’s primary trading partners. (...) Imports are reported on a cost, insurance and freight (CIF) basis and exports are reported on a free on board (FOB) basis” (*IMF DOTS*).

For our long-term analysis, we used annual data of the IMF DOTS ranging between 2002 and 2022 (the latest timepoint available). In order to obtain data comparable both in temporal and geographical terms, we calculated trade-to-GDP ratios (adding up imports and exports by country and then dividing it by the respective GDP, with data on the latter retrieved from the World Bank³). With four countries (the Czech Republic, Hungary, Poland and Slovakia) in the sample, our long-term analysis consisted of a sample with N=84.

To paint a more detailed picture of deglobalisation tendencies during the polycrisis, we collected data (in million USD) on quarterly imports and exports (and total international trade, as an aggregate) by country and divided this by the quarterly GDP of the respective country for the time period between 2019Q1 and 2022Q4.⁴ Quarterly GDP data was retrieved from the OECD’s Quarterly International Trade Statistics (*OECD 2023*). We calculated an import-to-GDP ratio, an export-to-GDP ratio and a trade-to-GDP ratio (expressed in the form of percentages), allowing for country comparison (and controlling for inflationary effects, amongst other things).⁵ We thus obtained an initial dataset with three indicators: with the four examined countries (i.e. the Czech Republic, Hungary, Poland and Slovakia) and 16 (15 in the case of Poland) quarters in our sample, we used here a dataset with N = 65.

3.2. The quantification of decoupling

With the aim of measuring the effects of decoupling in the Visegrád countries, we used the same IMF DOTS dataset. The database contains trade volume with respective trading partners (covering “all IMF member states, some non-member countries, the world and major areas”; IMF DOTS) for each country (quarterly, between 2019Q1 and 2022Q4).

² <https://data.imf.org/?sk=9d6028d4-f14a-464c-a2f2-59b2cd424b85>. Downloaded: 16 March 2024.

³ Source: *Countries and Economies*. <https://data.worldbank.org/country>. Downloaded: 28 February 2024.

⁴ Except for Poland where data is available until 2022Q3.

⁵ Instead of calculating the percentage change (by defining the first point on the timeline as 100 per cent), we calculated nominal percentages, thus allowing for the comparison of the trade structure of the respective countries in the sample.

In order to quantify the effects of decoupling/friendshoring, we follow a two-step methodological process. First, we grouped all trading partners into two possible subgroups. The first subgroup contains aligned countries (in terms of economic partnership and foreign policy), while the second subgroup contains all other trading partners. As *Rashid (2022:47)* argues, the war in Ukraine “pushed the world into an ideological divide”, identifying the West as one pole of an emerging new cold war. Aligning with both sociological concepts (see e.g. *Huntington 1996; World Population Review*⁶) and economic ones (e.g. *Spielvogel 2015, IMF database*⁷), we consider all member states of the European Union and/or NATO and/or the European Free Trade Association (see complete list in the *Appendix*) as members of the group of allies. All other countries (that were not included in the group of allies) were considered as the “rest of the world” (RoW).⁸ Trade figures by both groups were added up (thus expressing the sum of exports, the sum of imports and the sum of international trade by group). With this first grouping, we aim to quantify the effects of decoupling, as we set up a possible distinction between countries aligning with the Western side of the political-economic divide and the rest of the world. With four countries and 16 (15 in the case of Poland) points on the timeline, we once again obtained a dataset with N=65, with the following variables:

- International trade with allies (the sum of exports and imports, as a percentage of GDP)
- International trade with RoW (the sum of exports and imports, as a percentage of GDP)

At this point, it is worth noting that we use data on trade value for measuring the effects of deglobalisation and decoupling. This data, however, does not reflect on price changes. It is therefore possible that even if trade grew in a certain period, the actual volume of traded goods did not. This is also addressed in *Section 5*.

In the second step of our analysis, we proceeded as follows. In order to explore the phenomenon of decoupling in more depth, we further broke down the aforementioned two-faceted categorisation of allies and RoW. Based, *inter alia*, on *Kaaresvirta et al. (2023)*, we constructed the following subgroups of the main trading partners:

⁶ Source: *Western Countries 2023*. <https://worldpopulationreview.com/country-rankings/western-countries>. Downloaded: 14 August 2023.

⁷ *World Economic and Financial Surveys*. International Monetary Fund. <https://www.imf.org/external/pubs/ft/weo/2022/01/weodata/groups.htm>. Downloaded: 14 August 2023.

⁸ The reason for using this dichotomous categorisation is derived from *Rashid (2022)* on the one hand. On the other hand, the concept of decoupling / friendshoring implies a dichotomy itself: a country is either friendly or it is not; the ideological divide leaves little room for anything in between. The second step of our analysis aims to paint a more detailed picture where both allies and RoW are further deconstructed into relevant trading partner countries and country groups.

- the European Union,
- the United States,
- China,
- Russia,
- the United Kingdom,
- and Japan and South Korea (as an aggregate of the two sums).

It is worth noting that certain trading partners in the list above belong to the category of allies, while others belong to that of RoW (notably, China and Russia). Besides being some of the main trading partners of the region, these two countries (i.e. China and Russia) are the ones that are the main subjects of Western decoupling intentions. Thus, this allows for a direct analysis of decoupling phenomena (or, potentially, the lack thereof).

The six listed countries and country groups cover at least 86 per cent of total imports and exports of the Visegrád countries (and often exceed even 90 per cent).⁹ This also implies that an analysis of trade with these countries and country groups provides sufficient understanding of decoupling in the Visegrád countries.

As we were primarily interested in the decoupling effects emerging during the polycrisis, we used quarterly data from between 2019Q1 and 2022Q4 for imports and 2019Q1 and 2023Q2 for exports, respectively (the difference in the timeframe resulted from the availability of data). Altogether, we thus obtained a dataset of 16 quarters for imports, while 18 quarters for exports and 6 export partner groups, resulting in a total N of 816 (all items in all the four examined countries' exports and imports). In order to control, *inter alia*, for inflationary effects and other distorting factors, we calculated the ratio of exports to (imports from) a certain trading partner to total exports (imports). Thus, we were able to measure the relevance of a certain trading partner country or country group proportionately to total trade.

⁹ Detailed statistics on the distribution of trade with the six constituted countries and country groups can be found in the *Appendix in Table 1*.

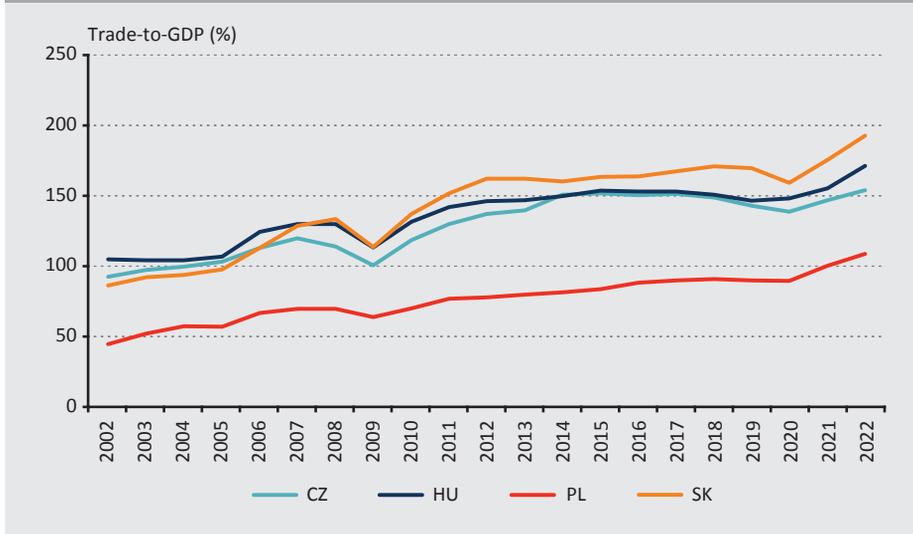
In this paper, we thus use descriptive statistics to analyse the short-term effects of exogenous shocks on international trade in the Visegrád countries. While descriptive methodology does not allow for testing hypotheses, it does provide us with the opportunity to answer the research questions stated in *Section 2*.

4. Results

4.1. Long-term (de-)globalisation tendencies in the Visegrád countries

First, we aimed to provide an overall picture of (de-)globalisation tendencies of the analysed region over the longer run, for the period from 2002 to 2022. This allows us to construct a framework for the time when we later strive to identify deglobalisation tendencies (or a lack thereof) in the region during the polycrisis of the early 2020s. Our results correspond with the relevant findings in the literature (see *Kaaresvirta et al. 2023; Kalotay – Sass 2021*). We found that European economic integration had a visible effect on these countries' embeddedness in the global economy: the examined countries were characterised by a rising share of foreign trade (to GDP) between 2004 (the year of EU accession) and 2007/2008 (the start of the Global Financial Crisis). Recovery after the GFC was achieved by the early 2010s (varying by country to a certain extent), with the globalisation indicator exceeding pre-crisis levels. A notable slowdown in the pace of globalisation occurred in the second half of the 2010s (referred to in much of the literature as “slowbalisation”; see *Kandil et al. 2020; Bykova et al. 2021*). Then, in 2020 (i.e. the outbreak of the Covid-19 pandemic), a sudden decline was seen in the level of globalisation (albeit less grave than during the GFC), which was followed by a quick recovery, despite the prolonged crisis induced by the pandemic and the subsequent war in Ukraine (which was also assumed to have further disrupted GVCs.) In addition, in accordance with previous suppositions (see *Chetverikova 2020; Losoncz 2017; Cieřlik et al. 2016*), it is visible that while the Czech Republic, Hungary and Slovakia share a very similar path and extent of globalisation tendencies, Poland's share of foreign trade (in relation to GDP) is significantly lower than that of the other three countries. Also, the Polish economy appears to be more resistant to shocks (such as the GFC or the Covid-19 pandemic). This presumably results from the relative size of the Polish economy and that the Polish economy relies strongly on internal consumption (in contrast to the other three Visegrád countries, which mainly base growth on foreign investment). *Figure 1* shows the aforementioned trends in detail.

Figure 1
Long-term (de-)globalisation tendencies in the Visegrád countries between 2002 and 2022

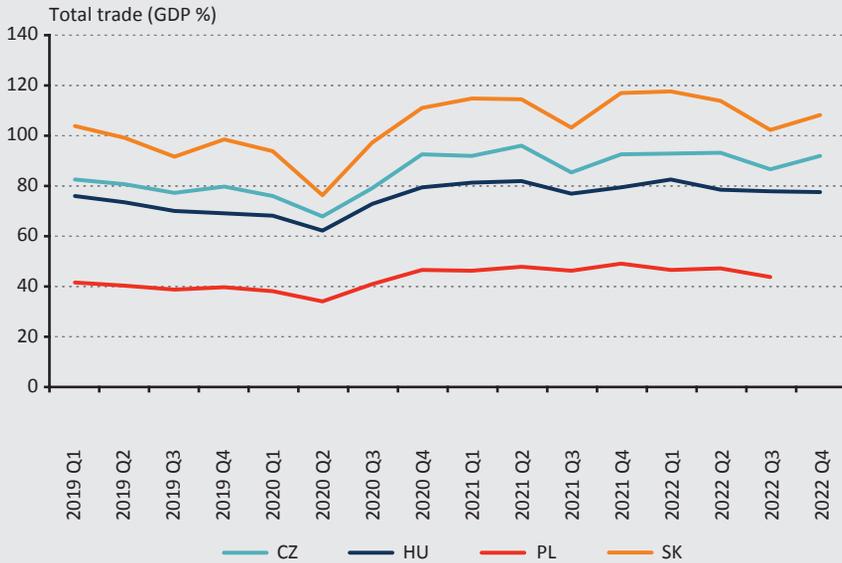


Source: Compiled based on data from IMF DOTS and the World Bank

4.2. Short-term effects of the polycrisis on the (de-)globalisation of the Visegrád countries

In this section, we present the statements on short-term deglobalisation tendencies that can be drawn from international trade statistics. First of all (and despite the widespread presumption of deglobalisation tendencies), over the longer run (i.e. between early 2019 and late 2022) we do not see any significant decline in international trade. International trade (controlled for the change in output) was higher in late 2022 than prior to the shocks of the early 2020s (i.e. the Covid-19 pandemic and the war in Ukraine). This is true for all four countries in the sample, regardless of these countries' embeddedness in global trade flows (which has traditionally been significantly lower in the case of Poland compared to the other three Visegrád countries, for comparison, see also *Figure 2*).

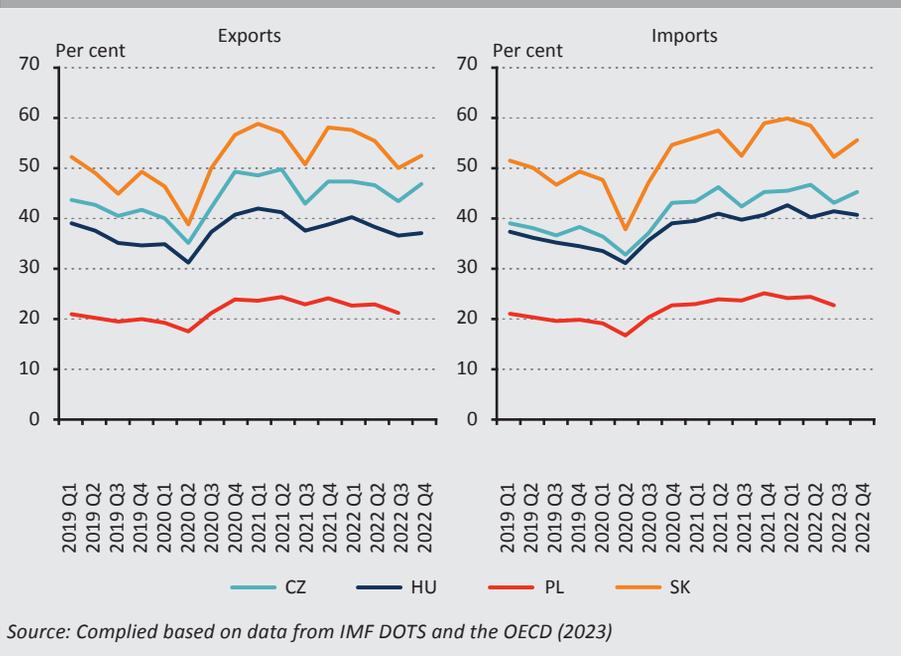
Figure 2
International trade as a percentage of GDP in the Visegrád countries



Source: Compiled based on data from IMF DOTS and the OECD (2023)

However, during the past four years, components of the polycrisis affected international trade figures over the short run. All of the examined economies experienced a significant drop in international trade in the first wave of the Covid-19 pandemic (2020Q1 vs. 2020Q2), due to restrictions and the short-term deterioration of global value chains. This drop, however, was followed by a very quick recovery of trade activities, which exceeded the pre-pandemic levels within a maximum of 6 months. A similar drop occurred in 2021Q2 to 2021Q3, followed by another fast recovery. The drop was caused by manufacturing supply chains reaching their limit and slowing down production, thus creating further disruptions in international trade (*Tradeshift 2021*). Unlike the outbreak of the Covid-19 pandemic in early 2020, the war in Ukraine affected the international trade of the Visegrád countries with a lag, as the ratio reached its low point as late as 2022Q3, approximately one half year after the start of the war (it should be noted that the downturn in 2022Q3 still approximates the 2019 figures in all of the examined countries). Thus, we can state that the supply chain shocks caused by measures aimed to stop the pandemic had a faster and more direct effect on international trade than the war in Ukraine (and sanctions directed against Moscow).

Figure 3
Imports and exports as a percentage of GDP in the Visegrád countries



Source: Compiled based on data from IMF DOTS and the OECD (2023)

If the trade statistics are further broken down into imports and exports, we see that the imports-to-GDP ratio is slightly higher in all of the examined countries in late 2022 (compared to early 2019). By contrast, exports are slightly lower in Hungary, slightly higher in Slovakia, and roughly the same in the Czech Republic and Poland in late 2022 (compared to early 2019). Therefore (assuming that international trade is a proxy for measuring globalisation), we can state that no significant deglobalisation trends can be detected in the Visegrád countries, but also that international trade did not increase significantly. (See *Figure 2* on overall trade statistics; a presentation of disaggregated data on imports and exports can be seen in *Figure 3*. Certain limitations regarding the shift in terms-of-trade ratios may apply; this is addressed in the subsequent subsections.)

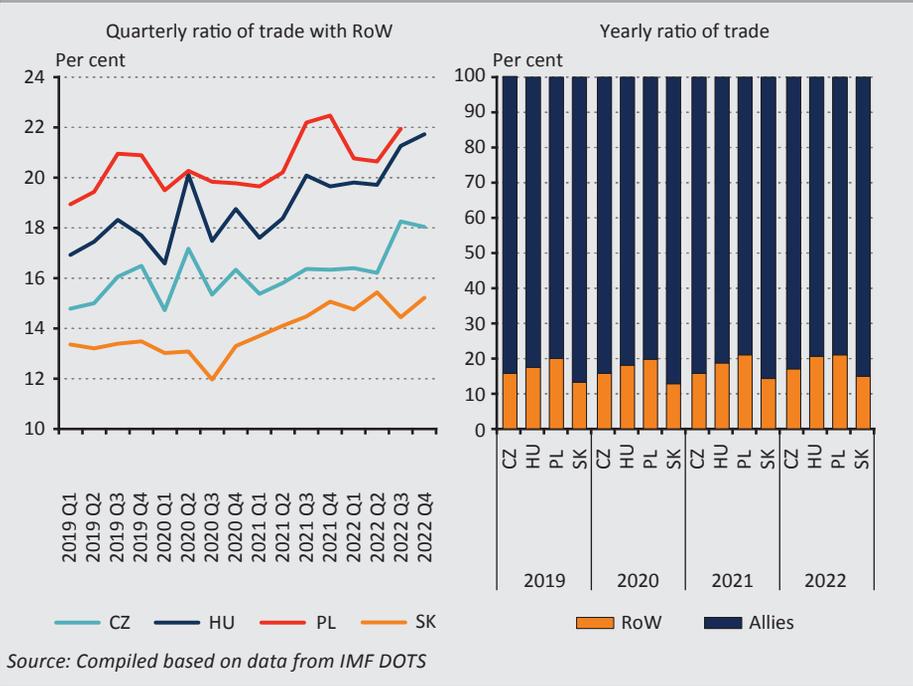
4.3. Decoupling tendencies in the Visegrád countries

4.3.1. Share of trade with allies and RoW

In this section, we focus on decoupling tendencies in the Visegrád countries after the polycrisis of recent years (and the shock of the war in Ukraine, in particular), based on international trade statistics. To measure these effects, we first use the previously introduced dichotomous categorisation of the group of allies (i.e. NATO, EU, and EFTA countries) and the rest of the world (RoW).

First of all, we find that the Visegrád countries trade predominantly with allies. Between 2019 and 2022, over 80 per cent of the trade conducted by the Czech Republic, Hungary and Slovakia trade was with allies, with Poland’s ratio also fluctuating around 80 per cent. Accordingly, between 2019 and 2022, only 12–15.4 per cent of Slovakia’s international trade flowed to and from RoW countries. In the Czech Republic, this ratio ranges between 14.7 and 18.2 per cent, in Hungary 16.5–21.7 per cent, and in Poland 18.9–22.5 per cent. (Interestingly, while Poland is the least open economy in the examined group, its trade relations are also the most diversified in terms of this two-faceted setup.) Disaggregated for imports and exports, the ratio of imports from RoW to total imports significantly exceeds that of exports directed towards RoW countries to total exports. (See *Figure 4* on overall trade data with RoW and allied countries to total trade ratio, while disaggregated data on imports and exports by trading partners can be found in *Sections 4.3.2 to 4.3.4.*)

Figure 4
International trade with allies and RoW countries as a percentage of total trade in the Visegrád countries



Source: Compiled based on data from IMF DOTS

When analysing the effects of the polycrisis, it is worth noting that – despite all of the efforts to shorten value chains and minimise trade with countries outside the political-economic block of alliance – trade with RoW countries has not diminished over the past four years. All of the examined countries traded more with RoW countries in 2022 than they did in 2019 (adjusted for GDP). In the Czech Republic, Hungary and Poland, the Covid-19 pandemic resulted in an upward spike in trade with the rest of the world (most probably due to a need for healthcare goods typically produced by non-Western countries). Also, 2021 as a whole was characterised by an increase in the ratio. When analysing imports and exports on aggregate, no clear decline in trade with RoW can be shown after the start of the war in Ukraine. One major exception here is Poland, where a decline in trade with RoW countries can be seen in the ratio in 2022Q1 and 2022Q2 (in the case of Slovakia, after the outbreak of the war, the ratio oscillates close to the value recorded for 2021Q4).

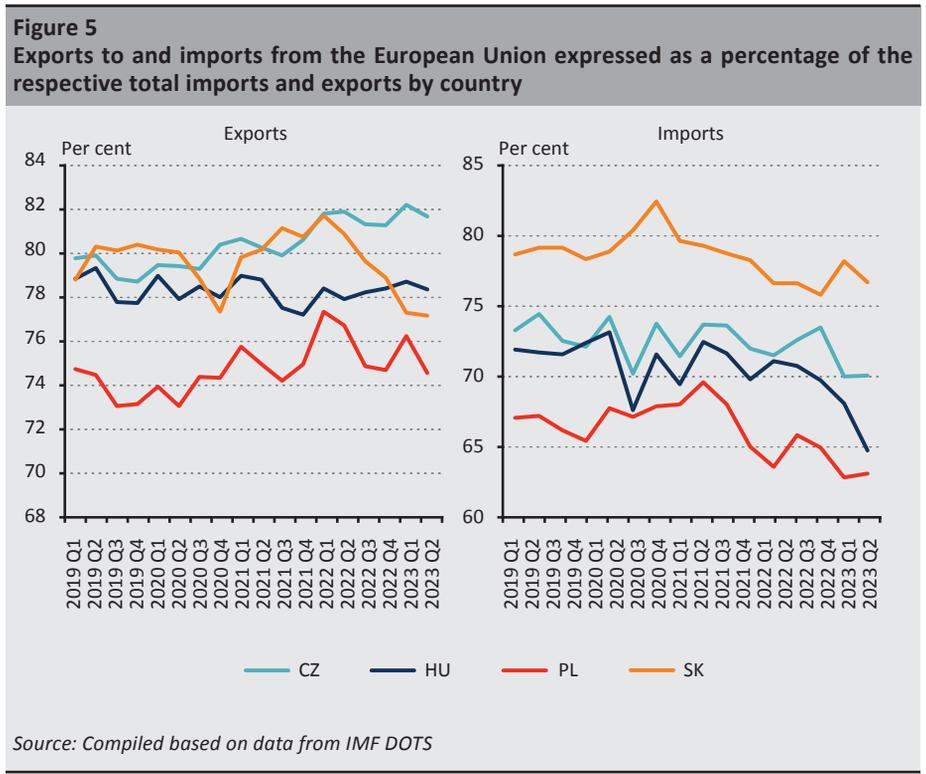
Altogether, considering exports and imports on aggregate, no clear signs of decoupling can be seen in the Visegrád countries in a dichotomous setup (i.e. distinguishing between allies and RoW). In order to paint a more detailed picture, in the next section we analyse trade flows with specific trading partner countries (and country groups).

4.3.2. Trade with the European Union

While “decoupling” has become a keyword when it comes to the restructuring of global value chains in the past years, it was already shown in *Section 4.3.1* that all of the Visegrád countries mostly trade with countries (and groups) with which they are politically, economically and militarily aligned. By far the most significant trading partner of the region has been and remains the European Union. Out of all countries, at least 70 per cent of exports are directed towards the European Union, with Poland being the least reliant on EU exports, while Czech exports directed to the EU exceed 80 per cent. (This reflects not only the political-economic alignment of the region, but its position in European-owned global value chains.) Furthermore, exports to the EU have remained more or less constant regardless of the polycrisis: a moderate decline can be seen in Slovakia, while moderate growth occurred in the case of the Czech Republic.

The European Union is also the largest import partner for all of the Visegrád countries, with imports ranging from approximately 65 per cent (in the case of Poland) to approximately 80 per cent (in the case of Slovakia), with the Czech Republic and Hungary in between. However, in respect of trends and tendencies, the polycrisis did affect the ratio of imports to the region: between early 2019 and late 2022, imports from the EU declined by 2–7 percentage points (with Hungary

registering the steepest decline). This, however, can not necessarily be interpreted as a “decoupling from the EU”. The relative decline in imports from the EU most likely resulted from the steep increase in energy prices starting from 2021 on (and particularly early 2022; see e.g. *Yagi – Managi 2023*) (with energy being imported from outside the EU, thus reducing the relative proportion of trade with the European Union). *Figure 5* presents the aforementioned results in detail.



4.3.3. Decoupling – imports (non-EU)

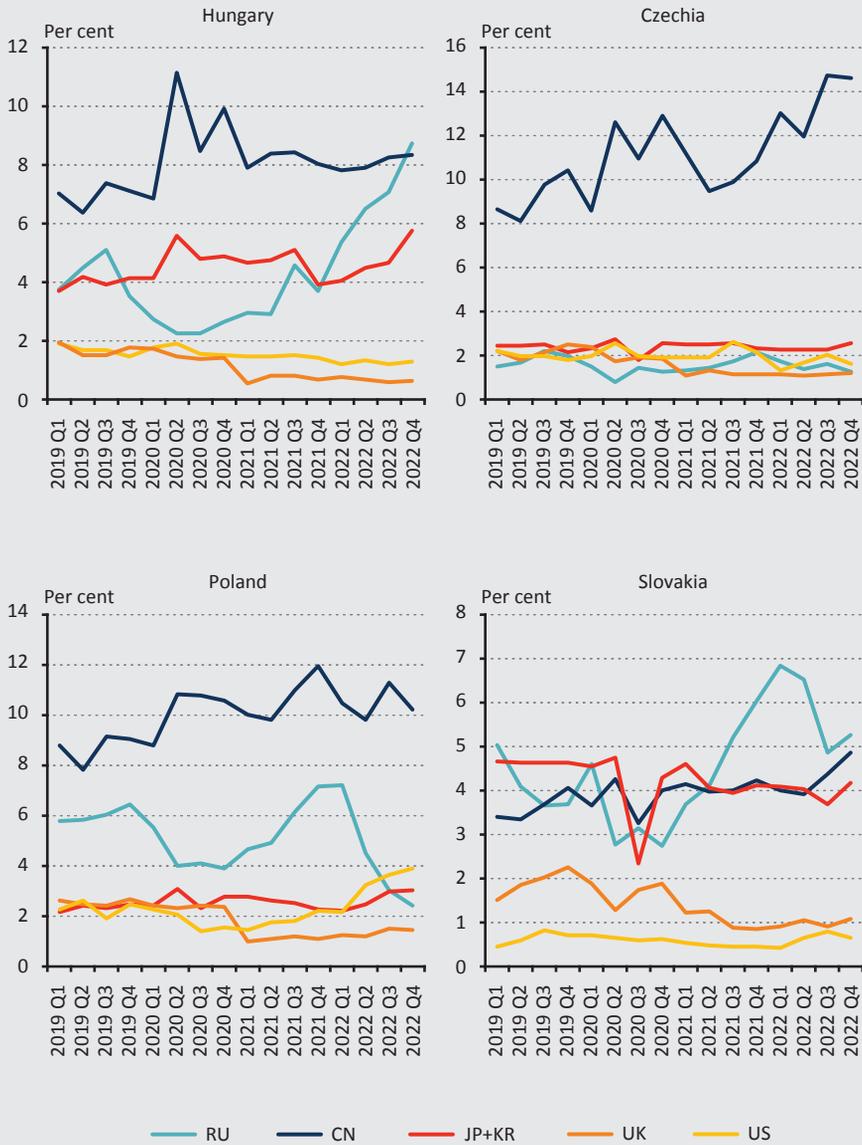
When it comes to analysing imports from the aforementioned partners and partner groups, the Visegrád countries diverge. However, some commonalities can be mentioned. First, even though China is one of the trading partners from which certain Western actors aim to decouple, none of the Visegrád countries trade less (as a percentage of total trade) with China than before the start of the polycrisis. Moreover, in all four countries, the ratio of Chinese imports is higher

than before 2020 (with significant upward spikes during the start of the Covid-19 pandemic, presumably reflecting the elevated need for healthcare products typically manufactured in China). Also, it is worthy to mention that, except for Slovakia (and in 2022Q4, Hungary), China is the number one import partner for all countries; China's position is particularly strong in the case of the Czech Republic.

The four countries diverge when it comes to decoupling from Russia. In geopolitical terms, Russian power projection potential is significantly higher in the region than that of China. Thus, while the global decoupling discourse primarily focuses on China (vis-à-vis the United States and Europe), decoupling from Russia carries with it a particular significance for the region – due to the geopolitical proximity on the one hand and energy dependence on the other. Despite certain common regional interests, significant country differences apply. Poland decoupled to a vast extent from Russian imports after the start of the war in Ukraine, shrinking its imports by two thirds throughout 2022. Poland's ability to decouple from Russia is likely associated with the fact that Warsaw had already severed numerous energy sector ties prior to the war in Ukraine (see e.g. *Abnett et al. 2022*). Czech imports from Russia have stagnated since the start of the polycrisis (at around 2 per cent of total imports), while Hungarian and Slovak imports have risen significantly (due to the sharp rise in energy prices from late 2022 on).

Imports from the United Kingdom, the United States, Japan and South Korea represent a relatively small proportion (less than 5 per cent in all cases) of total imports in all four Visegrád countries. By late 2022, no major overall rises in imports from the aforementioned partners had occurred, and the trade relations are rather characterised by stagnation. Imports from the UK tended to shrink (presumably due to Brexit rather than any decoupling aims). A notable rise in imports from the United States occurred in the case of Poland throughout 2022. Further details can be seen in *Figure 6*.

Figure 6
Imports from Russia, China, Japan, Korea, the United Kingdom and the United States expressed as a percentage of total imports by Visegrád countries



Source: Compiled based on data from IMF DOTS

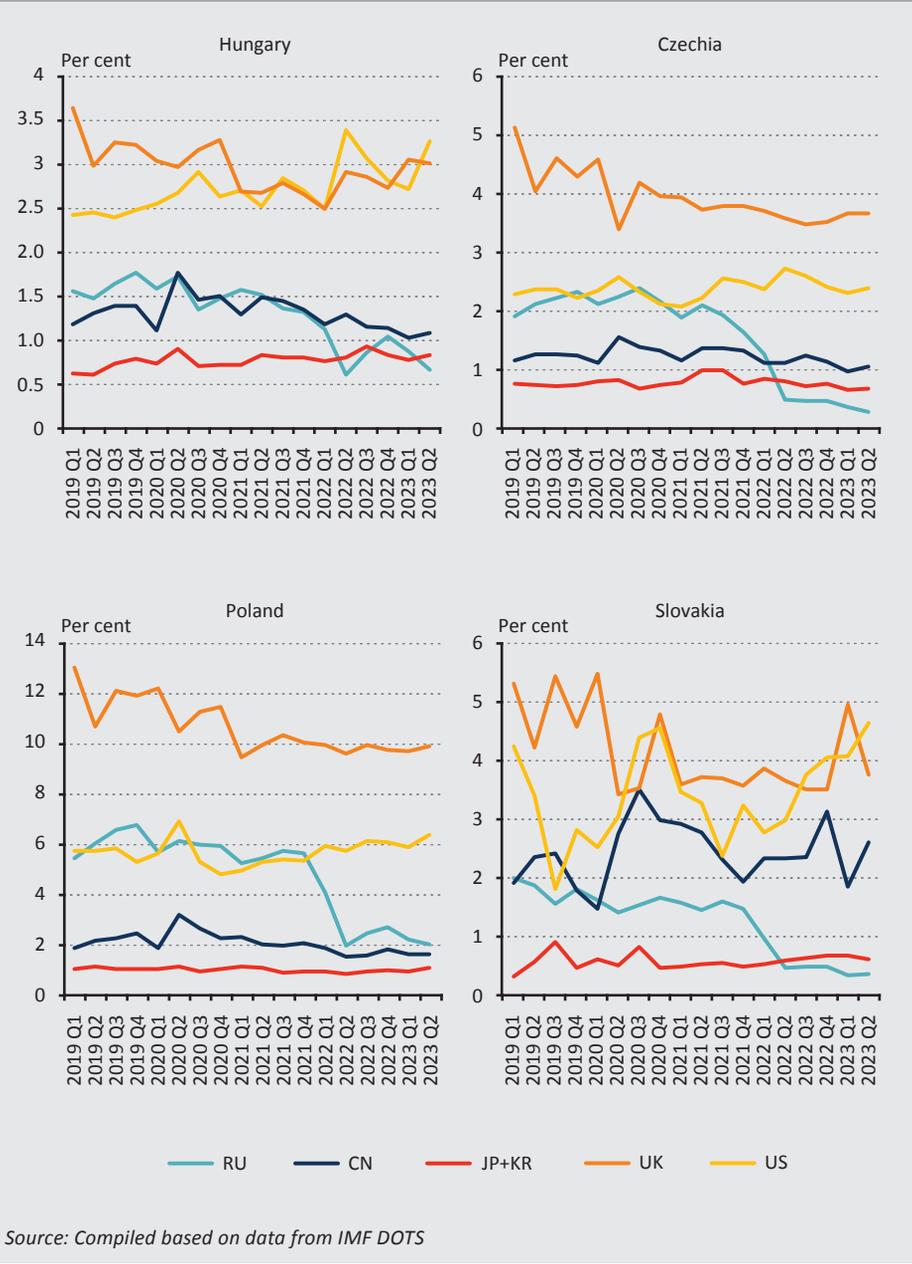
4.3.4. Decoupling – exports (non-EU)

In respect of exports, besides the European Union, the United Kingdom and the United States are the largest partners of the Visegrád countries (before 2022, Russia came in second place in some quarters for some of the countries; this shift is shown below), while these two partners play a less significant role in imports. This fact clearly reflects the region's position in global value chains: while imports arrive from the East (China, in particular), after assembly, goods move westward. Exports to the UK shrunk to some extent between 2019 and 2023 (again, presumably due to Brexit) except for Hungary, which exported more to the United Kingdom during this period. Thus, trade with the major Western partners did not grow significantly (despite the communicated need for re- and friendshoring). Similarly, exports to Japan and Korea also did not change significantly; however, altogether these two countries account for less than 1 per cent of total exports for each country and thus are not to be considered major export partners for the region.

While China is the most significant import partner for all Visegrád countries, it plays a significantly less relevant role when it comes to exports (also well reflecting the region's position in GVCs). Only one per cent of the respective Visegrád countries' total exports is directed towards China (the ratio is somewhat higher in Slovakia, ranging between 1.5 and 3.5 per cent during the examined timeframe). Exports to China saw a short-term upward spike during the first wave of the Covid-19 pandemic. Other than that, no major changes in exports have occurred, and accordingly there are no signs of decoupling from Chinese exports, despite Western efforts to do so.

While the region has not decoupled from the Chinese economy in the past five years, the case with Russian exports differs. In all four Visegrád countries, exports to Russia already started to decline before the start of the full-scale invasion of Ukraine and reached an all-time low in 2022, with exports falling by one half to two thirds after February 2022. Thus, in contrast to the lack of decoupling from China, the region indeed did decouple from the Russian economy (when it comes to exports) due to the geopolitical reshuffling, the sanctions regimes, uncertainty and the lack of trust in Russian actors (see e.g. *Sonnenfeld et al. 2022*). This has been the case regardless of foreign policy preferences (that do diverge among the Visegrád countries to some extent). Further details can be seen in *Figure 7*.

Figure 7
Exports to Russia, China, Japan, Korea, the United Kingdom and the United States expressed as a percentage of total exports by Visegrád countries



5. Conclusion

In this section, we summarise our key findings and their contribution to state-of-the-art literature on deglobalisation and decoupling. The key findings are the following.

1. In contrast to expectations about deglobalisation (see *Witt 2019, Goldberg – Reed 2023*), the ratio of international trade to GDP in the Visegrád countries is higher than before the pandemic. Thus, in terms of the value of international trade, the countries examined are more globalised than ever. Accordingly, we do not see any long-term changes in international trade in any of the Visegrád countries in the wake of polycrisis. Shocks (such as the pandemic, the war and the disruption of supply chains in Q3 2021) did indeed cause temporary setbacks in the trade-to-GDP ratio, but a recovery generally occurred within no more than two quarters.
2. Trade between the Visegrád countries and non-aligned ones (RoW, i.e. non-NATO, non-EU and non-EFTA) countries is generally low (ranging between 12 and 22 per cent of total international trade activities, respectively). However, trade with RoW countries in 2022 was higher in all of the examined cases than in 2019.
3. After we deconstruct the dichotomous setup, it becomes clear that the EU is by far the biggest trading partner of the region. Besides the EU, China is the biggest import partner of every Visegrád country, but a minor partner when it comes to exports. The share of trade with China has not declined since 2019, and thus the region has not started decoupling from the Chinese economy.
4. Russia was (and in some cases, still is) a major import partner for the region. When it comes to imports, Poland (which is less energy dependent on Russia) was able to decouple from the Russian economy after February 2022 to a vast extent; this, however, could not be achieved by the other three Visegrád countries due to energy-related links. Nevertheless, all of the Visegrád countries export significantly less (as a proportion of their total imports) to Russia since the outbreak of the war in Ukraine in 2022, signalling weakening bonds with the Russian economy.

Our findings contribute to the current literature in several ways. While deglobalisation and decoupling have become an ever more widely researched phenomenon in the course of the past years (see especially *Kaarevirta et al. 2023*), hitherto no focus was directed on the Visegrád countries' trade patterns in the wake of the polycrisis. We hope to have narrowed this gap.

Also, our findings challenge mainstream expectations about trade tendencies in the Western world. Neither have the economies of the Visegrád countries become

less globalised than in the late 2010s, nor have they decoupled from the non-Western part of the global economy. This is particularly surprising in a region that is extremely embedded into GVCs (and thus has a potential to reduce this embeddedness) and which is much more affected by the war in Ukraine (due to its geographic proximity) than its Western counterparts. With these findings, we generally support the claims of *Kaaresvirta et al. (2023)* and *Kalotay – Sass (2021)* regarding the lack of deglobalisation and decoupling in the region, and thus contradict *Bykova et al.'s (2021)* expectation of deglobalisation tendencies in the Visegrád countries. We also contribute to previous findings by presenting specific characteristics in the trade of the respective countries in the sample.

In terms of decoupling, it is also important to note how differently trade relations with Russia and China have developed. While decoupling is often treated as an equivalent of decoupling from China, the Visegrád countries – due to historical and geographic reasons – have a different focus when it comes to restructuring supply chains. As China does not pose a direct geopolitical threat to the Visegrád countries, there are no intentions to reduce this dependence. On the other hand, trade with Russia has shrunk to a vast extent since the 2022 escalation of the war in Ukraine. As energy ties are relatively hard to sever, the reduction of trade is particularly visible on the side of exports. Conclusively, the Visegrád countries' focus area on decoupling lies closer to home: it is directed against trade with Russia, instead of China.

The aforementioned findings have several implications. From a theoretical perspective, one must consider the issue of why deglobalisation and decoupling tendencies are lacking in this part of the world. While the format of such a paper does not allow for a thorough analysis for the reasons for this phenomenon, we suggest a few possible explanations.

First, in a region that is extremely dependent on its embeddedness in GVCs, political elites (irrespective of ideological preferences) will remain committed to maintaining participation in global commerce – even if this contradicts the interests of powerful allies or other domestic (geopolitical, economic, etc.) aspects. (This is a significant implication for policymakers within and outside the Visegrád countries as well: the globalised nature of these economies puts pressure on local policymakers to sustain international trade with all possible measures as long as possible.) Second, the lack of deglobalisation tendencies (or in some cases even the growth of the level of globalisation) can be explained by the specific position of the region in GVCs. Traditionally, the Visegrád countries (and CEE economies in general) are specialised in production phases with lower added value. Thus, when it comes to reshoring/nearshoring production processes, the Visegrád countries can be an alternative to faraway, politically unstable or untrustworthy countries to which low value-added production was offshored previously (East Asia, in particular). If production is indeed

nearshored to the Visegrád region, it explains why this region can become further globalised, despite deglobalisation tendencies on a global level. This again has a very important policy implication: decoupling tendencies hide a potential for the region, as these countries have good chances to attract production sites withdrawing from the non-Western world.

In the meantime, overall decoupling tendencies (i.e. aims to create a bipolar world economy) are not persistent in the Visegrád countries, and trade with non-aligned partners has grown in the past years (for obvious motives, Russia is an exception in this case). The most notable reason for this might be the fact that the Visegrád countries constitute a region that is already decoupled to a notable extent. The region predominantly trades with aligned countries (and in particular, fellow EU members), leaving little space for further decoupling. Also, the structure of GVCs incentivises maintaining the current setup. Beside the fact that GVCs are not necessarily easily reconfigured, the region is a connection point in production where imports from non-aligned countries are assembled, which later move westwards, to aligned countries. This function as a gateway thus leaves little space for individually determined decoupling, unless global decisions on value chain reconfigurations are made.

Also, we find it paramount to emphasise the special position of the Visegrád countries when it comes to decoupling. These countries focus on decoupling from Russia (instead of China, or, in more general terms, from all non-aligned economies) due to obvious geopolitical reasons. A simultaneous decoupling from both Eastern powers (in more general terms, all non-aligned economies) seems economically implausible and thus the priority is set to the decoupling from the more direct threat (even if the severing of energy ties can only be a longer-term goal in some cases). Thus, in this paper, we make a case for a new, regionally adjusted understanding of decoupling.

As a conclusion of this paper, we identify some limitations of our work and propose some directions for potential further research. Regarding the limitations, first (and as stated in the methodological unit of the paper), we used international trade as a proxy variable for measuring globalisation. The key here is the word proxy: while many (see *Vujakovic 2009* and *Irwin 2020*) argue that it is indeed a good proxy for globalisation, it does not cover all possible factors, such as cross-border flows of capital or political-institutional globalisation. Furthermore, as addressed in *Section 3.2*, in our dataset, we used trade volumes (in USD) to measure globalisation (and not terms of trade). Thus, it is possible that the lack of deglobalisation (and, in some cases, trade volume growth) rather reflects the price growth of certain goods and not a real upward shift in goods traded. On the one hand, this does not change our findings on globalisation: international exposure is well reflected in the value trade volume (measured in USD). On the other hand, we suggest that future research

delve further in this phenomenon to determine whether international trade (as a whole and by different possible groupings, as well) grew in real volumes as well, or it is the change in prices that leads to the perceived growth. The former would indicate higher embeddedness in the global economy, while the latter would tend to implicate problems of the real economy. Another methodological limitation is the potential persistence of sanction evasion (especially when it comes to decoupling from Russia where, as our analysis suggests, significant supply chain reconfigurations took place within a short timeframe); trade diversions via intermediaries were not controlled for in our analysis.

Additionally, our sample is limited in both geographic and temporal terms. While our results apply to the Visegrád countries, it would be worthwhile to extend our research to the entire CEE region (including the Baltics and the Balkans), or even to examine the issue on a global database. Also, the timeframe analysed (i.e., from 2019Q1 to late 2022 and early 2023) allows for measuring short-term effects of the polycrisis, it would also be worthwhile to examine the topic in a broader timeframe when it comes to the measurement of decoupling. This applies to decoupling tendencies since (at least) the GFC in 2007–2008 on the one hand, and a retrospective analysis some years in the future on the other (especially considering the fact that already the 2010s featured some events, such as the 2014 Russian aggression in Ukraine or the US-China trade war, that may have affected trading partner preferences). It is certain, however, that, due to the economic, political and military shifts in the global order, not even by then will deglobalisation and decoupling tendencies lose relevance – neither in the Visegrád countries nor elsewhere in the world.

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Appendix

Countries categorised into the group of allies: Albania, Austria, Belgium, Bulgaria, Canada, Croatia, the Czech Republic, Denmark, Estonia, Finland, France, Greece, Germany, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Montenegro, the Netherlands, North Macedonia, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, the United Kingdom, the United States.

| | Exports (%) | Imports (%) |
|----------------|-------------|-------------|
| Czech Republic | 90.29 | 91.10 |
| Hungary | 87.43 | 90.03 |
| Poland | 86.95 | 87.96 |
| Slovakia | 91.53 | 93.22 |

Source: Compiled based on data from IMF DOTS

Differences between Hungarian Innovation-Driven and Innovative Enterprises Based on Primary Research*

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The extensive growth model of the Hungarian economy in the 2010s should be gradually completed and then replaced by an intensive growth framework with innovation at its core. This is why it is important to gain a deeper insight into the innovation process. Innovation-driven enterprises are a specific group of innovating firms, which are special in that they achieved rapid revenue growth in their innovation-oriented business in the 2010–2019 business cycle. In our research, we explore what factors influence rapid growth among innovative firms. Our results indicate that the factors supporting growth were rising technological and human capital levels, increasing export intensity and improving access to venture capital, while the credit financing at low interest rate that characterised the previous decade did not lead to rapid growth in the distinctive innovation-driven segment. Innovative enterprises are typically robust companies with strong indicators and in many cases (entrepreneurial capacities, attitudes or perception of the market) they show similarities to enterprises in the innovation-driven group.

Journal of Economic Literature (JEL) codes: C83, O39, O49

Keywords: innovation, growth, survey data, regression analysis

1. Introduction

The catching-up of the Hungarian economy in the 2010s was based on growth that was mainly driven by extensive (quantitative) factors. However, the demographic trends, economic structure conditions and developments in commodity markets

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underscore the imperative to transition towards a new, intensive growth paradigm in order for growth to continue. This paradigm is based on boosting productivity and competitiveness, and optimising energy efficiency as essential components. In 2023, Hungary was ranked third out of four clusters as assessed in the European Innovation Scoreboard based on the Oslo Manual (*OECD/Eurostat 2018*), classified into the group of “moderate innovators”. One fundamental element of this intensive growth transformation is to foster an innovative corporate sector characterised by continuous renewal, ensuring the expansion of value-creating capacity in the Hungarian business landscape through the generation of marketable knowledge and skills.

In this study, we investigate the often elusive factors that contribute to the rapid growth of innovative businesses. This research contributes to the domestic innovation literature by examining two distinct groups of economically robust firms with observable innovation capabilities. These groups consist of enterprises that (a) received an R&D innovation tax allowance or were listed in the patent and trademark database of the National Intellectual Property Office; or (b) applied for innovation development grants from the National Research, Development and Innovation Office (NRDIO). Growth drivers are identified through an examination of individual, primary research data from innovative firms.

In *Section 2* of the paper, we review the relevant literature. In *Section 3* we present the data utilised for our analysis, while *Section 4* outlines the methodology. Our findings are then presented in *Sections 5* and *6*, with *Section 7* summarising our conclusions.

2. Literature background and motivation

While innovation is a crucial factor, it alone does not guarantee successful convergence in economic development. Achieving sustained, rapid economic growth is not solely contingent on innovation; it also requires entrepreneurial skills. There is a prevailing perception that fast-growing firms, often referred to as gazelles, outperform incumbent firms in terms of competitiveness. Empirical evidence, however, challenges this assumption (*Szerb et al. 2017*). Contrary to the expectations, (non-innovative) gazelle firms achieve rapid growth as one-hit wonders, lacking sustained innovation or external market ambitions. Consequently, they struggle to replicate their initial outperformance (e.g. *Parker et al. 2010; Hölzl 2014; Daunfeldt and Halvarsson 2015*; or, in the Hungarian context, *Szerb et al. 2017*; and *Komlósi and Szerb 2016*). Various business demographic features (such as industry, firm size, age and geographic location) play a role in determining whether a firm qualifies as a growth gazelle. Surprisingly, less than one fifth of these

firms exhibit innovative behaviour based on historical performance data (Szerb *et al.* 2017). Recent research by Varga-Csajkás *et al.* (2019, 2023) investigates the relationships between physical proximity and innovation collaborations among Hungarian high-tech gazelles using an agent-based model. Beyond geographical distance, alternative dimensions of distance – specifically technological and social distance – have a significant impact on the formation and density of innovation collaborations. Bodor *et al.* (2019) extend this inquiry by examining social capital in non-innovative Hungarian gazelles. Their findings reveal that all three types of social capital (connecting, linking, bonding) are only marginally accessible to these firms. Notably, the fastest growing companies with superior innovation performance exhibit distinct financing profiles: one group relies on bank and grant funding (linking social capital), while the other segment of gazelles secures financing through relatives and friends (bonding social capital).

The prevailing belief is that innovation significantly enhances the productivity of companies, thereby contributing to overall economic growth. In the context of Hungary, Halpern (2020) conducted empirical research and identified two distinct channels through which innovation influences productivity. Firstly, innovation directly improves productivity levels. Secondly, it indirectly impacts productivity by influencing the prevalence of innovative firms within the economy. The direct effect is nuanced by the fact that higher innovation performance as a share of assets is associated with higher profitability only above a certain level (Nádudvari 2017). Dai *et al.* (2019) investigated the aggregate impact of firm-level innovation on overall productivity growth. They found that the small impact of company innovation on aggregate productivity growth is primarily attributable to suboptimal resource allocation within innovative enterprises. This suggests that the relationship between productivity growth and innovation is not unambiguously positive, and the direction of causality is not clear (Halpern 2020; Kiss 2022). Statistically, innovative firms tend to exhibit higher productivity levels compared to non-innovative firms. Conversely, more productive enterprises are also more inclined to engage in innovative activities. These patterns are similar in the literature concerning the interplay between innovation and foreign market activity (Melitz 2003; De Loecker 2007). Beyond productivity gains, innovative companies can reach broader markets by enhancing the attractiveness of their products. This phenomenon which underscores the relationship between innovation and foreign market presence in the domestic context was studied by Halpern and Muraközy (2010).

High, sustained growth in innovative companies is not guaranteed, as previously discussed. Innovative performance is influenced by a range of external and internal factors, including cooperation, customer and supplier relationships, organisational flexibility, education system, tax policies, support mechanisms and financing options,

as well as managerial attitudes and behaviour (Kiss 2001; Pál 2007; Kiss 2013; Borsi 2017; Gelei and Kenesei 2017; Katona 2021; Ónodi and Répáczky 2022). Some of these characteristics can also contribute to entrepreneurial success. Geographical distance plays a significant role in determining the extent of innovation and the formation of collaborations (Grosz 2011). However, it is not the sole factor. Beyond geographical distance, scientific studies increasingly focus on the impact of other distance-related aspects on fostering innovation (Bodor et al. 2019; Varga-Csajkás et al. 2019, 2023). Firms with well-developed innovation cultures exhibit higher rates of competitiveness and success (Saxenian 1996). Innovation culture encompasses factors such as encouraging new ideas, creativity and risk-taking. Notably, Hungarian innovative firms and entrepreneurs demonstrate stronger risk-taking behaviour compared to the national average: They accept the risk of making mistakes and perceive such as learning experiences (MNB 2023).

3. Data

The Magyar Nemzeti Bank (MNB, the central bank of Hungary) identified 1,134 gazelle-growth and innovative Hungarian Innovation-Driven Enterprises (HIDE) in its Growth Report 2023 (MNB 2023). In the realm of IDE research, data availability confers a distinct advantage in areas such as venture capital finance, while in other domains, the lack of representative data sources on innovation-driven firms remains the primary impediment to empirical results (Botelho et al. 2021). Despite the scholarly efforts, well-defined, general characteristics of IDEs have not been identified by the experts in the field. In contrast to the narrow perspective presented in Aulet and Murray (2013), we adopt a more inclusive approach. Hungarian IDEs are not solely confined to firms with explicit innovation outcomes (patents, trademarks, R&D expenditure tax credits or government aid for firm development) that also exhibit rapid growth (so-called “gazelle” status). Instead, we incorporate companies that demonstrated gazelle-like growth between 2010 and 2019, even if their innovation activity was then only observed in the subsequent period. These firms likely achieved competitiveness in external markets due to innovation, prompting their inclusion. Our definition considers a company to be an exporter if at least 10 per cent of its turnover originates from export sales.¹ We also account for a phenomenon observed in Hungary, where companies often register patents for innovations that improved competitiveness after experiencing rapid growth. These firms have transitioned to the later phase of the life cycle of innovation-driven companies, where their external market activity’s competitiveness is ensured by the innovation they apply, sometimes registered later for strategic reasons.

¹ In using this boundary, we followed the practice of the World Bank Enterprise Survey (World Bank 2023).

In 2010, despite constituting a mere 0.3 per cent of all partnerships, innovation-driven firms accounted for 13 per cent of gross exports and more than 22 per cent of average GDP growth (*MNB 2023*). The presence of innovation-driven enterprises offers Hungary a promising avenue for sustaining and accelerating economic growth, thereby facilitating the convergence process.

3.1. The business population on which the survey is based

The questionnaire survey employed in this study was conducted within the framework of a Hungarian multi-stakeholder project. The project's primary objective is to achieve a more comprehensive and deeper understanding of the innovation and economic readiness of domestic enterprises (see *MNB 2023*). Collaboratively initiated by the Hungarian government, academia, financiers, companies and business entrepreneurs, this endeavour commenced in 2022 with the ultimate aim of formulating a regional enterprise development strategy based on innovation support. Given that certain aspects of the innovation process and both innovation capacity (I-CAP) and entrepreneurship capacity (E-CAP) remain invisible in direct statistical measurement, the secondary research was accompanied by a concurrent primary survey. These data constitute the foundational basis for our subsequent analysis.

The data analysed in this study consists of responses from a primary questionnaire survey designed to delineate the characteristics of Hungarian innovative and innovation-driven enterprises. These characteristics are often unidentifiable from existing statistical databases. The survey was conducted as a part of the NRDIO data collection procedure during the period of September to November 2022. The questionnaire was sent to 500 enterprises meeting specific criteria. These criteria included enterprises that had received an R&D innovation tax allowance, were listed in the National Intellectual Property Office's database of patent and trademark data, or had applied for innovation development support from the NRDIO. Survey participants completed the questionnaire anonymously, precluding the identification and linkage of their business demographics and economic performance to individual companies. From the 200 questionnaires received, we filtered out incomplete responses and duplicates. Some enterprises may have initiated the questionnaire multiple times, leading to several incomplete responses before the final, comprehensive submission. Additionally, instances were observed where multiple individuals within a single company completed the online questionnaire. In such cases, we considered the last fully completed response. Following rigorous data cleaning procedures, the database comprised 182 complete records. Among the respondents, 72 innovation-driven and 110 innovative enterprises were represented.

3.2. Characteristics of the questionnaire

In addition to inquiries regarding the respondent's gender and highest level of education, the questionnaire encompassed a comprehensive set of 40 questions, organised into five distinct thematic areas:

- (1) the innovation-economic environment,
- (2) human capital,
- (3) financing,
- (4) market competition, and
- (5) the role of cultural and motivational factors in innovation.

In the context of the *innovation-economic environment*, the questionnaire inquired about the companies' intellectual property rights, the regularity of R&D, the development of production and development processes, export activity and the extent to which they consider continuous innovation essential for business growth. The section on *human capital* delved into the qualifications and educational backgrounds of the employees and available workers. Specifically, it examined the presence of engineering expertise and PhD qualifications among personnel, as well as their active involvement in research and development endeavours. Regarding *financing*, the survey comprehensively covered the (perceived) availability of various financial sources such as bootstrapping, loans, government subsidies, venture capital and business angels. *Market competition* was another critical dimension explored. The survey assessed the market size, the strength of industry competition and the market and public-sector demand. Lastly, the questions on *cultural and motivational factors* included the reasons for business initiation (e.g. family considerations, financial aspirations, independence and career change) and entrepreneurial attitudes (risk-taking tendencies and tolerance for failure).

The survey questions systematically explored qualitative, firm-specific pieces of information, needs and satisfaction levels that cannot be obtained from administrative data sources. These inquiries provide insight into both entrepreneurship capacity (E-CAP) and innovation capacity (I-CAP) within organisations (Budden *et al.* 2017). Notably, the timeliness of responses enhances their value. The questionnaire deliberately omits inquiries related to physical and digital infrastructure, as Hungary, in international comparisons, boasts a favourable position in this regard (see Szerb *et al.* 2020; MNB 2022). While infrastructure significantly influences firms' innovation and entrepreneurial capacity, sporadic degradation within the dynamic business environment may have a slight impact.

The questionnaire featured two distinctive types of questions. In 39 cases, participants were asked to express their views by selecting a value on a 6-point Likert scale (see *Dusek 2024*), where a value of 1 denoted total disagreement and a value of 6 indicated total agreement. In all cases, respondents had the option to select the answer “I don’t know / I have no information”. The latter answer was deliberately added when compiling the questionnaire in order to capture respondents’ attitudes towards a statement in finer detail. The remaining question inquired about the availability of 13 specific types of funding. For each funding category, respondents could choose from three options: available („Yes”), not available („No”) or not known (“I don’t know”). All 182 respondents could choose from three options. Interestingly, certain variables elicited a higher frequency of “I don’t know / I have no information” responses, while the companies that completed the questionnaire exclusively or almost exclusively gave Likert scale answers for other questions (*MNB 2023:59*). This observed pattern informed the subsequent empirical analysis, as detailed in Section 5 (Estimation results).

Table 1
Descriptive statistics for variables in the primary database

| | Number of questions | Minimum number of respondents | | Average number of respondents | | Maximum number of respondents | |
|-----------------------|---------------------|-------------------------------|-----|-------------------------------|--------------|-------------------------------|-----|
| | | IDE | I | IDE | I | IDE | I |
| Innovation | 7 | 69 | 108 | 71.6 | 109.0 | 72 | 110 |
| Human capital | 8 | 63 | 90 | 69.4 | 104.4 | 72 | 109 |
| Financing | 4 | 61 | 94 | 65.0 | 101.3 | 70 | 109 |
| Market | 5 | 65 | 103 | 70.4 | 107.6 | 72 | 110 |
| Motivation | 15 | 61 | 83 | 64.7 | 99.0 | 71 | 108 |
| <i>Total</i> | 39 | 61 | 83 | 67.7 | 103.2 | 72 | 110 |
| Financial instruments | 13 | 45 | 64 | 56.6 | 86.2 | 70 | 105 |

Source: MIT – IDE project questionnaire survey

4. Applied methodology

To identify the essential characteristics that distinguish innovation-driven companies from innovative ones and to estimate their partial effects, a linear probability model (LPM) and probit regressions are used.² The response variable of the models is innovation-drivenness, and the independent variables are selected from the survey questions. The inclusion of the latter (Likert-type) variables in regression models is a task that requires caution, for which several approaches can be found in the practical literature (*Dusek 2024*).

² The applicability and differences are explained in detail by *Maddala (1983)*.

4.1. Transformation of variables

One common practice is to include an explanatory variable as a categorical one, which is equivalent to taking m different levels of a variable and creating binary responses from them and including $m-1$ dummy variables in a regression equation, to avoid perfect collinearity. The disadvantage of this approach is the significant reduction in the number of cases per variable that results from the creation of many new variables. This can lead to a loss of statistical power.³ In our case, the small sample size ($n = 182$) allows for a maximum of 6–9 explanatory variables to be included in the regression models. Therefore, the application of dummy coding in the above manner would exhaust our possibilities with response options to a single question.

The literature often treats Likert items as interval or ratio variables.⁴ Beyond raising questions regarding the applicability of parametric statistical methods, this approach has the disadvantage of excluding the possibility that steps on the scale values may have different effects. Furthermore, in our case, this is not a viable option because the responses “I don’t know / I have no information” beyond the scale have a particular explanatory power for a statement,⁵ which we intend to consider in the models.

The solution we employ is dichotomisation, a common practice for Likert scales with an even number of response options and for continuous variables as well (e.g. *MacCallum et al. 2002*). However, it also influences statistical power and the proportion of explained variance (*Cohen 1983*). This approach treats responses indicating agreement and disagreement as a single, unstressed unit. Although this results in a loss of information, the direction of the answers remains unchanged. In addition, the „I don’t know” option, which indicates a lack of information, can be used as a separate category (this particular form of dummy coding may be referred to as „trichotomisation” or „pairwise dichotomisation”). If none of the respondents selected the „I don’t know” option for a given statement, it was included in the equation as a binary variable. In instances where a categorical variable has three levels (No information – Agree – Disagree), they are incorporated into the regression equations as two binary variables.

³ For logistic regression, simulation studies suggest a minimum of 10 observations per variable (*Peduzzi et al. 1996*).

⁴ On the various approaches to the statistical treatment of Likert and other types of scales, see for example *Harpe (2015)*.

⁵ This relevant specificity among claims about financial instruments was shown in a previous analysis (*MNB 2023:59. Figure 5-19*).

4.2. Linear probability model

In light of the aforementioned considerations, the following linear probability model was estimated:

$$Y_i = \beta_0 + \beta_1 D_{1i} + \beta_2 D_{2i} \dots + \beta_k D_{ki} + u_i, \quad (1)$$

where $Y_i = 1$ indicates that company i is fast growing and $Y_i = 0$ indicates that company i is innovative. $D_i = (D_{1i}, \dots, D_{ki})$ denotes the vector of dummy variables, β_0 is the constant, β_1, \dots, β_k is the vector of coefficients and u_i is the error term. Based on the linear probability model, $P(Y = \text{fast growing} | D) = E(Y = \text{fast growing} | D)$ equation (1) says that the probability that a firm is innovative and fast-growing is a linear function of the explanatory variables. Furthermore, the estimated coefficients measure the predicted change in the probability that a company is IDE when an explanatory variable increases by one unit, holding the others constant. For this reason, the choice of the base values of the variables is important from an interpretative – and in some cases econometric – point of view. Following from this, the category „Disagree” was set as the baseline in all cases.

| Table 2 | |
|--|---|
| Managerial opinions marked by the explanatory variables | |
| Variable name | Statement in the survey |
| <i>Access to financial support</i> | My business has easy access to R&D public financing. |
| <i>Market size</i> | The market size is appropriate, and the customer base of my business is well known and segmented. |
| <i>Access to credit</i> | My business can easily get credit. |
| <i>Technological level</i> | We are satisfied with the technological infrastructure needed to run the business. |
| <i>Export share</i> | The majority of our sales come from export markets. |
| <i>Qualified labour force</i> | Our employees are well qualified. |
| <i>Access to venture capital</i> | If my business needed to, I could easily contact business angels/venture capitalists. |
| <i>Source: MIT – IDE project questionnaire survey</i> | |

Based on economic theory and statistical reasons, 7 questions were selected for the estimation (*Table 2*). From a statistical perspective, the explanatory power and the information criteria of the models were considered. Following the division of the variables into two or three categories, we included a total of 12 explanatory variables in the initial model.⁶

4.3. Probit model

One drawback of the linear probability models is that the estimated probabilities are not guaranteed to fall within the interval [0;1] (e.g. *Wooldridge 2008*). A solution to this issue is to transform the probabilities with distribution functions, as these are monotone and taking on values from the interval [0;1].

Using the standard normal distribution, we obtain the probit model:

$$P(Y_i = 1|D) = \Phi(\beta'D) = \int_{-\infty}^{\beta'D} \varphi(z)dz, \quad (2)$$

where $\Phi(z)$ is the cumulative distribution function of the standard normal distribution, $\varphi(z)$ is the density function, and $\beta'D = \beta_0 + \beta_1 D_{1i} + \beta_2 D_{2i} \dots + \beta_k D_{ki}$. For the initial probit specification, the independent variables listed in *Table 2* were used, the same as those included in the linear probability model described by equation (1). The coefficients of the probit model are difficult to interpret in their original form. Therefore, we present the marginal effects in the study instead.

5. Estimation results

The estimation results of the above-described model specifications are presented in *Table 3*. In a probability context, the outputs fall between 0 and 1, but the coefficients shown later can be interpreted as percentages (semi-elasticities) after multiplication by 100. The probability of an event occurring with certainty is then 100 per cent. For the interpretation of the coefficients, we follow the latter.

⁶ In the two cases where there was only 1 “I don’t know” response to a question included in the model, the observations were deleted and only 1 dummy variable was included. These cases do not affect the estimated coefficients, as the observations devoid of an error term. Furthermore, calculating an F-statistic to assess the group significance of the variables would be infeasible for the full set of explanatory variables.

| Table 3 | | | | |
|------------------------------------|-------------|---------------------------------|-----------------------------|------------------------------|
| Regression results | | | | |
| Dependent variable | | P(grew rapidly=1) | | |
| | | Linear probability model | Probit regression I. | Probit regression II. |
| <i>Access to financial support</i> | Do not know | 0.69*** (5.97) | | |
| | Agree | 0 (-0.02) | -0.01 (-0.07) | |
| <i>Market size</i> | Do not know | -0.60*** (-4.14) | | |
| | Agree | -0.02 (-0.25) | -0.05 (-0.50) | |
| <i>Access to credit</i> | Do not know | -0.17 (-1.36) | -0.21* (-1.84) | -0.18 (-1.56) |
| | Agree | -0.26*** (-3.39) | -0.28*** (-3.82) | -0.26*** (-3.60) |
| <i>Technological level</i> | Agree | 0.21** (2.48) | 0.23*** (2.95) | 0.18** (2.26) |
| <i>Export share</i> | Do not know | -0.34*** (-4.56) | | |
| | Agree | 0.20** (2.57) | 0.20*** (2.64) | 0.17** (2.31) |
| <i>Qualified labour force</i> | Agree | 0.21*** (2.8) | 0.22*** (3.1) | 0.26*** (3.63) |
| <i>Access to venture capital</i> | Do not know | 0.1 (0.92) | 0.13 (1.21) | 0.14 (1.3) |
| | Agree | 0.11 (1.32) | 0.14* (1.77) | 0.14* (1.76) |
| N | | 179 | 173 | 177 |
| R-squared/Pseudo R-squared | | 0.148 | 0.164 | 0.147 |

Note: „Do not know” and „Agree” denote binary variables, where the baseline is „Do not agree”.
The t-statistics are in brackets.
Significance levels are indicated by *** ($p < 0.01$), ** ($p < 0.05$), * ($p < 0.1$).
The probit regression coefficients indicate marginal effects.
Goodness-of-fit metric for the probit models is pseudo R-squared.
Source: MIT – IDE project questionnaire survey

In each case, disagreement with the statement was chosen as the state 0 of the category variables – the state to which we relate the coefficient associated with each category level. That is, for example, for the last specification, „an innovative firm that agrees with the statement that most of its revenue comes from export sales is 17 per cent more likely to grow rapidly than an innovative firm that disagrees with the statement”. Of course, the statistical conclusions can be formulated in a less fragmented way, such as „innovative firms that mainly export are 17 per cent more likely to grow faster than their less exporting or non-exporting counterparts”. For the interpretation of the coefficients, we follow this latter, more simple approach.

5.1. Model specifications and coefficients

The probability of high growth of innovative firms is explained by the explanatory variables at almost 14.8 per cent ($R^2 = 0.148$) in the linear probability model (*column 1 in Table 3*). The binary cases of the variables *access to financial support*, *market size* and *export share* when respondents answered „I don’t know” to the statement are significant only in this model specification, and at a significance level of 1 per cent. The probability of rapid growth is significantly higher ($\beta = 0.69$) for firms that lack information on their ability to access government subsidies than for those that do not have access to government aids. Conversely, the probability of rapid growth is diminished when an innovative company does not know its own demand (*market size*: $\beta = -0.60$) or is uncertain whether a larger share of its turnover comes from exports (*export share*: $\beta = -0.34$), in comparison to companies that disagree with the relevant statements.

We incorporated all modellable⁷ variables into the initial probit regression (*column 2 of Table 3*) that were also included in the linear probability model. In this specification, the coefficients of easy access to government aids (*access to financial support*) and knowledge of a well-defined market size (*market size*) are also not significant. Therefore, these insignificant variables were left out from the final model equation. Consequently, the second probit specification (*column 3 of Table 3*) contains 7 explanatory variables, which fulfils the criterion of a minimum of 15–20 observations per covariate (see *Hair et al. 2018*) and thus provides sufficient statistical power.

5.2. The final model equation

In the second probit equation, the value of the pseudo- R^2 shows that about 14.7 per cent of the variability of the response variable can be explained by the independent variables. The dependent variable takes a value of 1 if the innovative company

⁷ The probit specifications indicated perfect prediction due to single observations in given categories of these variables. Therefore, in these specifications the perfectly predictable observations are omitted from the fit (e.g. *Kunz et al. 2017*). Thus, the sample element number of the first probit model changes to 173, while the number of cases in the second model changes to 177.

demonstrated rapid growth in the 2010s and 0 if the innovative company did not exhibit gazelle-like growth. The results of our primary research indicated the presence of 7 such variables or 5 characteristics. Consequently, the number of independent variables compared to the sample size does not reduce the power of the estimation (α).

Companies that are satisfied with the quality of their technological infrastructure are more likely (18 per cent) to have grown rapidly in the 2010s. This is consistent with the observation that technological advantage can also be regarded as a competitive advantage, which can be used to gain market power and increases sales. The quality of the workforce also shows a significant positive relationship with growth prospects. Innovative companies that employ well-qualified workers are 26 per cent more likely to grow at a rapid, gazelle-like pace.

The coefficient of export market orientation (*export share*) is statistically significant, indicating that a focus on foreign markets is associated with a significant, 17 per cent increase in the probability of innovation-driven status. In other words, companies that derived a larger share of their turnover from exports are more likely to experience rapid growth than innovative companies which focus more on the domestic market.

Easy access to credit reduces the probability of rapid growth by 26 per cent on average. The contradiction between attracting funding and growth probability is apparent. Almost half of innovation-driven companies were supported by the Funding for Growth Scheme of the Magyar Nemzeti Bank, but the programme helped small and medium-sized enterprises to access credit (*Hegedűs and Schmidt 2022*) in times of credit constraints (*Bodnár et al. 2014*). The years after 2017 were characterised by a period of funding at low interest rates, during which time companies had an abundance of funds to invest, but under tight labour market conditions. In the oral interviews and discussions that followed the questionnaire, innovation-driven enterprises highlighted that they had acquired production lines during the favourable interest rate environment of the 2010s. These were not needed for production at that time and their utilisation rates have remained very low since then. In other words, while the inexpensive funds were utilised by rapidly expanding domestic innovative firms, the resulting additional investments did not increase their net sales.⁸ On the other hand, in numerous instances, start-ups with considerable growth potential are unable to access bank loans due to the insufficient number of or stable completed business years.

⁸ The companies surveyed completed the questionnaire in autumn 2022. This may lead to a temporal inconsistency in the interpretation of the results, as while the rapid growth of companies was achieved in the 2010s, the survey was conducted in the year following two crisis years (2020 and 2021).

Finally, the results indicate that venture capital financing has a growth-enhancing effect. Companies that (potentially) easily reach venture capitalists are more likely to experience accelerated growth than those that do not think they have easy access to venture capital. This result is in line with the theoretical expectations. This is because companies that access venture capital funding are not eligible for bank loans as start-ups. However, raising funds at the *seed* stage is crucial to their growth potential (MNB 2023).

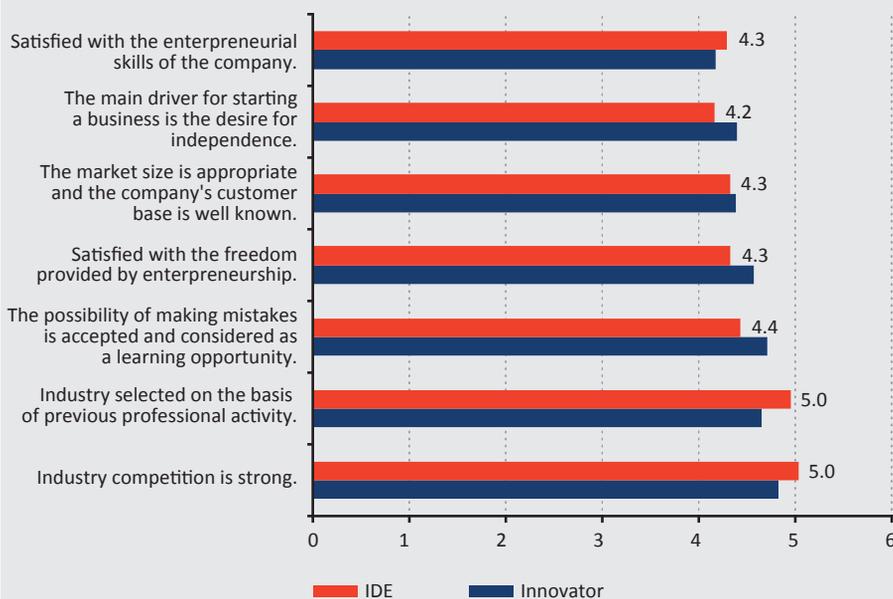
6. Other results

As previously stated, the control group was comprised of innovative (but not fast-growing) enterprises, a segment which is also characterised by robust performance indicators. Consequently, no significant partial effects were found in factors that would otherwise be expected in the case of a general control group of companies. These results are discussed in the following sections.

6.1. The role of the competitive environment and motivations

In many cases, innovative and innovation-driven companies provided similar responses. *Figure 1* illustrates the operational characteristics of firms for which the average of responses was 4 or higher on the Likert scale. For these variables, innovative and innovation-driven enterprises gave a similarly high number of agreeing responses. They regularly spend on corporate R&D and believe that continuous innovation is a prerequisite for market expansion. In addition, entrepreneurial skills and attitudes are uniformly dominant among the respondent companies. Both groups perceive intense and competitive environments, which may be related to their specific sectoral clustering. 43 per cent of innovation-driven firms operate in knowledge-intensive, highly specialised, narrow industries such as natural science and technical research and development, computer programming, engineering, technical/business management, information technology advisory services and other niche markets (MNB 2023). Maintaining a competitive position is a strong motivation for both innovative and innovation-driven companies. Although companies consider competition in their market to be strong, the size of the market itself was found to be appropriate. These companies were set up with the intention of becoming independent, utilising the experience gained from previous activities.

Figure 1
Characteristics of corporate operation in innovative and innovation-driven enterprises



Note: Answers with an average score of at least 4 based on the Likert scale evaluation. The averages of IDEs are highlighted.

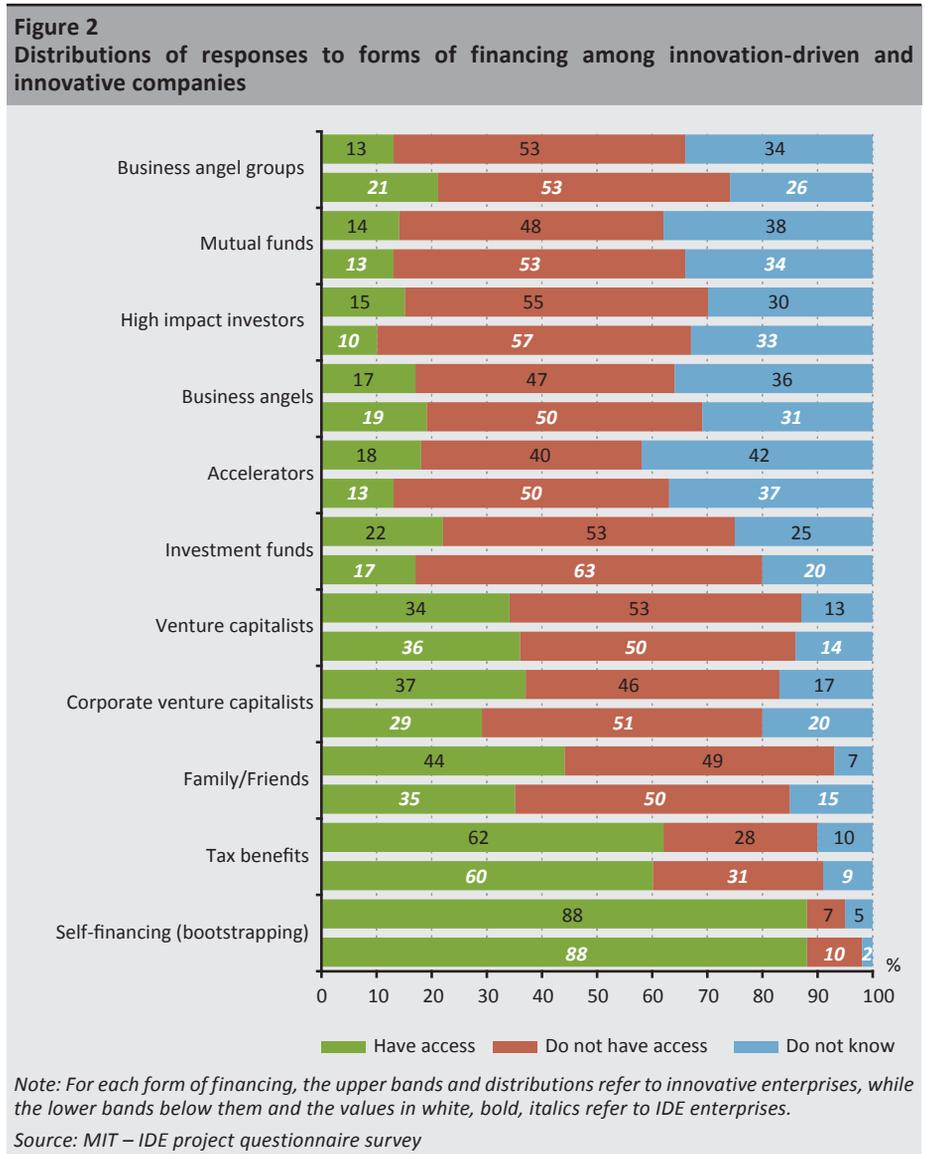
Source: MIT – IDE project questionnaire survey

Both innovative and innovation-driven companies believe that the risk of failure is accepted. Mistakes made within companies are regarded as an inherent and inevitable aspect of the learning and development process. This perspective is not commonly held among those who aspire to establish a new business in Hungary. The willingness to become an entrepreneur in Hungary is strongly influenced by the fact that among those who see a good opportunity in starting a business only 16.8 per cent of Hungarian adults (nearly one in six respondents) are not afraid of the potential failure of becoming an entrepreneur, which is very low by international standards (*GEM 2021*).

6.2. The role of funding

Among the various forms of financing, self-financing (88 per cent) and tax allowances (62 per cent and 60 per cent, respectively) are the most accessible fundraising options for the majority of firms (*Figure 2*). Bootstrapping, a form of self-financing, entails the reinvestment of initial revenue by newly created businesses in their own development, thereby enabling them to grow from their own resources. 160 companies indicated that they applied this form of internal business financing, which can also be used for new core innovations. Revenue growth is related to the

equity ratio (MNB 2023). In addition, it is an opportunity for businesses interested in innovation to grow faster than they could on their own by leveraging external partners (raising funds).



In relation to funding opportunities, it is important to note that in some cases a significant proportion of respondents selected the „I don’t know” category. This indicates that certain forms of financing were not considered viable alternatives or were not known to companies. More than 30 per cent of respondent companies

were uncertain as to whether they could readily establish contact with accelerators (42 per cent and 37 per cent, respectively), business angels (26 per cent to 36 per cent) or mutual funds (38 per cent and 34 per cent). Alternative corporate financing options are therefore difficult to access for innovator companies, which is compounded by the fact that these options are not widely known among companies (MNB 2023).

7. Conclusions

In this research, we endeavoured to address the inquiry of the factors distinguishing innovation-driven enterprises from solely innovative ones. In 2023, based on the essay by *Aulet and Murray (2013)* and their own conceptualisation, more than 1,100 innovation-driven enterprises were identified in Hungary (MNB 2023). We define innovation-driven enterprises as those that have achieved rapid sales growth in their innovation-focused business during the 2010–2019 business cycle, specifically maintaining an average sales growth of at least 20 per cent over three consecutive years. Build upon these findings, our research question focuses on identifying the often elusive factors that contribute to accelerated growth among innovator firms beyond the mere presence of innovation. Existing literature has demonstrated that innovation alone does not invariably translate into business success. Furthermore, innovation inherently carries the risk of failure. Nevertheless, regardless of the growth indicators, these enterprises willingly embrace the inherent uncertainty and endeavour to learn from the outcomes of ideas that do not yield the desired results.

This study examines a cohort of over 1,100 innovation-driven enterprises, identified from administrative data sources (MNB 2023). The secondary research was complemented by primary research. Specifically, we analyse data from this anonymous primary survey. Our findings revealed that innovative enterprises exhibit robust characteristics, as evidenced by hard indicators. Furthermore, in numerous instances, these enterprises share similarities with firms categorised as part of the innovation-driven group, particularly in terms of entrepreneurial capacities, attitudes, and market perception.

The rapid growth in this specific segment is influenced by distinct factors. Our findings indicate that the growth drivers encompass increased technological and human capital levels, export intensity and access to venture capital. Notably, traditional credit at low interest rates, which was prevalent during the pre-COVID economic cycle, has not significantly contributed to rapid growth within this priority group. Surprisingly, even for innovator companies characterised by advanced technological performance, the expansion of cutting-edge technological capabilities correlates with accelerated growth prospects. The nuance is underscored by respondents' satisfaction with their own production technology, which distinctly

impacts growth. A similar argument applies to highly qualified (skilled) labour. At the end of the 2010s, there was a substantial increase in demand for live workforce, particularly among experienced professionals. Nevertheless, the perception of employee skill levels, as perceived by respondent firms, significantly influences our estimation equation. Intense foreign market activity emerges as a clear growth driver in this business segment. Notably, venture capital financing, due to its sporadic distribution, only exhibits significance at the 10 per cent level. The role of finance including private equity financing, assumes critical importance, as emphasised in our study and in the final Section of the Growth Report 2023, particularly for risky start-ups investing in innovation.

The analysis was based on the responses to a cross-sectional questionnaire conducted in autumn 2022. The survey targeted a group of enterprises with a general propensity for innovation, but only a subset of these enterprises (innovation-driven enterprises) exhibited rapid growth in the 2010s. Despite potential temporal discrepancies, we discerned factors that defy straightforward quantification within a model-based framework, elucidating the disparities between the two groups. The retrospective nature of our analysis raises the possibility that the determinants of rapid growth during the interceding period between global economic crises may have also influenced adjustment in the 2020s. It is essential to stress again that certain criteria remain time-independent (e.g. human capital, export orientation or financing situation), and the resilience of innovator firms during crises mitigates distortions. However, the interpretive framework relies on one-time, non-disclosable cross-sectional data, limiting our research due to the timing of business opinion surveys and inherent anonymity of the questionnaire. Consequently, we were unable to establish the link between the business ratings and demographic characteristics (e.g. sector, size and age of companies, and geographical location) or economic performance.

Research concerning the nexus between innovation and growth remains a dynamic and intellectually challenging domain. It is incontrovertible within professional circles that innovation, as a catalyst of economic growth, assumes a pivotal role in shaping economies and societies. Given the evolving landscape of technology and economic paradigms, there is a growing demand for rigorous, contextually pertinent research in this specific field. To foster professional discourse and deliberation, it is imperative to delve further into this intricate relationship. Such exploration necessitates a comprehensive examination that combines observable business demographics with latent firm attributes. By unravelling the multifaceted interplay between innovation and economic growth, we can adopt a pragmatic perspective on the mechanisms driving economic development. Moreover, this enhanced understanding will inform the design of more effective policies aimed at promoting innovation conducive to societal well-being and sustained economic progress.

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Market Timing Investment Methods on the Budapest Stock Exchange*

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A large body of literature confirms that simple investment methods based on timing can outperform and thus be an alternative to traditional investment strategies. The study tests this hypothesis on the Budapest Stock Exchange stock index: a simple timing strategy using 4,619 moving averages was tested on 554,935 trades over the period from 1998 to 2022. The study finds that a wide range of the 4,619 variants performed well on in-sample data, but most could not achieve outperformance out of sample. In some cases, overfitting cannot be ruled out, nor can the effect of randomness due to the low number of cases. The robust variant selected on the in-sample data outperforms out of sample and over the full period at trading costs. However, at a one per cent significance level the Monte Carlo simulation of this variant does not allow the null hypothesis to be rejected, i.e. it cannot be ruled out that randomness or market noise caused the results.

Journal of Economic Literature (JEL) codes: G17, C15, C41

Keywords: timing, technical analysis, stock markets, BUX index

1. Introduction

Research in the literature has examined a number of timing strategies over the past decades, with the primary aim of providing a solution to the problem of the stock market risk premium. In other words, although the stock market risk premium is positive across a wide range of stock markets, a number of past observations suggest that the premium can be negative even over a long period of time. For example, the Irish stock market had a risk premium of –0.6 per cent between 1900 and 1939, the Swiss stock market –0.5 per cent between 1910 and 1949, and the German stock market –1.8 per cent between 1960 and 1979 (McQuarrie 2021). In addition to the above, it can be observed that not only the risk premium, but

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also the real return can be negative even for long-term investments. Data from *Anarkulova et al. (2022)* suggest that the probability of a negative real return is significant (12–15 per cent) over a 20–30 year time horizon for a broadly diversified equity portfolio (stock market index), and calculations by *Bihary et al. (2018)* suggest that the risk of holding equities increases for 30 years, and only then starts to decrease, reaching zero at 100 years. The modern portfolio theory of *Markowitz (1952)* provides a traditional solution to these risks, while non-traditional solutions include market timing methods.

Many market timing solutions are linked to technical analysis signals, including moving average signals. The work of *Brock et al. (1992)*, who laid the foundations for the study of moving averages and other trading rules, is noteworthy in this respect. In their research, they showed the predictive ability of the 1-day and 50-day, 1-day and 150-day, and 1-day and 200-day moving averages on the Dow Jones Industrial Average index for the period 1897–1986. In the 30 years since the original research, several more studies have continued to test moving averages using a similar methodology on a wide range of stocks, stock market indices and investment instruments. Despite the number of analyses, no clear conclusions can be drawn from the material. In some cases, the authors did not conduct out-of-sample tests, while in other cases the role of costs was not taken into account, and there are several papers that failed to demonstrate the forecasting power of moving averages, i.e. that moving average strategy cannot be used to achieve outperformance.

This paper aims to test the hypothesis that market timing methods are alternatives to the traditional “buy-and-hold” strategies that follow from efficient markets theory and Markowitz’s modern portfolio theory. A further aim of the study is to complement the above literature by using data from the BUX index to analyse moving average based crossover signals, building on the original methodology developed by Brock et al. but extending it to a wider range of moving averages, comprising 4,619 combinations, for a total of 554,935 trades. For this purpose, the data set for the last 25 years of the BUX index was used, separating the data set into in-sample (7 January 1998 to 29 December 2017) and out-of-sample (2 January 2018 to 30 December 2022) ranges. As far as the author knows, no comprehensive study using the BUX index has been performed to date.

To evaluate the results, the two best variants were selected according to pre-defined rules on the in-sample data, and the out-of-sample performance of these variants was also examined. Separation of the data into in-sample and out-of-sample stages and the pre-defined selection rules was necessary because without them, the variant trained on the historical data would be automatically selected, given that

the large number of combinations requires that one of the variants should fit the historical data well with a high return. However, this does not mean that the model can be used to obtain optimal results on future data (out of sample). The results show that the model variant with the highest risk-adjusted return selected on the in-sample data ([31–5]) failed to outperform the BUX index on the out-of-sample data. However, the variant selected on the basis of the robustness criterion ([110–7]) was able to outperform out of sample on the in-sample data. The role of costs is also well outlined by the results, because if we ignore costs, the outperformance of the two selected model variants ([31–5] and [110–7]) is significant. Due to the low number of cases and the limited sample, a Monte Carlo simulation of the [110–7] variant was also performed. Based on the results, the null hypothesis cannot be rejected, i.e. the possibility that the outperformance is due to randomness cannot be excluded.

Based on the tests over the whole period, 45 per cent of the 4,619 variants outperformed if trading costs were not taken into account. Taking into account trading costs, only 9 per cent was able to outperform. This shows that moving averages also have some predictive ability for the BUX index, but the models are extremely sensitive to trading costs. However, this calls into question whether the methods can be put into practice, and it cannot be said that in reality they are useful, applicable alternatives to traditional strategies on the BUX index of the Budapest Stock Exchange.

The paper is structured as follows: *Section 2* reviews the literature, *Section 3* presents the methodology, and *Sections 4–6* provide an evaluation of the results.

2. Review of literature

Technical analysis is the collective name for methods of price forecasting that produce their predictions for the future from statistical tests based on past stock prices and trading volumes. By contrast, the efficient markets theory holds that stock prices reflect all past information, so that the past prices cannot be used to make predictions about the future (*Fama 1970; Malkiel 2003*). However, it is now largely proven that capital markets do not always meet the information efficiency condition of the efficient markets theory (*Komáromi 2002*). In addition, there are now hundreds of anomalies that generate excess return that contradict the theory of efficient markets (*Hou et al. 2018*), although many of these are economically insignificant and undetectable out of sample (*Falck et al. 2021*).

Among the hundreds of stock market anomalies, however, we find so-called price effects specifically related to the relationship between past price and future price. First, it was *De Bondt and Thaler (1985)* who showed that portfolios of past losers outperform portfolios of past winners. This long-term reversal effect was observed in the work of De Bondt and Thaler in the five years following portfolio compilation and is not the only anomaly in the relationship between past price and future price. In fact, reversal effects similar to those described above have been demonstrated not only over a long time scale, but also over a very short time scale of 1–4 weeks (*Jegadeesh 1990*). Moreover, in addition to the reversal effects observed in the short and long run, the momentum effect confirms that a link between past price and future price can be established (*Jegadeesh – Titman 1993*). In the case of the momentum effect, we find that portfolios of past winners (1–18 months) also outperform in the future (1–18 months). Thus, while reversal price effects can be identified in the very short (1–4 weeks) and very long (36–48 months) time horizons, in the medium term (1–18 months) the momentum effect can be observed across a wide range of stocks. The momentum effect can be observed even three decades after its discovery, even in intraday data (*Gao et al. 2023*), and is also present in manually collected stock market data from 1866 to 1907 (*Chabot et al. 2009*).

For the Budapest Stock Exchange, *Nagy and Ulbert (2007)* demonstrated the momentum effect and the long-term reversal effect for the period 1996–2007. A decade later, *Lakatos (2016)* observed that the long-term reversal phenomenon is still present on the Budapest Stock Exchange, i.e. past losers outperform past winners in the future. The momentum effect was identified in research conducted by *Mérő et al. (2019)* on the domestic stock market. Their study shows that momentum can be a statistically significant predictor of future return in the Hungarian stock market as well. Hungarian studies are also available on short-term reversal effects. *Neszveda – Vágó (2021)* investigated hypothetical trading strategies that are based on buying stocks that lose in the short term and selling stocks that win. The strategy also produced significantly positive returns on the Hungarian stock market over the period 1990–2019.

Responding to criticisms of the efficient market theory, *Malkiel (2003)* also addresses the above price effects in his paper. Among his findings is that most of the anomalies detected are not robust, are highly sample dependent, and are often the result of data mining. On the other hand, even if these correlations exist, they disappear once they are known, as we have seen in past cases. *Komáromi (2002)* summarises the problems with the anomalies identified by saying that although free lunches exist in capital markets, it is impossible to predict when, where and to what extent an investor can expect a free lunch.

In addition to price effects, studies are also available in the context of technical analysis signals. *Neely et al. (2011)* used simple moving averages, price momentum and trading volume data to predict the risk premium in the stock market. The predictive power of the examined signals had higher in- and out-of-sample explanatory power than the predictive power of macroeconomic factors examined by *Welch and Goyal (2008)*.

Among the studies of simple trading rules, the work of *Brock et al. (1992)* can be considered as a starting point, given that they were the first to standardise the signals of the most popular technical instruments. Their tests involved simple trading rules based on timing, such as crossover signals of moving averages and breaking price levels. In their study on simple moving averages, they examined the crossover signals of the moving averages of 1 and 50 days, 1 and 150 days, and 1 and 200 days on the Dow Jones Industrial Average index over the period 1897–1986 in sample. Their findings include that rules based on technical analysis signals have predictive power, but that the ability to exploit this potential is severely limited by trading costs. The methodology laid down by Brock et al. has been confirmed by a number of subsequent studies in other markets over other time horizons. For example, *Bessembinder and Chan (1995)* showed excess returns on stock markets in Hong Kong, Japan, Korea, Malaysia, Thailand and Taiwan over the period 1975–1991 using Brock's rules. *Hudson et al. (1996)* were able to observe outperformance on the FT30 stock market index from 1935–1994, *Mills (1997)* on the FT30 index (1975–1994), and *Bessembinder and Chan (1998)* on the Dow Jones stock market index (1926–1991). Among the studies on stock markets in the region, *Kresta and Franek (2015)* found that 6-day and 27-day simple moving averages on the Czech stock index outperformed the stock index on 1993–2015 data, but the study was conducted only in sample. However, *Fang et al. (2012)* reviewed Brock's original rules over the period 1987–2011 (out of sample) and found that the out-of-sample performance of simple technical rules is extremely low. According to the authors, the unfavourable results are not due to the fact that market efficiency was higher during the period under study, but rather to the fact that the previous research overfit the signals on the in-sample data.

Technical analysis tools primarily generate their buy and sell signals based on the trading price and, in the case of some models, the trading volume. The models can be broadly grouped into four categories, of which moving averages are primarily a possible means of implementing trend-following behaviour. Other models include oscillator-type indicators (e.g. the Relative Strength Index), volatility indicators (e.g. Bollinger Bands) and indicators based on volume (*Marek – Šedivá 2017; Williams 2006*). Although a large number of trend-following models are available, most of

them are based on moving averages, the crossover of moving averages, and the distance between them. Furthermore, it can be concluded that moving averages are closely related to the practical application of the momentum effect (*Marshall et al. 2010*). Research on moving averages is ongoing. *Avramov et al. (2021)* showed a 9 per cent annual abnormal return on the US stock market based on the distance of short-term (21-day) and long-term (200-day) moving averages in a cross-sectional analysis. The reported return exceeds the abnormal return from momentum, profitability premium and other anomalies. The results of the above study were confirmed by *Abudy et al. (2023)* in international stock markets with a cross-sectional analysis based on the distance between the 30-day and 300-day moving averages. In the context of technical analysis and price effects, a number of studies have addressed the role of market efficiency, i.e. the outperformance of strategies in markets, products and periods where market efficiency is low or declining. *Marshall et al. (2009)* have shown that the effectiveness of the rules defined by Brock is higher in low market capitalisation, low liquidity stock markets. *Li et al. (2023)* examined the results of strategies based on moving averages over different time periods in 40 stock markets. In addition to finding outperforming models in many stock markets, they found that signals are more efficient in stock markets in non-OECD countries, in stock markets in countries with low GDP and in capital markets with no long-term history of stock trading. Studies on the market efficiency of the Budapest Stock Exchange suggest that the stock market has some of the characteristics of capital markets in developing countries and some signs of market inefficiency (*Birău 2015; Molnár 2006*). Related to market efficiency, *Fernández et al. (2023)* found in the context of predicting the risk premium of the stock market that the predictive ability of the instruments studied by *Neely et al. (2011)* is higher under calm market conditions.

The role of cognitive biases in investor decisions also arises in relation to market timing, such as the momentum effect or some technical analysis tools. Among other things, the disposition effect can also be associated with certain market anomalies (e.g. momentum), and studies by *Joó and Ormos (2011)* suggest that the decisions of Hungarian stock market investors are also influenced by the disposition effect. For the domestic equity market, *Csillag and Neszveda (2020)* showed that investors' expectations affect the outcome of momentum strategies, so that the explanatory power of the momentum factor was significant in a period of positive consumer sentiment, but failed to significantly predict expected returns in the following period in times of negative consumer sentiment.

In addition to investor sentiment, the literature also highlights the importance of media attention (*Csillag et al. 2022*), different investor reactions to extreme events (*Rádóczy – Tóth-Pajor 2021*) and seasonality (*Neszveda – Simon 2022*) in the context of the momentum effect. Considering that the root of the price effect behind the moving averages and the momentum are the same, one might suspect that the above factors also influence the results of the moving average models used for timing. Based on *Csiki and Kiss (2018)*, it is likely that during periods of regional shocks, the correlation between developed and regional markets is higher, and that these processes also affect the BUX index under study.

Overall, therefore, the available studies are contradictory, and there is a wide range of literature supporting and contradicting technical analysis and price effects. However, it is also observed that different circumstances can be defined under which the reliability of the signals is higher. These circumstances are often associated with market efficiency, cognitive biases by investors, market sentiment and increased media attention. From the literature review it can be seen that the moving average is a key element in models using market timing. Intensive research into the subject is still ongoing. They also have the advantage of being cost-effective to use, easy to implement and have a transparent operational structure, which is a significant advantage over the “black box” nature of machine learning-based models (*Buczynski et al. 2021*). The literature also shows that there are differences in market efficiency between capital markets in developed and developing countries. At the same time, market timing models show different results depending on market efficiency. Considering the market inefficiency observed on the Budapest Stock Exchange, this study can complement the international literature on moving average timing, which focuses largely on developed capital markets. The aim of this study is to complement the above literature by examining the moving averages of the BUX index, a popular tool of technical analysis, on the Budapest Stock Exchange.

3. Methodology

Following the methodology of *Brock et al (1992)*, simple moving average crossover signals were used as the basis for the analysis. Although only a few combinations of moving averages were used in the original study, current computational capacity allows for in-sample and out-of-sample analyses extended to a wide range of variants (4,619 variants in total, 554,935 transactions).

The moving average crossing signal is based on the crossing of a short-period and a long-period simple moving average. The value of simple moving averages can be calculated from the arithmetic averages of the closing prices over period t as follows,

$$MA_t = \frac{\sum_{i=1}^n P_{t-i+1}}{n}, \quad (1)$$

where:

- P_t the closing price t date,
- MA_t is the simple moving average at time t ,
- n is the number of days, the time period of the moving average.

Moving averages allow time-series analysis to find recurring patterns, trends and seasonality changes in the data set. Although a number of cross-sectional data sets have been investigated in the context of moving averages, following Brock's methodology, this study uses a time-series model.

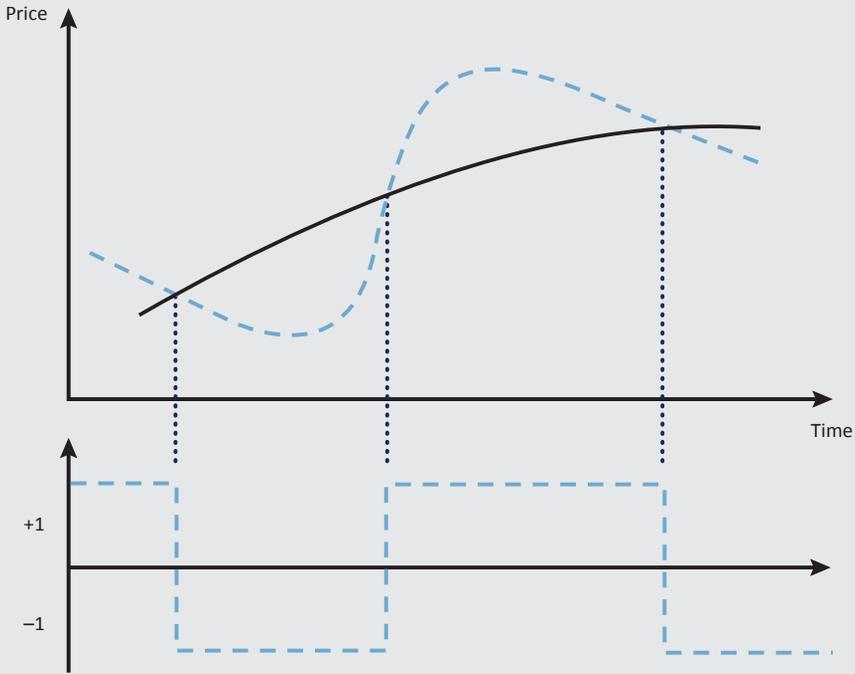
The buy and sell signals of the model can be linked to the crossover signals of two moving averages, where f is a short-term and s is a long-term moving average, as follows:

$$\text{Buy if } MA(f)_t > MA(s)_t, \text{ and } MA(f)_{t-1} \leq MA(s)_{t-1}, \quad (2)$$

$$\text{Sell if } MA(f)_t < MA(s)_t, \text{ and } MA(f)_{t-1} \geq MA(s)_{t-1}. \quad (3)$$

Based on the above, if the shorter-period simple moving average (hereinafter short SMA) is above the longer-period simple moving average (hereinafter long SMA), a buy signal is given. We can talk about a sell signal when the short SMA falls below the long SMA. In addition to opening a long position, a buy signal also closes a short position opened in the previous cycle. In the same way, the closing of a long position is accompanied by the opening of a short position, i.e. an open position is followed throughout the investment horizon (*Figure 1*).

Figure 1
Signals of short SMA and long SMA and the binary outcomes of the rules



Note: In the upper part of the figure, the dashed curve indicates the short SMA and the solid curve the long SMA. The lower part of the figure shows an illustrative example of a buy and a sell signal, where the +1 value of the output signal indicates a long and the -1 value indicates a short position. The figure clearly shows that when the short SMA crosses the long SMA curve in an upward direction, a buy is entered into. In the same way, if the short SMA crosses the long SMA curve on the downside, the long position is closed and a sell, short position is opened.

For the calculation of the crossover signals, the closing prices were taken into account, but the transactions were opened at the next day's opening price, given that in reality it is no longer possible to conclude a transaction after the closing price has been established. The return on a long position can be calculated as follows:

$$R = \frac{(1-f) \times CP - (1+f) \times OP}{OP}, \quad (4)$$

where:

- f = transaction fee,
- CP = closing price of the transaction,
- OP = opening price of the transaction.

The calculation of the return on short positions is as follows:

$$R = \frac{(1-f) \times OP - (1+f) \times CP}{OP}. \quad (5)$$

The aggregate returns of the transactions, the balance of each model variant, are calculated according to the following formula:

$$X = X_0 \times \prod_{i=1}^n (1 + R_i), \quad (6)$$

where:

- X_0 is the initial balance, which is 1 for all model variants,
- R_i is the return realised on transaction i .

The starting balance was always one unit. The return over the whole period was expressed using the compound annual growth rate (CAGR) as follows.

$$CAGR = \left(\frac{X}{X_0} \right)^{(1/N)} - 1. \quad (7)$$

In addition to the return, the maximum drawdown on model variations was also calculated. The calculation is based on an examination of the post-peak profit drawdown on the balance of the model variant. On the balance curve, the declines after all profit peaks are calculated [based on *equation (8)*], and the largest of these declines gives the maximal drawdown. For example, if the balance of a model variant drops to 400 points after a balance value of 800 points, and then to 700 points after another balance value of 1,000 points, then the measured drop is 50 per cent in the former case and 30 per cent in the latter, so the maximal drawdown for the model variant is 50 per cent.

$$DD = \frac{\text{maximum balance} - \text{minimum balance after maximum balance}}{\text{maximum balance}} \quad (8)$$

Given the maximal drawdown, the model calculates the risk-adjusted return based on the Managed Account Reports Ratio (MAR):

$$MAR = \frac{CAGR}{MDD}. \quad (9)$$

In the testing, the return and risk data of all combinations of 1–20 day short SMA and 20–250 day long SMA, i.e. 4,619 combinations with 0.3 per cent opening and closing transaction fees, were examined. In order to avoid overfitting, an in-sample period was set aside for which parameter optimisation was done. Optimal variants were selected according to predefined rules and then tested on out-of-sample data. The separation of the data into in sample and out of sample and the predefined selection rules was necessary because without them, the variant trained on the historical data is automatically selected, given that the large number of

combinations requires that one of the variants should fit the historical data well. However, this does not mean that the model can be used to obtain optimal results on future data (out of sample).

In the selection of the optimal models, two variants were distinguished. In the one case, we select the variant with the highest risk-adjusted return (based on MAR) on the in-sample data and use it on the out-of-sample data and then on the full sample. In the other case, the selection is based on robustness criteria. This latter case is based on the principle that a trading method is considered less sensitive (robust) to overfitting if a small change in parameters does not cause a significant change in the outcome. To determine this, it is necessary to display the in-sample results of all variants in a heat map format (see Section 5, Figure 2).

Despite the fact that the study is carried out on 25 years of data, the number of cases behind each model variant is limited to a few hundred transactions (2,323 variants less than 95 transactions), so it is not clear whether the result is due to randomness, market noise, or whether the selected model actually has predictive and outperforming ability. To clarify the above, a Monte Carlo simulation is carried out following the guidelines of Aronson (2006).

The Monte Carlo simulation of market timing strategies is based on the output signals of the model variables, which are the binary values +1, -1 assigned to each day in the full sample (about 6,000 days). In addition, it is essential that the prices are converted into a stationary time series, as this is the only way to ensure that an upward or downward trend in the sample does not distort the performance of the buy and sell transactions. The stationary time series can be generated by the following operation.

$$\text{LOG} \left(\frac{CP_t}{CP_{t-1}} \right) - ALR, \quad (10)$$

where:

- CP_t = the closing price at the end of day t ,
- CP_{t-1} = the closing price at the end of day $t-1$,
- ALR = average of the logarithm of the time series.

According to the above, the return of each day needs to be calculated, transformed into the logarithm of the return, and the average of the returns is subtracted from the return of each day to obtain the stationary time series, whose mean and sum are zero. The next step is to sum the stationary time series and the outcome of the best model variant, i.e. to calculate the average return of the model variant

based on the stationary time series and the outcomes (+1 if in a long position, -1 if in a short position).

Once the average return of the best model variant has been calculated, the elements of the 6,000-day stationary time series are randomly mixed (without replacement) and the average return is calculated from the randomly mixed data. This process is repeated 10,000 times and the average return calculated on the original data series is compared with the result of 10,000 randomly generated average returns (Table 1).

| Table 1 | | | | | |
|----------------------------|-----------|-----------|-----------|-----------|-----------------------|
| Example simulations | | | | | |
| Output signal | -1 | +1 | +1 | -1 | |
| Random daily return 1 | -0.1% | +0.3% | -0.5% | +0.5% | Average return |
| Result 1 | +0.1% | +0.3% | -0.5% | -0.5% | -0.15% |
| Random daily return 2 | +0.3% | -0.1% | -0.5% | +0.5% | Average return |
| Result 2 | -0.3% | -0.1% | -0.5% | -0.5% | -0.35% |

Note: The table shows examples of four output signals on two randomly generated data series.

The null hypothesis in this study is that the best model variant is due to randomness, i.e. market noise. The alternative hypothesis is that the best variant has predictive power, and that the outperformance is not due to randomness. The significance level was set at 1 per cent. The null hypothesis can be rejected if the best 100 out of 10,000 randomly generated variants are equal to or better than the best 100 variants of the selected model. Although a significance level of 5 per cent is used in a wide range of studies, unfortunately this leads to many false results. For example, *Harvey et al. (2016)* find that 158 of the 296 stock market factors examined can be considered to be false discovery. Considering that the timing methods under investigation can be put into practice, the author deems it justified to require a stricter-than-usual level of significance.

The hypothesis of the study is that investors benefit from a better risk-return profile than the traditional “buy-and-hold” strategy with simple timing strategies. This can be established in the manner described above, i.e. on in-sample data, the chosen model outperforms out of sample over the whole period, based on pre-defined selection rules, and the results are confirmed by the robustness test (Monte Carlo simulation).

4. The data used

For the analysis, I used the BUX index prices (opening and closing prices), which are available on the Budapest Stock Exchange (BSE).¹ The BUX index shows the average price change of the shares with the largest capitalisation and volume traded in the BSE's equity section. The basket of the index contains a variable number of shares, from a minimum of 12 to a maximum of 25. The index itself is not a tradable product, but the OTP BUX index-tracking fund (ISIN HU0000704960) and the BUX index futures index, whose primary maturity in December (BUX2412) traded at high volume, are available in the BSE product range. Given that the above investment products involve trading costs that are not included in the BUX index data, an opening and closing trading cost of 0.3 per cent was taken into account in the analysis.

The full sample covered the period from 7 January 1998 to 31 December 2022. Data prior to 1998 were excluded because detailed exchange rate data are not available for this period, only closing prices, which are not sufficient to optimise the models. The in-sample data covered the period from 7 January 1998 to 29 December 2017 and the out-of-sample data covered the period from 2 January 2018 to 30 December 2022.

The results of the models tested were compared with the performance of the BUX index. The compound annual growth rate (CAGR) was used to compare returns, while the maximal drawdown (MDD) and the Managed Account Reports Ratio (MAR) were used to measure risk. The return and risk data for the benchmark index are summarised in *Table 2*.

| Period | MDD (%) | CAGR (%) | MAR |
|-----------|---------|----------|------|
| 1998–2022 | 68.6 | 6.9 | 0.10 |
| 1998–2017 | 68.6 | 8.2 | 0.12 |
| 2018–2022 | 36.2 | 2.1 | 0.06 |

Note: The first row of the table shows the return and risk indicators of the BUX index for the full period, the second row for in sample and the third row out of sample.

¹ Source of data: <https://bse.hu/pages/data-download>

5. Results of the study

The study calculated the results of 4,619 variants of simple moving average signals (554,935 transactions in total). I tested the short-term moving averages with 1–20-day and the long-term moving averages with 20–250-day parameters. The return on the benchmark index over the in-sample period was 8.2 per cent. Only 248 (5.3 per cent) of the 4,619 variants in sample were able to achieve this result. The top 10 model variants are associated with 28–31 long-term and 5–10 short-term moving averages (*Table 3*).

Table 3
In-sample results sorted by return

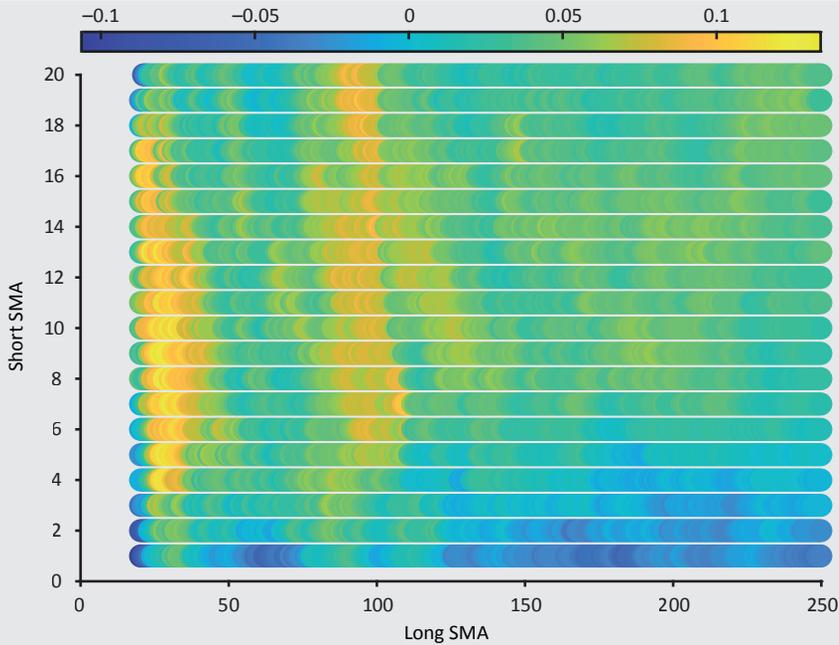
| Long SMA | Short SMA | MDD (%) | CAGR (%) | MAR |
|----------|-----------|---------|----------|------|
| 31 | 5 | –33.8 | 13.4 | 0.40 |
| 28 | 8 | –38.7 | 12.4 | 0.32 |
| 31 | 8 | –47.5 | 12.4 | 0.26 |
| 30 | 10 | –50.6 | 12.4 | 0.24 |
| 31 | 7 | –42.8 | 12.3 | 0.29 |
| 29 | 5 | –30.6 | 12.3 | 0.40 |
| 29 | 8 | –41.3 | 12.3 | 0.30 |
| 24 | 13 | –54.4 | 12.2 | 0.22 |
| 28 | 13 | –50.3 | 12.1 | 0.24 |
| 30 | 9 | –42.9 | 12.0 | 0.28 |

Note: The long SMA and short SMA columns show the time period of the moving averages underlying the model variant. Under the MDD, the maximal drawdown, in the CAGR column the compound annual growth rate of the model variant, and in the MAR column the managed account reports ratio are shown.

The successful variants are clustered around two distinct areas. The first area is located in the range of crossover signals between the 25–35 day long-term and 5–11 day short-term moving averages (*Figure 2*).

The second, clearly distinguishable area is associated with the crossover signal of 90–110 long-term and 7–20 short-term moving averages. The in-sample results for these variants are summarised in *Table 4*.

Figure 2
Return (CAGR) of the 4,619 variations



Note: The figure shows the return (CAGR) for the 4,619 variants. Each point shows the results of one model variant tested over the period between 7 January 1998 and 29 December 2017. Yellow dots indicate high negative returns (CAGR) and blue dots indicate low negative returns (CAGR). The colour scale above the figure can help interpret the returns associated with the colour transitions.

Table 4
Returns on 90–110 long-term and 7–20 short-term moving averages

| Long SMA | Short SMA | MDD (%) | CAGR (%) | MAR |
|----------|-----------|---------|----------|------|
| 110 | 7 | -48.4 | 10.2 | 0.21 |
| 111 | 7 | -52.8 | 10.2 | 0.19 |
| 96 | 19 | -46.2 | 10.1 | 0.22 |
| 98 | 18 | -51.3 | 9.8 | 0.19 |
| 101 | 14 | -50.2 | 9.6 | 0.19 |
| 92 | 20 | -43.2 | 9.4 | 0.22 |
| 109 | 7 | -54.6 | 9.1 | 0.17 |
| 102 | 14 | -50.9 | 9.0 | 0.18 |
| 88 | 12 | -43.1 | 9.0 | 0.21 |
| 99 | 17 | -53.9 | 9.0 | 0.17 |

Note: The long SMA and short SMA columns show the time period of the moving averages underlying the model variant. Under the MDD, the maximal drawdown, in the CAGR column the compound annual growth rate of the model variant, and in the MAR column the managed account reports ratios are indicated.

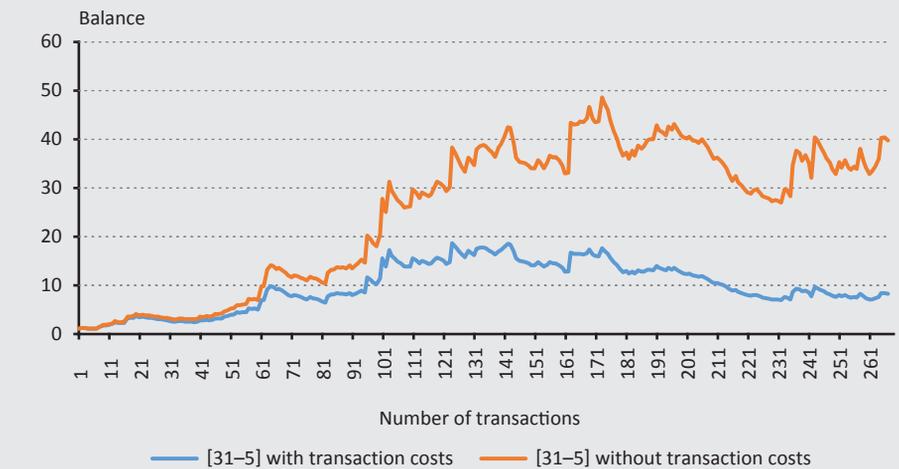
The in-sample data show that 5.3 per cent of the model variants have comparable results to the benchmark index. However, it cannot be stated with certainty that the results shown are not explained by overfitting, and thus the best models selected on in-sample data need to be tested on out-of-sample data as well.

To avoid overfitting and hindsight bias, a variant each was selected from the in-sample data based on the highest risk-adjusted return (MAR) and robustness. The criterion of the highest risk-adjusted return was met by the crossover signal of the 31-day long-term and 5-day short-term moving average, i.e. the [31–5] model variant. While this variant showed the best performance of all cases (both in terms of CAGR and MAR), the results can also be considered robust on the in-sample data, given that small changes in parameters did not cause significant variation in returns. For the second model selected, we can only speak about robustness. This is the area bounded by the 90–110 long-term and 7–20 short-term moving averages shown in *Figure 2*, where we see variants that are not the best in terms of outcome indicators (CAGR and MAR), but nevertheless outperform the benchmark index. In this area, we find close parameter variations with similar result indicators, i.e. the robustness criterion holds (small changes in parameters do not cause significant differences in the results). Here, the best performing model was the 110-day long-term and 7-day short-term moving average crossover signal ([110–7] model variant). No other area can be identified from the in-sample data that meets the criteria for highest risk-adjusted return or robustness. Based on the above selection criteria, the out-of-sample studies will continue with models [31–5] and [110–7].

The out-of-sample tests covered the period from 2 January 2018 to 30 December 2022. Over this period, the benchmark index returned 2.1 per cent (CAGR), with a maximal drawdown of 36.2 per cent. The [31–5] model variant underperformed the benchmark index with an out-of-sample result of –7.9 per cent compound annual growth rate, with a maximal drawdown of 44.7 per cent. The results of the [110–7] model variant were better, but this variant could not outperform in absolute returns (CAGR 2 per cent), only approaching the benchmark index returns (CAGR 2.1 per cent). At the same time, the return achieved with the benchmark index was achieved with almost half the risk (maximal drawdown of 16.5 per cent), so the MAR of 0.12 is twice the MAR of the benchmark index (0.06).

Thus, it is likely that the [31–5] variant provided an outperforming result on the in-sample data due to overfitting. This is also evident from the balance curve of the variety over the whole period after the 200th transaction (*Figure 3*). While our end-period balance with the benchmark index was 5.4 units with a starting balance of one unit, the end-period balance of the [31–5] variant was 39.8 units without costs and 8.1 units with costs. To summarise the results, the [31–5] variant outperforms in terms of CAGR and MAR both in sample and over the full period, regardless of trading costs, but not on out-of-sample data. The outperformance measured over the whole period is entirely due to the in-sample results.

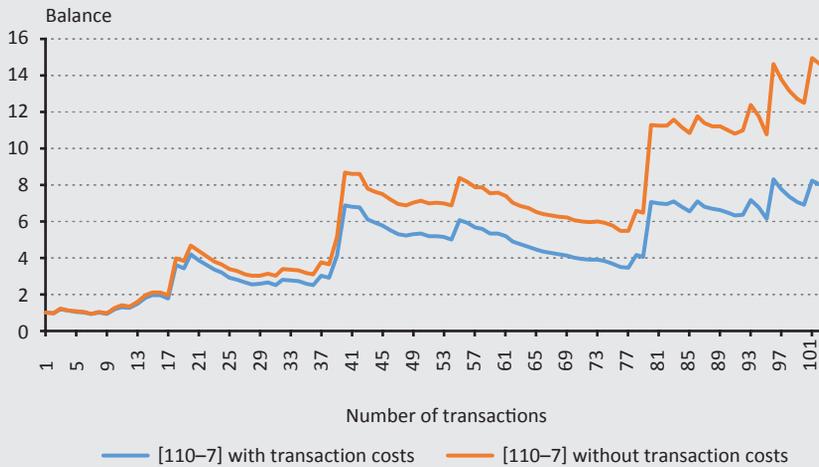
Figure 3
Changes in the balance of model variant [31–5]



Note: In the period between 7 January 1998 and 30 December 2022. The period before the 200th transaction covers the in-sample transactions.

For the [110–7] variant, a more stable balance change can be observed over the full sample (*Figure 4*). While our end-period balance with the benchmark index was 5.4 units with a starting balance of one unit, the end-period balance of the [110–7] variant was 14.4 units without costs and 7.9 units with costs. The [110–7] variant outperforms both in sample and over the whole period in terms of CAGR and MAR (even with trading costs), but only in terms of MAR for out-of-sample data. However, the low number of cases (103 transactions) in this variant makes it more likely that randomness, or market noise, caused the outperforming result.

Figure 4
Changes in the balance of model variant [110–7]



Note: In the period between 7 January 1998 and 30 December 2022. The period before the 82nd transaction covers the in-sample transactions.

Table 5 shows the full-period results of the two variants with and without trading costs. In the full sample, both model variants outperformed the benchmark index. Outperformance regarding out-of-sample data is only seen for variant [110–7], but due to the low number of cases, it is useful to perform a robustness test to assess the probability that the observed result is due to market noise or randomness. The role of costs is also well outlined based on the results, since if we ignore costs, the outperformance with the two model variants selected is significant. Over the full period, 45 per cent of all model variants outperform the benchmark index without costs, but only 9 per cent outperform when costs are taken into account. This observation rather suggests that moving averages have some predictive power, but that models are very sensitive to trading costs.

Table 5
Results measured over the full period

| Period | MDD (%) | CAGR (%) | MAR |
|-----------------------|---------|----------|------|
| Benchmark index | 68.6 | 6.94 | 0.10 |
| [31–5] with costs | 63.4 | 8.7 | 0.14 |
| [31–5] without costs | 44.6 | 15.9 | 0.36 |
| [110–7] with costs | 41.2 | 8.6 | 0.21 |
| [110–7] without costs | 21.3 | 11.3 | 0.53 |

Note: The MDD column of the table shows the maximal drawdown, the CAGR column the compound annual growth rate of the model variant, and the MAR column the return per unit of maximal drawdown.

The analysis detailed above differs from the original research by *Brock et al. (1992)* in terms of the trading direction. This was because it only included long positions and the authors ignored the short positions. With respect to the BUX index, when looking at the full sample and taking into account trading costs, the exclusion of short positions does not significantly improve the results of the models. Although there is a decrease in risk for the best performing variants (*Table 6*), the number of trades is significantly reduced when short positions are excluded, with only 30–40 for the best performing variants.

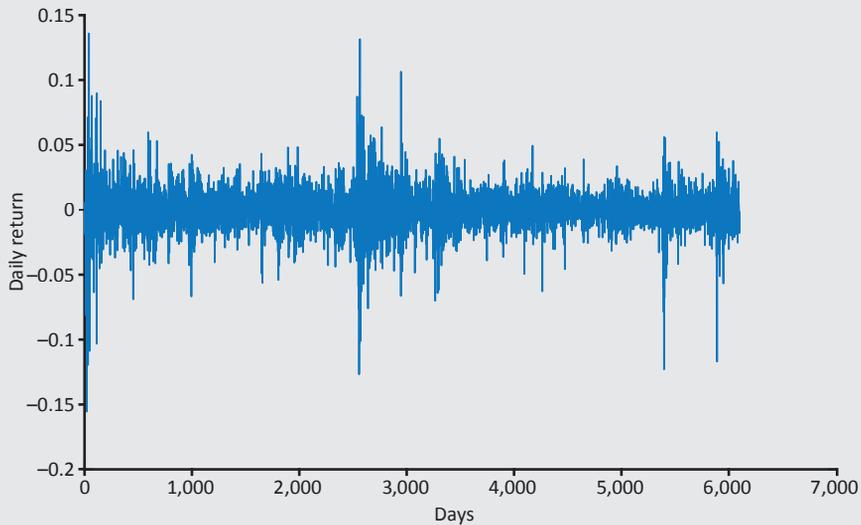
| Long SMA | Short SMA | MDD (%) | CAGR (%) | MAR |
|-----------------|-----------|---------|----------|------|
| 105 | 14 | 17.7 | 9.3 | 0.53 |
| 96 | 19 | 16.9 | 8.7 | 0.52 |
| 109 | 14 | 18.6 | 9.4 | 0.5 |
| 101 | 14 | 18.5 | 9.2 | 0.5 |
| 103 | 15 | 18.4 | 9.1 | 0.5 |
| Benchmark index | | 68.6 | 6.94 | 0.10 |

Note: The long SMA and short SMA columns show the time period of the moving averages underlying the model variant. Under the MDD, the maximal drawdown, in the CAGR column the compound annual growth rate of the model variant, and in the MAR column the managed account reports ratio per unit of maximum drawdown are indicated. For the above model variants, only signals related to the opening of buy transactions were taken into account.

6. Robustness test

Despite the fact that the BUX index data in the back-testing goes back 25 years, the number of transactions in each model variant is considered low (a few hundred). This certainly raises the possibility of market noise, and therefore a robustness test on the [110–7] variant is required, as described in *Section 3*. After converting the daily returns to a stationary time series (*Figure 5*), the binary outputs (–1, +1 values) of the [110–7] variant were matched to the time series data for the full sample (6,101 days).

Figure 5
Stationary time series of the BUX index

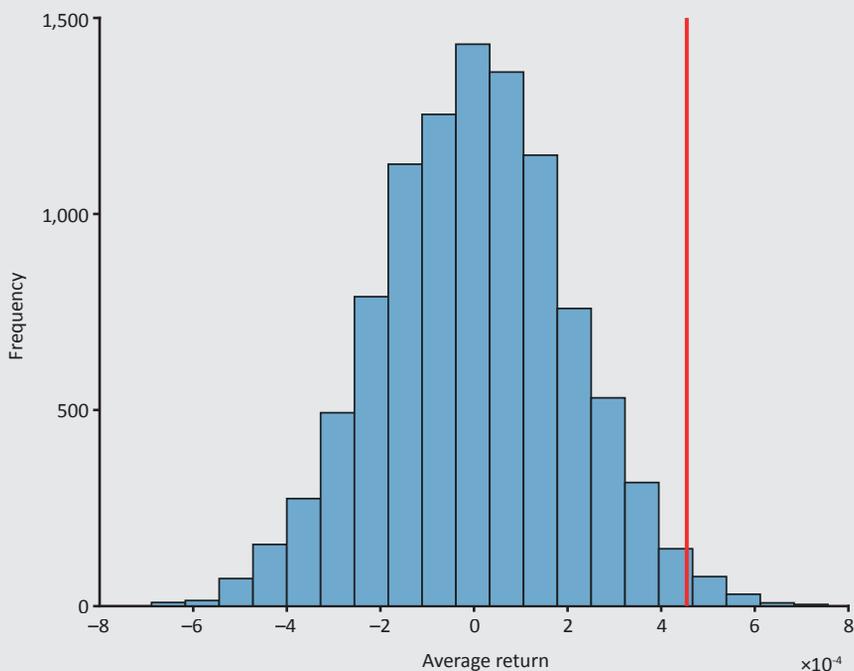


Note: The figure shows the time series of the BUX index data over the entire sample converted to a stationary time series based on formula no. 10.

After the above, the stationary daily returns were randomly mixed, and then the average daily return was calculated after matching with the output signals of model variant [110–7]. The data set was then repeatedly randomly (without replacement) mixed until 10,000 randomly generated time series and their associated average returns were available. *Figure 6* shows the average return for 10,000 randomly generated time series and the average return on the original time series. The p-value is 0.013, which is not sufficient to reject the null hypothesis.

The above shows that, although the variant [110–7] selected on the in-sample data outperforms both out of sample and over the whole period from the robustness point of view, the possibility that it may outperform due to randomness cannot be ruled out.

Figure 6
Histogram of the average return of 10,000 simulated cases



Note: The red vertical line representing the average return on the original time series.

7. Summary

The available literature differs on the predictive and outperforming ability of simple market timing methods. Intensive research on the subject is underway on simple moving average crossover signals. These studies are controversial, which is partly due to different methodology, out-of-sample data and lack of hypothesis testing.

Using the procedure described above, the results of 4,619 possible variants of moving averages were calculated on the stock index of the Budapest Stock Exchange, using 25 years of historical data, for in-sample, out-of-sample and full-period data. The results of each variants were compared with the return of the BUX index. In total, data from 554,935 transactions were processed. The separation of the data into in sample and out of sample and the pre-defined selection rules was necessary because without them, the variant trained on the historical data is automatically selected, given that the large number of combinations requires that one of the variants should fit the historical data well. However, this does not mean that the model can be used to obtain optimal results on future data (out of sample).

Taking into account a 0.3 per cent opening and closing trading cost on the in-sample data, 5.3 per cent of the 4,619 variants outperformed the benchmark index. The model variant [31–5] selected on the basis of the highest return on the in-sample data failed to outperform on the out-of-sample data. The model variant [110–7], selected on the basis of robustness criteria, outperformed both in sample and out of sample. Due to the low number of cases, it was necessary to perform a Monte Carlo simulation on the [110–7] variant. The results show that the null hypothesis cannot be rejected, i.e. the possibility that the outperformance of variant [110–7] is due to randomness cannot be excluded.

Based on the full period analyses, 45 per cent of the 4,619 variants outperformed when trading costs were not taken into account. Taking into account trading costs, only 9 per cent was able to outperform. The above suggests that moving averages may have some predictive power for the BUX index, but the method is very sensitive to trading costs, and thus it is questionable if it can be put into practice. Given that the results of the best model variant cannot be statistically confirmed as being significant, it cannot be said that simple trading rules based on the BUX stock index of the Budapest Stock Exchange offer a useful alternative to traditional investment strategies.

The above results also provided evidence of the limitations of the analysis of moving averages and market timing, since despite the long time horizon (25 years), the number of cases does not exceed 95 transactions in half of the model variants examined (2,323 variants). In addition to the above, the literature also raises the possibility that specific factors (e.g. investor sentiment, increased media attention, investor cognitive bias) may also affect the results of market timing methods (Marshall et al. 2009; Li et al. 2023; Fernández et al. 2023). These factors have also been studied in the domestic capital market, and results confirming international observations have been obtained (Csillag – Neszveda 2020; Rádóczy – Tóth-Pajor 2021; Neszveda – Simon 2022). In the continuation of the study, the results of timing strategies would be examined in the light of changes in investor sentiment and media attention, focusing specifically on this issue.

Despite the above, the results confirm the international literature, i.e. moving averages have predictive ability for market efficiency in the stock index of the Budapest Stock Exchange, which is located further away from the capital markets of developed countries. However, simple rules cannot be put into practice because of the trading costs involved. Notwithstanding the above, moving averages can be useful for investors in the stock market timing decision process.

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The Challenges of Fragmentation of the International Financial System – Towards a Brave New World Order?*

János Müller  – Ádám Kerényi 

The emerging new world order will be subject to a number of strong and unexpected effects, transforming and fragmenting the international financial system. The multilateral world economy has come under the influence of a multipolar power structure, triggering geopolitical tensions, which has led to the creation of economic and financial blocs, and the struggle to strengthen power positions. Financial fragmentation poses risks to international financial and monetary stability. Reducing negative impacts requires international cooperation, but the regulatory activities of international financial institutions are constrained by power blocs. This paper seeks to answer the question of how the fragmented world order affects the international monetary system, flows of capital, monetary policies and financial stability.

Journal of Economic Literature (JEL) codes: E3, E5, G1, F02, F12, F65

Keywords: world order, fragmentation, deglobalisation, integration, central bank digital currency, financial stability

1. Introduction: Concept and definition of financial fragmentation

The development of the world and of humanity has reached a stage where the process of the emergence of a new world order has become the subject of scientific analysis, professional and everyday public discourse, and even of literature (Huxley 1958; Kerényi – Müller 2019): the old order is coming to an end or being substantially transformed, and international political, economic and financial relations are changing and reorganising. This historic change has implications for the global financial system and financial relations. A change of this magnitude can be triggered when a number of separate, interacting, reinforcing phenomena occur in the world in a historically short period of time.

* The papers in this issue contain the views of the authors which are not necessarily the same as the official views of the Magyar Nemzeti Bank.

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In the international economic and financial system, when fragmentation is used as an umbrella term for the emergence of change, profound transformations are taking place in the background, in space and in time. This may be a situation that has ended after a process of transformation, or it may be a dynamic process that builds on and fundamentally changes the previous situation. In this analysis, we briefly review the main stages of the international monetary system that have led to the transformation of the world order and the associated change in the international monetary system.

There is no generally accepted definition of fragmentation in the literature. International financial organisations agree that the term itself refers to fragmented financial markets, but then summarise the causes, potential effects and risks of fragmentation in different ways.

In our analysis, we follow the BIS methodology, which summarises the characteristics of a fragmented system in a comprehensive framework, according to which fragmentation has several dimensions (*Claessens 2019*). This may differ depending on whether you analyse it from a national or global perspective. Fragmentation may also differ depending on the financial market, e.g. in securities markets, banking markets or payment and credit services. Fragmentation can arise for a number of reasons other than financial regulation, including natural barriers, market forces and differences in the institutional environment. Its analysis should include its impact on the efficiency of financial services, including market liquidity, its impact on transparency, consumer and investor protection; and finally its relationship with overall (global) financial stability (*Claessens 2019:4–5*).

According to the Basel Committee on Banking Supervision (BCBS), fragmentation in financial markets can lead to distortions of competition caused by the absence of global minimum banking standards or by the incomplete and inconsistent implementation of these standards. But market fragmentation goes beyond financial regulation. According to the Financial Stability Board (FSB), fragmentation refers to markets that are fragmented geographically, by product type or by participant. The fragmentation of international banking activity may suggest that capital and liquidity pools are segregated in local markets and cannot move freely across jurisdictions (*FSB 2019:27–28*).

According to the Institute of International Finance (IIF), the risk of fragmentation is reflected in differences in regulatory regimes and frameworks that can hinder the development of financial services and the spread of beneficial innovations, and limit the ability to stabilise the financial situation effectively (*IIF 2019*). From a substantive point of view, fragmentation can be seen and understood both in the global space and within the framework of national and local jurisdictions. In our analysis, we look at it primarily in an international context, but also consider the role of central banks

when fragmentation poses a risk to a country's financial stability (IMF 2023:81). One of the key reasons behind the emergence of the above elements in the international monetary system is that the process of deglobalisation has caught up to the process of operational globalisation, which had been steadily gaining ground in recent times. To be able to understand deglobalisation, we should summarise the concept of globalisation, as its elements change in opposite directions during deglobalisation. According to Jagdish N. Bhagwati (2007), globalisation is the integration of national economies into the international economy through trade, FDI, short-term flows of capital, international movement of people in general and the flow of technologies. "Globalisation is an all-encompassing process. It involves the integration of national and regional economies, and societies and cultures through the global network of trade, finance, communication, migration and transportation. [...] Geographical and political constraints have less and less bearing on the allocation process" (Halmai 2023:6).

It should suffice to just list recent developments that have triggered deglobalisation. In the era of the Fourth Industrial Revolution, the new digital world came into being as an integral part of it, with the rise of artificial intelligence and robotics, the outbreak of the coronavirus pandemic, geopolitical tensions intensified, the energy crisis, global inflationary pressures, trade wars emerged, supply chains were disrupted and the Russian-Ukrainian war broke out. These processes in themselves brought changes in international economic and political relations, but several effects were interlinked and mutually reinforcing, fundamentally altering the relatively calm post-Cold War environment free of geopolitical tensions. This has set in motion a global process with as yet unforeseen outcomes. The combined impact of geopolitical, economic and technological forces can be described as the ongoing fragmentation of global economic relations and the international monetary system.¹

The fragmentation of the existing world order has three mutually reinforcing and, in specific cases, weakening factors: (i) global political and geopolitical power relations; (ii) changes in economic and trade relations; and (iii) changes in the operating conditions of the international monetary system, and restrictions on the free flow of capital. Our analysis focuses on the third element of this three-dimensional process, i.e. we are looking for the answer to the question how the fragmented world order affects the international monetary system, flows of capital, monetary policies and financial stability.

¹ In the following, we use the term 'fragmentation', which has become accepted in literature, to describe the process. Fragmentation means to break up, to fall to pieces. (From the Latin *fragmentum*: a portion, a piece of something.)

We are witnessing a sudden geopolitical shift, along the fault lines of which the world with its cross-border payment and trade systems and reserve currencies is breaking up into separate economic blocks. The main causes of this are primarily to be found in different ideologies, different political systems and heterogeneous technological standards (*Gourinchas 2022*).

We will analyse the impacts of the fragmentation process on the international financial system and monetary policy, which is often directly triggered by the power and political issues shaping the new world order, and by geopolitical tensions. Political conflicts of power are not the subject of our analysis, but where they are present as a trigger or as a factor reinforcing the disintegration of the system, we naturally refer to them. In this context, geopolitical tensions are one of the decisive factors in this process, encompassing several elements of disruption, friction and power struggles in international relations. Behind them, there are measures to rebalance power relations, discriminatory regulations restricting trade and financial relations, actions to prevent the free movement of capital, goods, services and technologies, and the imposition of sanctions of various kinds between countries seeking to change the power relations. Almost immediately, these measures lead to fragmentation of trade and financial relations between countries and groups of countries, and their ultimate impact is in any case negative.

2. The historical roots of the changing global order

It is worth looking back at the milestones of the last eight decades to see the roots of the emerging new world order.

World War II totally changed the international power structure. In the new world order that was emerging, fragmented trade relations had to be reorganised and the international monetary system had to be put on a new footing. After the war, the Western bloc wanted to consolidate international economic and trade relations and make them work for itself, forming a new basis for the international monetary system.

In 1944, the Bretton Woods Agreement was concluded in the USA, which made it possible to lay the foundations for a new world economic system. The International Bank for Reconstruction and Development (1944), the World Bank (1945) and the International Monetary Fund (1944) were created. This meant the establishment of a regulated framework for the international monetary system, and at the same time the United States became the dominant, hegemonic power in the international economic system. The US dollar became the dominant currency of international trade, with the exchange rate of all currencies fixed in dollars and the value of the dollar pegged to gold at a fixed rate. The global position of the US and the dollar

was strengthened by SWIFT (Society for Worldwide Interbank Telecommunications), the world's largest cross-border clearing house, which settles transactions in dollars, with at least one of the participants in a transaction being a US financial institution. A new system for financial and trade relations was established (London still retained its role as a financial centre, and the pound sterling played an important role in the trade of the countries of the British Empire and later the Commonwealth).

Subsequently, the North Atlantic Treaty Organisation (NATO), a military alliance led by the US, was founded in Washington in 1949, with twelve countries at the time of its signing, now thirty-one. As a result of this process, the United States has become a hegemonic world power. The other pole of world power was the Soviet Union and the Soviet bloc with the Eastern European countries it occupied. The confrontation between these two blocs became more and more acute in all areas, as the creation of the Iron Curtain illustrates. The Cold War era began, and the bipolar world power system was established. This was facilitated by the General Agreement on Tariffs and Trade (GATT), which followed the World Bank and the International Monetary Fund in 1947, then the World Trade Organisation (WTO) and, in 1961, the Organisation for Economic Co-operation and Development (OECD).

The Helsinki Final Act, adopted by the Conference on Security and Cooperation in Europe (CSCE) and signed by thirty-five countries in 1975, paved the way for the close of the Cold War. However, this required an agreement between the two superpowers, the USA and the Soviet Union, and mutual security guarantees, which finally came about in 1990–1991, when the two Germanies were united and Soviet troops withdrew from the Warsaw Pact countries.

The period following the end of the Cold War created favourable geopolitical conditions for the emergence of global economic and trade relations and value chains. The international monetary system was stable, supported by a system of rules and regulations of international financial institutions, and backed by the monetary policies of independent central banks. This did not mean, however, that even in this peaceful period there was not a determined effort to change the international balance of power and influence in the international trade and financial system.

So, within a historically short period of time after the end of World War II, the conditions for a new world order to function in political, military, economic, commercial and financial terms were established. At the same time, this bipolar system of world power, marked by the USA and the Soviet Union, was determined primarily by the military balance of power, and directly by their economic and financial systems, and there were several developments and efforts to change it.

In the background of this process, three factors became dominant over time, revealing the fault lines of the bipolar world order. This led to the emergence of a multilayered international monetary system, the foundations of which are changing and being transformed in the new tripartite world order. For a long time, the global hegemonic power of the US was backed by the Bretton Woods system,² the International Monetary Fund (IMF) and the dollar-based SDR system. There is strong economic and financial competition between the three dominant players in the world order, the US, China and the European Union, with the growing trend towards a reduction in the dollar's hegemonic role. This reduced the operational scope of the Bretton Woods system and the IMF's regulatory scope. According to analysts, the Bretton Woods system has not been a system for some time. According to *De Larosière (2012)*, for example, since the early 1970s, the financial system has been characterised by the term "non-system" rather than "system".

The presence and accumulation of external imbalances persisted, financial markets developed faster than the real economy, and liquidity surpluses became part of the system, at least until the crisis of 2008–2009. In this confused and complex situation, the IMF's previously established intellectual tenets were unsuccessful, and thus several attempts were made to reform the system (*Kruger 2012; IMF 2015*). However, due to the unleashing of financial markets and the lack of international support for change, reforms were not implemented (*Báger 2017*).

The second and most significant event is the creation and development of the European Union. Over the past two decades, the EU has become an economic powerhouse; the development of the Economic and Monetary Union was successful, the creation of the eurozone made it possible to establish the Banking Union, and the Capital Markets Union has developed substantially. From an economic and financial point of view, the European Union became a global geopolitical player, the second pole of the world order.

In 2019, the new President of the European Commission announced the need to strengthen the EU's role in world politics, and described her own presidency as a "geopolitical commission". To coordinate the EU's role internally and externally – in world politics – each EU Commissioner's cabinet set up an "External Coordination Body". The background to this change was the recognition that the multilateral world is moving towards a multipolar direction, where the EU's geopolitical position must be secured (*CEPS 2020*). The international financial crisis of 2008–2009 was a landmark event, one of the consequences of which was the collapse of US global geopolitical hegemony.

² The 80th anniversary of its creation will be in July 2024.

The next element of this process was that China became a global political and economic player alongside the US and the EU. A tripolar world order was established, which led to a new type of bloc formation, backed by major financial and trade agreements. A new force in the future will be the competition between central bank digital currencies (digital dollar, yuan and euro), which will be crucial for international monetary policy and financial cooperation. In this situation, the question may arise as to whether it will be possible to transform the SDR system into a digital system in the interests of international monetary policy and financial stability. This is not ruled out in principle, but there is little chance of a transformation of the current system to replace the current SDR with a digital version. The great challenge for the international monetary system is when, how and to what extent the digital dollar and the digital euro will be able to compete with the digital yuan, and how their competition will develop.

In this competition, the IMF is striving to maintain its leading role, as symbolised by its efforts to create a Global Financial Safety Net (GFSN) and its initiative to develop a Universal Monetary Unit (UMU) as an international central bank digital currency.

In response to this, and with a defensive purpose, the process to create the Transatlantic Trade and Investment Partnership (TTIP) between the US and the EU was launched in 2010 with an intention to link the two largest economies in the world. By the end of Obama's presidency, the treaty was ready for signature on the basis of the principle of mutual benefit, but the Trump administration refused to ratify it, citing US interests.

The failure of the treaty was due to the fact that the US made substantial changes to its economic and trade policies in order to maintain its position of power. It provided substantial subsidies to domestic producers to maintain their competitive advantage, and introduced export and discriminatory import restrictions violating previous free trade rules. Instead of the principle of mutual benefit in international economic relations, the growing share of investment was confined within the global power framework, blocking the flow of high-tech products to China and restricting imports from China. These developments led to the global power structure becoming tripolar by the end of the last decade, with the US, the EU and China dominating (*Economist 2023*).

In 2022, this tripolar order was hit by an unexpected new impact, the outbreak of the Russian-Ukrainian war. In terms of international financial cooperation and the expected development of fragmentation, this military conflict will have a longer-term negative impact – which cannot be assessed today. Traditional trade flows in a number of products have disappeared or fallen sharply over the period (energy, agricultural and high-tech products), particularly within Europe, with a knock-on effect on financial relations. Some of the severe sanctions imposed due to the war,

including on the financial sector, are effective, but others also affect those who have imposed them. As a result, part of Russia's export and import flows have been redirected, for example towards China and the Arab region, and a system of reciprocal preferences and new forms of financing have been developed to maintain these. This affected the power blocs and brought about a transformation of their financial relations.

The sanctions against Russia, Turkey and Venezuela may have undermined the confidence of countries that are geopolitically out of sync³ with the United States in the security of dollar reserves and payments (*McDowell 2021*).

3. Fragmentation in the new world order

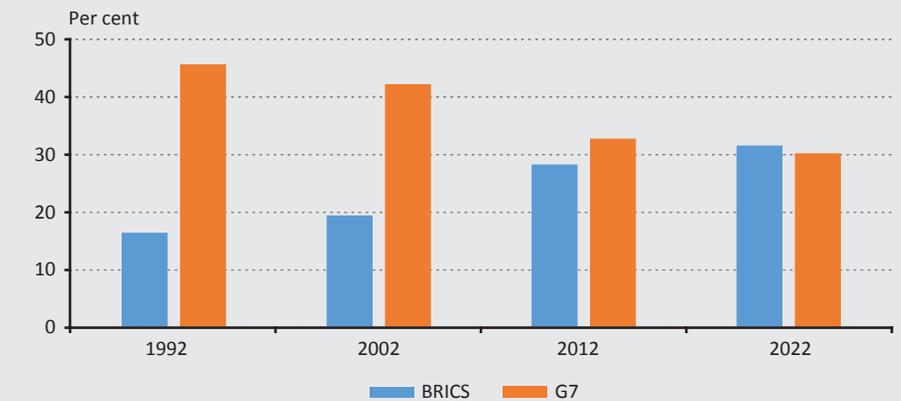
In the post-Cold War period, in the emerging tripartite world order, China has become a global power with the second largest GDP in the world. The central objective of Chinese economic policy was to ensure sustainable economic growth. One important element of the strategy developed was that the considerable industrial surplus capacity and capital reserves accumulated over several decades as a result of intensive capital inflows should be used abroad. In this spirit, the Chinese government announced a strong opening to external markets. At the same time, the strengthening and dynamic expansion of international financial and economic relations began. This included opening up business relations, increasing overseas direct investment, and reassessing global economic relations. China has taken significant steps to strengthen the international financial influence of its currency, the renminbi (RMB).

The basis of the “relationship” between the actors in the new power structure is competition, to ensure the financial autonomy and stability of their own bloc. A complete separation of international financial relations between the actors in the new tripartite power structure is not possible. The competition between the blocs they have created is intensifying, and the drive for independence is growing, while the US wants to maintain the leading role of the dollar. All of this leads to the so-called financial strategic divergence between competing blocs and the fragmentation of financial relationships.

³ As a trigger for the drive to de-dollarisation, international research shows that negative foreign policy decisions and sanctions (e.g. Russia, Turkey, Venezuela) can undermine confidence in the dollar, which also affects countries that are geopolitically out of step with the US in terms of the security of dollar reserves and payments.

The Regional Comprehensive Economic Partnership (RCEP), a free trade agreement signed in 2020, is an example of this strategy, the drive for independence from the dollar and a new element of fragmentation, with fifteen countries, including China, Australia, Japan, Indonesia and South Korea.⁴ This group accounted for 30 per cent of global GDP at its establishment, making it the world’s largest trading bloc and reinforcing the third pole of the emerging world order (*Figure 1*). The precursor to the RCEP agreement was the China–Australia Free Trade Agreement (ChAFTA), signed in 2015.

Figure 1
Shifting global balance of power the contribution of BRICS and G7 to GDP (1992–2022)



Note: BRICS group members: Brazil, Russia, India, China and South Africa; G7 group members: Canada, France, Germany, Italy, United Kingdom, Japan and the United States of America

Source: Calculated using Atlantic Council Geoeconomic Center data

We could enumerate a long list of bilateral or multilateral economic, trade and financial agreements (see e.g. *Dadush – Prost 2023*) which have been concluded in the last decade and in some way, individually and together, reinforce the process of the emergence of the new world order. These agreements are having a major impact on global financial markets, increasing the risk of volatility and signalling that member countries that have signed up to these agreements want to reduce their dependence on the existing global financial system, especially the dollar. At the same time, the economic potential and geopolitical position of the group of countries they represent can be an advantage if they can slow down the spread of contagion and develop their own rules of defence in the event of an international financial crisis.

⁴ The full list of member countries is Australia, Brunei, Cambodia, China, Indonesia, Japan, Laos, Malaysia, Myanmar, New Zealand, Philippines, Singapore, South Korea, Thailand and Vietnam.

In addition to political and military arrangements, the development of financial dependency has become a major factor in influencing the balance of power over the past decade. Its primary instrument is (long-term) lending to partner countries' economies and infrastructure investments, while also determining the currency of such financing and loan contracts. As a result, the five most dominant currencies in the IMF's SDR basket in 2022 were the US dollar at 43.2 per cent, the euro at 29.3 per cent, the Chinese yuan at 12.3 per cent, the Japanese yen at 7.5 per cent and the pound sterling at 7.4 per cent.

These regional and bilateral agreements have not strengthened the previous multilateral system. By the end of the last decade, the world had split into a tripolar bloc, known as the "strategic divide". On one side is the USA, on the other the European Union, and on the third side, China and the South-East Asian region. The direct consequence of this divide is the transformation, the "disintegration" of the former financial system.

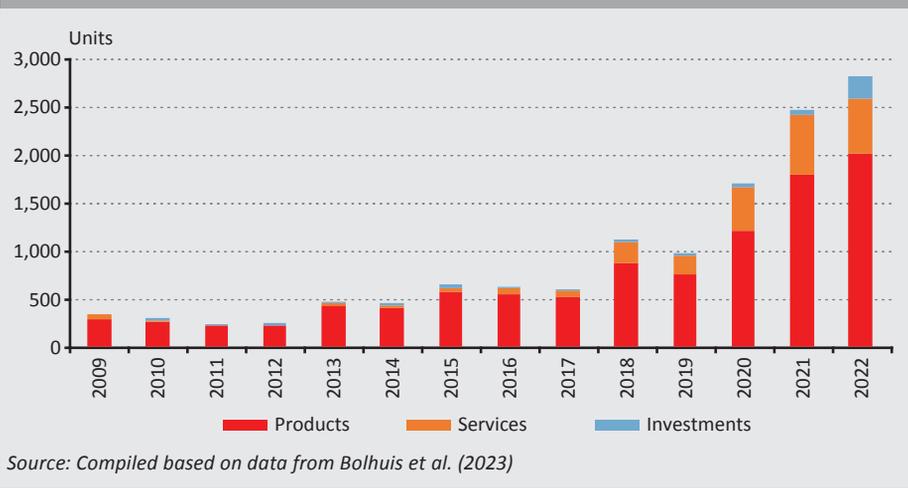
Christine Lagarde, President of the European Central Bank (ECB), described the process as follows: *"We are witnessing a fragmentation of the global economy into competing blocs, with each bloc trying to pull as much of the rest of the world closer to its respective strategic interests and shared values. And this fragmentation may well coalesce around two blocs led respectively by the two largest economies in the world. [...] In this sense, insofar as geopolitics leads to a fragmentation of the global economy into competing blocs, this calls for greater policy cohesion."* (Lagarde 2023:1).

Political will would be necessary to allow international financial regulators to work together in a multipolar space to reduce risks to monetary stability. It is hoped that this expectation can be met more successfully within the European Union than in a fragmented global financial policy space where cooperation between multilateral financial institutions is becoming less effective.

The aim of the competing blocs is to maintain and strengthen their positions of power and influence, using a variety of means. Strategies to support this include both attack and defence. As a means of defence, the competing hegemonic blocs seek to establish regional commercial and financial international groups alongside and around themselves. Ongoing global power and geopolitical changes have a direct, reciprocal impact on the fragmentation of the international monetary system (IMF 2023). There is a strong effort to weaken the still strong international position of the dollar, or otherwise to become independent of the dollar, with implications for the dollar-based SDR system and indirectly for the international role of the IMF.

Geopolitical tensions trigger the fragmentation of the international monetary system directly and indirectly through multiple channels, which in turn amplifies the risks to the system. Geopolitical tensions lead primarily to the imposition of financial restrictions and sanctions, thereby increasing financial market uncertainty. At the same time, trade restrictions (on exports and imports) appear, disrupting traditional supply chains. Financial fragmentation disrupts the redistribution of cross-border foreign lending and investment and the order of flow of capitals, which in the long run may lead to a more limited diversification of international capital and liabilities (Figure 2).

Figure 2
Increase in exposure to trade restrictions (2009–2022)



Geopolitical tensions intensified in the post-Cold War period, and the bipolar world order began to unravel. The conditions of international conventions aimed at closing the Cold War, which made it possible, were ignored and violated. Against this background, in order to preserve or increase economic and financial spheres of influence, there were numerous local military interventions, and an arms race was relaunched. Another aspect of this process is that China became an international geopolitical player by using efficiency, productivity, economic growth and financial dependence as instruments. Finally, the development of the European Union, the creation of the eurozone and the demonstration of its economic and financial resilience after the 2008–2009 crisis have made it an international geopolitical power. On the one hand, these processes have weakened the former hegemonic leadership of the US and, on the other, forced it into a defensive position, the early instruments of which were trade restrictions, mainly on imports, against competitors, which were replaced by a policy of increasingly severe sanctions,

and restrictions on the use of the instruments of the international monetary system (e.g. SWIFT).

The geopolitical situation deteriorated further with Russia's attack on Ukraine. The EU and the US have imposed a number of sanctions on Russia, such as *"the freezing of nearly half of the Russian central bank's foreign exchange reserves and the exclusion of a number of Russian banks from SWIFT, the dominant financial messaging system used to facilitate cross-border payments. Several observers noted that these sanctions may have far-reaching consequences for the role of the currencies of the sanctioning countries – including the US dollar and the euro – in the international monetary and financial system."* (Den Besten et al. 2023:1 and Abely 2023).

Real economic changes (trade restrictions, sanctions) triggered by geopolitical tensions disrupt commodity market linkages, supply chains, trigger inflation, reduce economic growth and increase economic and financial fragmentation (Catalán et al. 2023). Another consequence of this process is the emergence of liquidity and solvency stress in banks and non-financial corporations. Ultimately, this will lead to higher volatility in foreign funding and return on equity risk.

The new world order is experiencing a number of powerful, sometimes unexpected, impacts. The analyses of the problems are consistent in identifying the risks, but the proposals for solutions are contradictory and vary in emphasis. There is a need for international cooperation and international coordination to reduce negative impacts, while the active regulatory activity of international financial organisations is limited by the power blocs, creating a regulatory and cooperation trap.

Geopolitical tensions may lead to the introduction of measures restricting the flow of capital and cash, creating unpredictability and uncertainty for investors in international financial relations. Such effects include recent financial sanctions, regulations restricting capital investment and international asset freezes. This increases financial fragmentation, which negatively affects the profitability, liquidity and lending capacity of banks. The vulnerability of negatively affected countries to financial shocks increases. A direct effect of fragmentation is that the system of global financial relations is changing (Tran 2023).

As a sign of financial fragmentation and a reduction in the dollar's influence, in June 2022 the BRICS countries announced that they would develop a new global reserve currency similar to the IMF's SDR system. The aim is to counterbalance the hegemony of the United States over international financial institutions. This could allow the world's leading emerging economies to cluster together strongly, building their own sphere of influence with its own currency unit. This ambition is reinforced by the fact that the new currency will also be available to countries outside the

BRICS group. A new development occurred at the same time. In 2022, *“the People’s Bank of China (PBOC) declared its plan to create a yuan reserve pool with the Bank for International Settlements and with regulators of Indonesia, Malaysia, Hong Kong Special Administrative Region, Singapore and Chile to guarantee the necessary liquidity to participating economies during times of market volatility.”* (Giovannini 2022).

As mentioned above, geopolitical tensions trigger competition between global factors and defence at almost the same time. The above example shows a new element of power competition; the aim of the defensive effort in this case is to reduce and break the hegemonic international role of the dollar. An essential element of this process of deglobalisation is the drive to de-dollarise the world economy, which is challenging the international monetary order. *“The dollar-based monetary order is already being challenged in multiple ways, but two in particular stand out: the spread of de-dollarisation efforts and central bank digital currencies (CBDCs). [...] But recently, the pace of de-dollarisation appears to have picked up. Over the past year, China and India have been paying for Russian commodities in renminbi, rupees and UAE dirhams. India has launched a rupee settlement mechanism for its international transaction. [...] With the expansion of BRICS to beyond Brazil, Russia, India and China, the de-dollarisation of trade flows may proliferate. CBDCs could accelerate this transition.”* (Pozsár 2023).

The BRICS group has always been a strong member of the financial and trade blocs. Six countries announced their intention to join in August 2023: Argentina (which eventually did not join), Egypt, Ethiopia, Iran, the United Arab Emirates and Saudi Arabia. The acceding countries became full members from January 2024. This will significantly strengthen China’s influence in the Arab region and Africa.

The above developments illustrate the emergence of fragmentation in the emerging new world order, with clear risks and dangers.

4. The dangers and risks of global economic and financial fragmentation

The negative effects of the increasing geopolitical tensions of recent years have triggered a process of economic and financial fragmentation, and an unwelcome fragmentation of global financial markets to an extent that could threaten international financial stability. Uncertainty caused by geopolitical tensions hampers the conditions for the cross-border flow of capital. The negative impact on capital flows adversely affects foreign investment, creating tensions between investor and host countries. International payment systems may be hampered. As stability is shaken, banks’ funding costs rise, their profitability falls and they reduce their lending. Fragmentation risks can lead to significant economic costs, price increases due to disrupted supply chains, import restrictions or sanctions. Another

negative effect is that “*geopolitical tensions are transmitted to banks through the real economy. [...] The stress is likely to diminish the risk-taking capacity of banks, prompting them to cut lending, further weighing on economic growth.*” (Catalán et al. 2023:1).

However, it is legitimate to ask when fragmentation reaches the point where it poses a real threat to financial stability, or when fragmentation may have benefits up to a certain point. The answer is not simple, because global economic, power, dependency trade relations and their changes have to be considered simultaneously with the financial systems, financial exposure and financial stability that depend on them. Moreover, behind these processes are the global aspirations for power, i.e. to maintain or strengthen positions of power. And the international monetary system is also an instrument, or sometimes a sufferer, of this process, and thus of the development of the new world order (Pozsár 2023; Buckley – Trzeciński 2023).

The historical experience of different economic cycles is that, following a crisis or a tension, a double effect prevails. On the one hand, monetary and fiscal policy is gradually loosening, and the flow of capital movements and leverage is expanding. On the other hand, the lessons of the crisis will be used as a basis for more stringent financial regulation that will trigger international cooperation. At the same time, monetary policy had to be made capable of handling and adapted to the post-crisis situation. The events of the international financial crisis of 2008–2009 bear this out. It has led to tighter international financial regulation and increased regulatory cooperation, but a decade later the system is no longer able to manage the risks posed by global financial fragmentation.

Fragmentation can have a negative impact on the stability of the international monetary system, which is important for global economic stability and sustainable growth. To achieve this, the IMF considers it necessary to enhance international surveillance, promote international risk-taking and flows of capital; strengthen global resilience to financial shocks, and to prepare for crisis prevention by establishing a Global Financial Safety Net (GFSN) to maintain liquidity (IMF 2023a).

In addition to de-dollarisation, the emergence of central banks digital currencies (CBDCs) poses a particular challenge for the transformation of the international monetary system, as will be discussed in more detail later. Within a short time, it became clear that the applicability of CBDCs beyond national borders could become a tool for increasing international trade and financial influence, and thus global power struggles. Regulatory cooperation between international, and in some cases global, financial powers is also needed for CBDCs, but fragmentation is an obstacle.

One future challenge of central bank digital currency will be which of the currently competing CBDCs will gain more space and influence in the international financial

market, i.e. which will be the tangible manifestation of the power and security aspects of the future international monetary system.

All three major geopolitical players in the global economy are now actively preparing to launch their own digital currencies: the digital dollar, the digital euro and the digital yuan. China is a pioneer in this field, with the digital yuan already being tested in practice and rules for its domestic use being developed. A programme has also been developed to introduce the other two, which will be discussed later. It is clear that competition is an essential aspect of introduction and cross-border applicability, and the challenge as to which of the competing CBDCs will gain more space and influence in the international financial market, which will be an important element of power and security in the future international monetary system.

CBDCs are becoming part of this race, redrawing geopolitical positions by influencing the flow of international trade and financial exposure. Trade exposure takes into account the combined impact of export and import, supply and consumption processes in international value chains on international and global processes.

Financial exposure takes into account the total investment portfolio and all liabilities linked to the US, the euro area or China. An earlier analysis illustrates the expected emergence of competition, potential integrability and digital currency substitution risk for digital currencies by showing the trade and financial exposure and dependence on the euro area, the US and China. In terms of trade exposure, the euro area and the US have almost the same share, with China in third place. However, it is worth noting that China dominates the Far East region, as well as the whole of Africa and Australia. In terms of financial exposure, however, the US is in first place, the euro area in second and China again in third place (*Müller – Kerényi 2022*).

In order to reduce exposure to geopolitical tensions and the negative effects of financial fragmentation, the EU considers it necessary to strengthen European financial integration, in addition to preparing for the introduction of the digital euro. This was boosted by financial turbulence in the US and Switzerland in first half of 2023. The EU's competent bodies have decided to strengthen the eurozone's crisis management system, in particular by completing the building of the banking union and the capital markets union and by creating the European Deposit Insurance Fund. The EU sees the need to strengthen the resilience and defences of the financial institutional system as essential to ensure economic growth and resilience in the euro area. This is the framework for ensuring that capital markets allow for the efficient allocation of capital. This is an important requirement because the role of non-bank financial institutions in financing the euro area economy has grown significantly over the past decade, with increased risks for the financial system. *"Interconnectedness between the banking and the non-bank financial sector*

remains high, increasing the scope for contagion.” (Guindos 2023a:1). New, stricter regulation is needed to protect the stability of the financial system.

In a world fraught with geopolitical tensions, the European Union’s decision-making bodies have set out what needs to be done to ensure monetary stability, sustainable economic development and the preservation of international positions. This was helped by the experience of the 2008 financial crisis, as it became clear that the conditions for the functioning of the Economic and Monetary Union, the Banking Union and the Capital Markets Union needed to be strengthened. Once these are achieved, the next task is fiscal union and the development of a common fiscal policy. At this point, however, there are obstacles that are difficult to circumvent, which are briefly summarised below.

Following the founding of the European Union, which currently has 27 Member States, fundamental changes were brought about by the introduction of the euro in 1999 and the creation of the Economic and Monetary Union. This is when the EU split into the eurozone (now with 20 members) and the group of countries that remain outside or will join later (Bulgaria, Denmark, Czechia, Hungary, Poland, Romania and Sweden). By the time the eurozone was strengthened and it became clear that it was viable, the global financial crisis of 2008 had set in. It then proved that the EU was capable of overcoming the crisis, but it also forced the political realisation that the Union, and the eurozone in particular, needed to be strengthened. The key questions are in what way the financial system can develop, how monetary stability can be ensured in a two-speed Europe in the event of an international shock, and how the eurozone can be expanded and made complete, without which the Monetary Union cannot be complete. Bulgaria and Romania have already announced their intention to join. In a document published in 2017, the European Commission identified the euro, the single currency of the EU, as an essential condition for progress.

For the purposes of our analysis, the above shows that within the European Union there is a geo-economic division between the so-called core countries and the peripheral countries, with the result that the financial system is split between euro area members and non-euro area countries. The impact of this situation on the EU needs to be nuanced. On the one hand, it is undeniable that the EU is one of the influential factors in the current trilateral world order, the role of the euro in the international payments system is significant, the introduction of the digital euro and its usability beyond the euro area is expected to stabilise its position of power, but the future of the EU would be much more positive if a complete and unified Monetary Union were to be established (*Guindos 2023b*).

The impact of Brexit was questionable in terms of the stability of the European Union's financial system and its future international role. The period since then has shown that this change has not weakened the international position of the EU, and the euro area in particular, but has strengthened it. It has promoted the development of the Banking Union, the Capital Markets Union and regulation to strengthen financial stability. At the same time, London's role as an international financial centre has weakened, with the euro taking over the second place from the pound sterling to follow the dollar in the IMF's SDR basket. In response to the post-Brexit situation, in October 2020, the same year as the UK's exit, representatives of the financial organisations of nineteen EU member states and the EU Commission agreed that the EU's financial centres would be coordinated by Frankfurt and Luxembourg (The EU Roundtable of Financial Centres). The EU's international financial position was indirectly strengthened by the creation in 2018 of the World Alliance of International Financial Centers (WAIFC), based in Brussels, which represents the world's largest financial centres and is tasked with promoting international financial cooperation. It is certainly no coincidence that London, as a financial centre, is not a member of either of these two organisations. The European Commission decided in November 2019 to move the European Banking Authority (EBA) to Paris.

This accelerating and diversifying process has geopolitical and international financial risks. There are several ideas and proposals in the literature to reduce and prevent these. The IIF has made targeted proposals to the G20 to address market fragmentation, develop global regulatory standards and strengthen international cooperation among regulators. They argue in their analysis that there is a need to monitor the implementation of internationally agreed regulatory standards, improve the comparability of regulatory regimes, make the extent and impact of national discretion known, and help promote impact assessments and stakeholder involvement. It must be ensured that regulatory reforms remain fit for purpose in changing circumstances and the FSB should ensure a holistic assessment of reforms. These proposals can be effective if they are accompanied by increased international cooperation between regulators. This should include setting concrete objectives for closer cooperation between regulators and policymakers, strengthening trust between supervisors, and making information and data sharing between regulators more effective (*IIF 2019:2*).

Consequently, fragmentation can undermine broader common economic policy objectives, and supervisors, regulators and financial institutions need to be aware of the risks to financial stability arising from the rise in geopolitical tensions and commit to identifying, quantifying, managing and mitigating these risks.

The International Monetary Fund, as the guardian of international monetary stability, remains a key player, but it is also part of the financial bloc, and it is difficult to foresee how and in what way its role will be affected or constrained by the changing world order.

In light of the above, several international financial institutions have argued that in the emerging multipolar world order, power players are seeking to give priority to their national and regional interests, while global cooperation would be needed more than ever. Due to increasing geopolitical tensions, the adequacy of the global financial safety net needs to be ensured, which requires high levels of international reserves for countries, the development of bilateral and regional financial agreements and the provision of precautionary credit lines by international financial institutions.

5. Fragmentation and central bank digital currency

In a multipolar world order, the functioning of the international monetary system, which can also be used as a tool for competition between power blocs, is significantly affected by central bank digital currency. As mentioned above, China has been at the forefront of the early implementation and piloting of central bank digital currency. As it has become a dominant player in the world economy and world trade in recent decades, it has sought to use its currency, the renminbi, to gain influence in the international financial market and in the financing of international trade. China's international economic relations in Asia, the Arab countries and Africa have been greatly strengthened, and the objective of financing these relations not in dollars but in renminbi has been brought to the fore, the international use of which also paves the way for the rise of the digital yuan.

It is now clear that the introduction and the preparation for the use of the digital dollar is inevitable, and that its implementation will have a significant impact not only on the US financial system and monetary policy, but also on global financial processes.

Preparations are underway for the introduction of the digital euro. In April 2020, the EU Commission launched two major consultations, the Digital Finance Strategy and the Retail Payments Strategy. The document published by the EU Council in June 2020 launched the process of digital transformation of the EU, including the introduction of the digital euro. The competent EU institutions have set the target of introducing the digital euro by 2025 at the latest (*Müller – Kerényi 2022*).

The emergence and preparation for the introduction of the digital currencies of central banks is not a consequence of fragmentation, but can have a significant impact on strengthening it or mitigating risks. Soon after CBDCs were introduced, groups of central banks agreeing to use CBDCs across borders appeared as the first signs of financial blocs. Two new forms of these are presented below.

One is the announcement by the International Monetary Fund and the Digital Currency Monetary Authority (DCMA) of the launch of a central bank digital currency, the Universal Monetary Unit (UMU), in 2023. In line with the objective, the UMU, which will be convertible into any legal tender, should comply with the crypto asset regulatory recommendations previously developed by the IMF and strengthen the monetary sovereignty of the participating central banks and the financial integrity of the international banking system.⁵ This decision allows for two conclusions. On the one hand, the role of the IMF as the guardian of international monetary stability so far is diminishing, and on the other, it is part of the creation of a financial bloc whose geopolitical power it is strengthening.

Another development is the so-called Mariana project, initiated by the Eurosystem (which brings together the ECB and the central banks of the countries that have adopted the euro) and the BIS Innovation Centre, among others. The Mariana project represents the launch of a new financial grouping that is a response to the Universal Monetary Unit CBDC described above, which is intended to be introduced with the participation of the International Monetary Fund, i.e. to strengthen the emergence and competition of international financial blocs (*BIS 2023a*).

We should mention the BIS Project Polaris initiative, which does not aim to create a new financial bloc, but merely to enable the international secure, offline and online use of CBDCs. *“The option to pay offline means that you can use CBDC without an internet connection, either temporarily or due to coverage limitations. Central banks considering the possible introduction of offline CBDCs need to consider a complex matrix of issues, including security, privacy”* (*BIS 2023b:1*).

These developments confirm that the fragmented international financial environment, the digital era and the emergence of competing blocks are challenging central banks, requiring them to review their monetary stability, reform their payment systems and issue their digital currencies, and that risk mitigation requires stronger international regulatory cohesion.

⁵ *Leleplezte tervét az IMF: saját digitális fizetőeszközt bocsát ki (IMF unveils plans to issue its own digital currency)*. Portfolio.hu, 16 April 2023. <https://www.portfolio.hu/bank/20230416/leleplezte-tervet-az-imf-sajat-digitalis-fizetoeszkozt-bocsat-ki-609398>. Downloaded: 5 July 2023.

The cross-border, international emergence of CBDCs will certainly have an impact on the global financial system and power relations. The geopolitical competition between the US and China may be influenced by CBDCs in several directions (Buckley – Trzeciński 2023). The first version is that the dollar could retain its dominance, as it will be cheaper and more accessible than its competitors. Alternatively, the United States may lose its global financial dominance as its competitors use their central bank digital currency in blocs organised around themselves, fragmenting the international monetary system. Many countries are under pressure to join the US or China-led bloc, which threatens security, economic growth and financial stability. With geopolitical tensions already present, the possibility of this happening is minimal. *“Each of these possibilities will pose opportunities and risks for states and the global financial system as a whole. However, the second outcome, a global economy fragmented into two or more competing blocs, likely led by the US and China, poses an existential threat to the currently truly global financial system.”* (Buckley – Trzeciński 2022).

6. Summary and conclusions

One of the major questions of our day and age is how the new world order in transition will affect the international monetary system, and how it will reinforce its fragmentation. This is primarily driven by efforts to change the global balance of power, creating strong geopolitical tensions. These efforts focus on changing the political and power relations established after World War II and those adopted after the close of the Cold War, and the international monetary system developed within them. In this multifactor process, the preservation or enhancement of power positions or the global expansion of new actors can only be achieved by disrupting the existing order, often with serious conflicts of interest.

In order to achieve power goals, economic and trade relations that previously operated at a global level are changing, and fragmentation is occurring, not triggered by, but as an inevitable consequence of the fragmentation of the international monetary system. Among the means of changing the geopolitical situation and the balance of power, there are military-political, local armed conflicts, which are not the subject of our analysis, but we must be aware that they are important factors in international financial fragmentation.

The factors triggering geopolitical tensions have launched a process of deglobalisation, whereby earlier multilateral relations are shifting towards a multipolar order, and within a historically short period of time, the global economic, trade and financial relations of the past are fragmenting.

Transformation involves defending and strengthening existing power relations, and in the case of new actors, building their own positions and spheres of influence. The protection of sovereignty, of their own geopolitical space and of monetary stability also aims to avoid a power vacuum.

The three main players in the new multipolar order are the US, China with the South-East Asian region, and the European Union. The first two want not only to defend their positions of power, but also to strengthen their economic, financial and military influence. The primary objective of the European Union is to safeguard the economic and monetary stability of the Union and, within it, the euro area, and to strengthen its geopolitical role.

A new instrument of financial fragmentation is the use of financial blocs and financial dependency, with geopolitical tensions between competing blocs triggering fragmentation of the international monetary system, which increases the risks of the system. Global economic and trade relations have changed in an unfavourable direction, supply chains important for economic development have been disrupted, import restrictions between competing blocs have been introduced, leading to financial restrictions and sanctions, and increasing financial market uncertainty. The rapidly changing and unpredictable international situation has a negative impact on cross-border flows of capital, capital allocation and foreign investment. All of this will undermine the profitability and liquidity of banks, increase financial market volatility, accelerate the contagion of negative effects and threaten monetary stability.

Central banks and international financial institutions are looking for ways to reduce risks, but these steps are often controversial. In the geopolitical contest for power, a significant number of measures taken to preserve monetary stability and sovereignty reinforce fragmentation, while the representatives of the power blocs are pushing for more effective international regulation and the functioning of the international financial institutions that represent them. In the emerging multipolar world order, power factors are pushing national and regional interests to the fore, while reducing the negative effects of fragmentation would require stronger political cohesion, global cooperation and the development of a financial safety net. There is a need for international cooperation and international collaboration to reduce the negative impacts, while the active regulatory activity of international financial organisations is limited by the power blocs, creating a regulatory and cooperation trap.

Digital development and artificial intelligence are contributing to this shift. The most important is the emergence of digital currencies, so-called central bank digital currency, and the preparation for their introduction. China is leading the way in

adoption and deployment, but plans are also underway to introduce the digital dollar and the digital euro. CBDCs are designed to perform several functions and to protect sovereignty, and their international use can increase the international influence of their adopter, create cross-country financial dependence and promote economic and financial blocs.

The outcome of the changing world order, and the fragmentation it entails, is unpredictable. Competing blocs would have an interest in preserving the stability of the international monetary system and reducing the expected risks to the international payment system, but this is hampered by geopolitical tensions and the power ambitions of the competing blocs.

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Is the Next EU Enlargement Taking Shape?*

Péter Gottfried 

When considering the next enlargement of the European Union, the political and economic situation in the world which provides the framework of possibilities and challenges is rarely examined. This paper argues that it is of vital importance for the future of the European Union as a whole that future enlargement or enlargements strengthen the EU only in case of full membership, i.e. if future membership is based on the full scope of rights and obligations. While the gradual application of certain rights and obligations may be justified in the pre-accession phase, this may only apply to the pre-accession phase itself and may not lead to differentiated categories of membership. It is vital that the achievements of EU integration, in particular the integrity of the internal market, must not be endangered. The earlier enlargement paradigm according to which each enlargement must be accompanied by further deepening of integration should be reconsidered. Instead, the more frequent use of existing instruments of flexibility and possible extension of their scope should be considered.

1. Introduction

The European Commission issued its communication on pre-enlargement reforms and policy reviews on 20 March 2024 (EC 2024b). This document outlines for the first time the approach of the Commission to the next possible enlargement, in the wake of the political decision taken by the European Council in December 2023 on opening accession negotiations with Ukraine, Moldova and Georgia. The document outlines certain aspects, but does not contain specific details which need to be clarified and detailed in the ‘negotiating framework’ to be agreed upon by the Council at a later stage.

The political debates and scientific work on future enlargement focus on aspects such as how to bridge or at least to reduce the economic and social differences between the present and future members, which are clearly larger than in the earlier cases of enlargement, in order to facilitate integration as smooth as possible; when and how applicants can fully meet each of the Copenhagen criteria and to what extent existing institutions and decision-making should be modified; and

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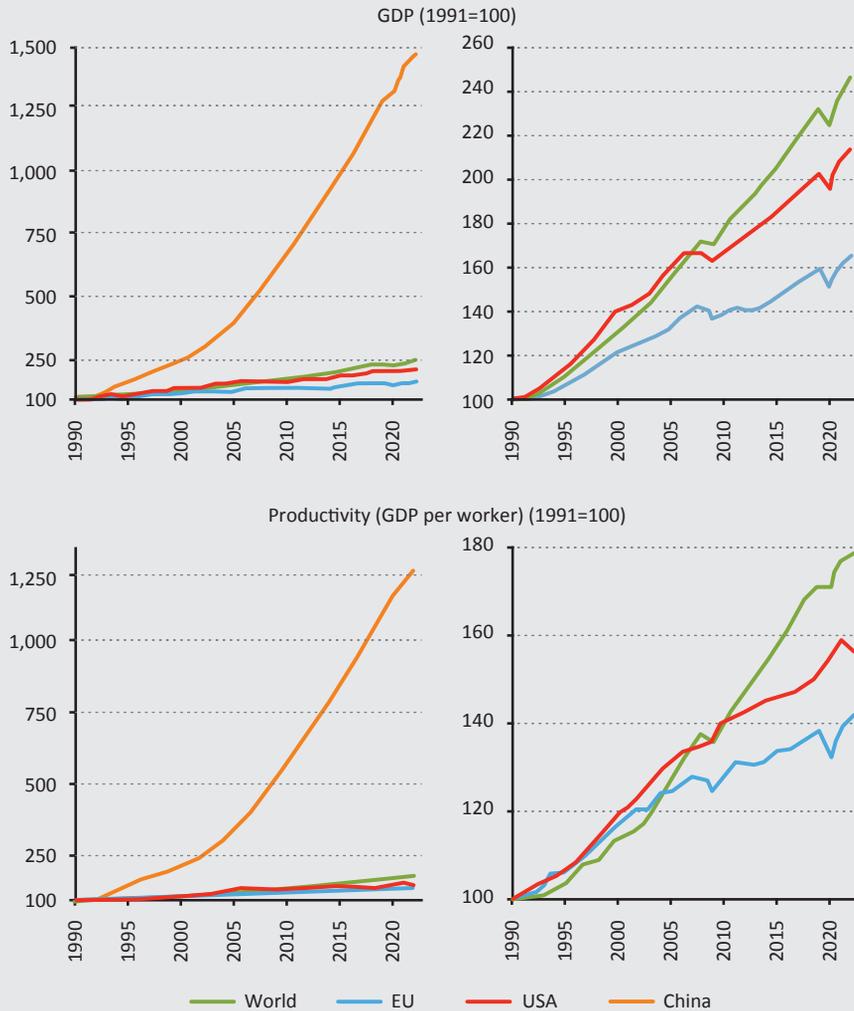
how budget rules and common policies with major budgetary implications – first and foremost cohesion policy and the Common Agricultural Policy – would be affected (*Emerson 2023; Blockmans 2023; Darvas et al. 2024*)? It has not yet been considered, however, that all of these possible major European changes may occur during a time of significant shifts in global political and economic power, which directly affect the absorption capacity and competitiveness of the EU. This consideration, however, is quite relevant in terms of answering the ultimate question, i.e. whether and how to achieve that future enlargement ensures that Europeans, both in the present and the future Member States, live in peace, security and welfare as provided for by the Treaties (*European Council 2023a; European Council 2023b: point 13*).

This article attempts to answer the question of whether the Commission as set forth in the above referred document intends to base the upcoming enlargement on the model of the previous ones. Are the earlier negotiating principles and methods to be applied? Or, as consequence of the much greater difference in development levels and socio-economic structures of Ukraine as compared to earlier accessions, does the Commission propose a more politically-driven approach with a less demanding attitude to social, economic and administrative requirements? The answer to these questions has major implications for the future of the European Union itself.

2. Europe in a changing world

Before assessing the enlargement document of the European Commission (*EC 2024b*), it is worthwhile to refer to two other reports published a couple of weeks earlier as they well describe the global context. The report of the high-level expert group on cohesion (*EC 2024a*) and the 9th Cohesion report (*EC 2023*) paint a rather sobering picture. Beyond the description of the multiple crises, the former notes that “For at least the last three decades, Europe’s economic growth has consistently lagged behind the world overall, particularly compared to the most advanced and emerging economies. This extended period of relative economic underperformance has been matched – and to a certain extent exacerbated – by increasing polarisation within countries” (*EC 2024a:8*) and goes on to say that “lack of economic dynamism, polarisation, and scant opportunities are at the base of a rising tide of discontent with the European project. This discontent is particularly strong in regions that have remained stuck with low levels of development or faced prolonged stagnation” (*EC 2024a:8*). For all of these reasons, the enlargement document deems it important to strengthen cohesion. At the same time, since 1990, the shocking speed of economic development in some other regions of the world economy is also emphasised (see *Figure 1*). Since 2000, growth has increased at a level of 8 per cent per year in some parts of China and in some other regions of Asia. Some regions in India and most of South-East Asia grew at a rate of 4 per cent, and Central and Eastern Europe at 3 per cent annually.

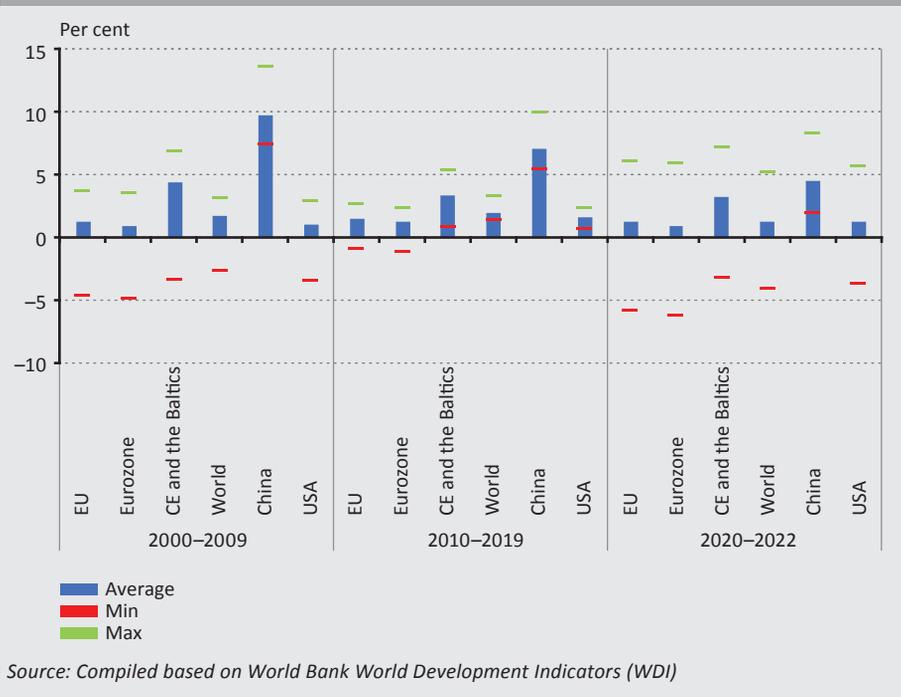
Figure 1
Evolution of GDP and of GDP per capita in major regions of the world



Source: EC (2024a:12)

The growth shortfall of the EU since 2000 is reflected in the statistics. Growth rates for the EU and the Eurozone fall well below those of China and the USA, and periods of crisis have impacted the EU economy. In addition, the EU economy is also more affected by downturns. At the same time, Central Europe and the Baltics grew above the rate of the world and above the USA (Figure 2).

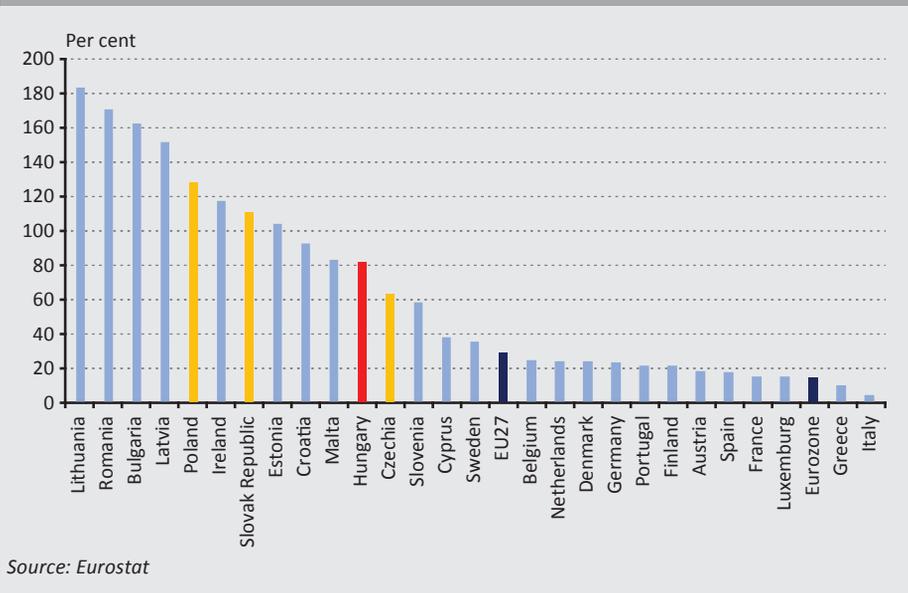
Figure 2
GDP per capita growth in the world (2000–2022)



In parallel with the convergence of development levels within the EU, the growth rates of Member States are diverging. Growth in some Southern and even parts of some Western European regions has been visibly slowing. While the growth performance of Hungary is not as impressive as that of some other Member States which joined the EU at the same time in 2004, it was three times higher than that of the EU or Eurozone average between 2000 and 2023. GDP per capita in 2023 was 81.5 per cent higher in Hungary than in 2000, while the increase was 14.1 per cent and 28.9 per cent in the EU27 and the Eurozone, respectively.² The corresponding figures for some earlier acceding Member States were 4.2 per cent in Italy, 9.9 per cent in Greece and 15.1 per cent in France, and growth levels have been below the EU average in Spain, Belgium, Portugal and even in Germany. All of these figures are obviously interpreted with significantly different levels of GDP.

² McKinsey Global Institute (2023), referred to by the document of European Commission (EC 2024a)

Figure 3
GDP per capita in 2023 compared to 2000

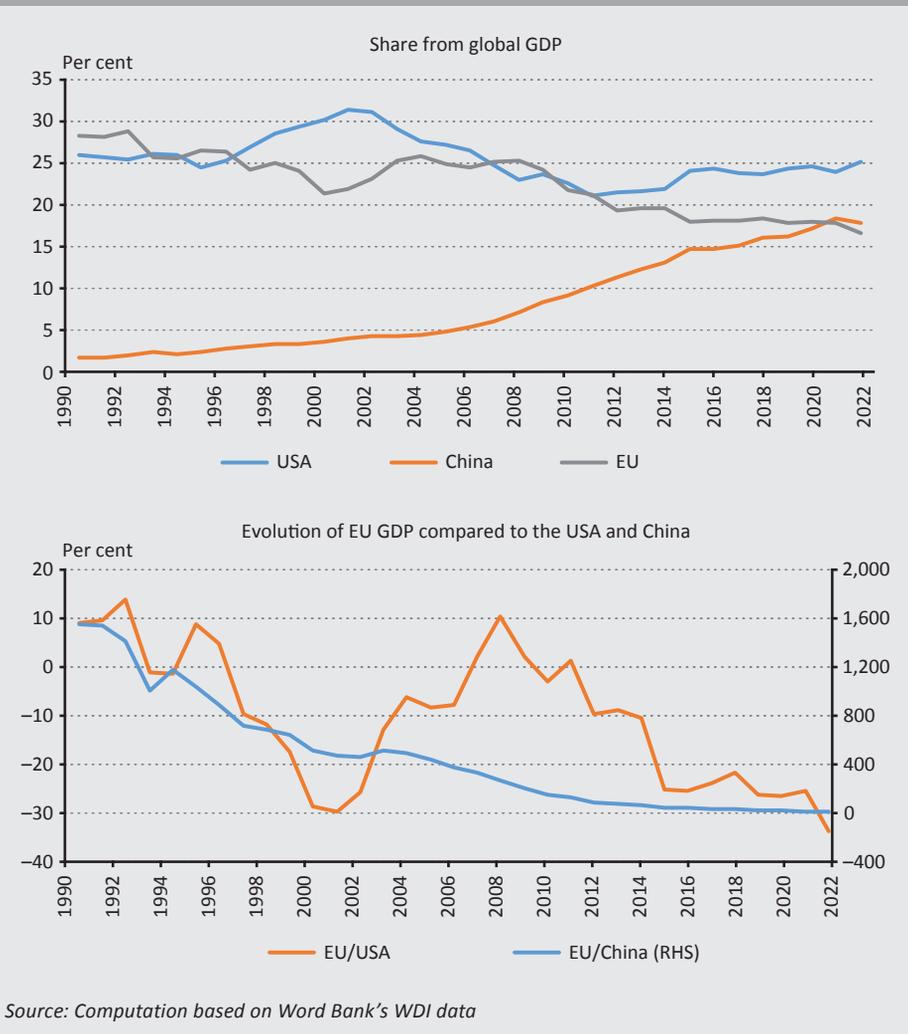


Real GDP per capita in a number of Greek, Italian and North-Eastern French regions was lower in 2023 than in 2000. “More than 60 million EU citizens live in regions with GDP per head lower than in year 2000. An additional 75 million people, nearly one third of the EU population in regions with near-zero growth. Collectively about 135 million people, nearly *one third of the EU population*, live in places which, in the *last two decades*, have *slowly fallen behind*”.³

The above figures are even more frightening than the often-quoted data on the declining share of the EU in the world economy. The share of EU global production reached 28 per cent in 1990 before falling to below 17 per cent in 2022. The EU’s GDP has increased by 69 per cent in more than three decades, while that of the world has risen by almost 150 per cent. During this period, global GDP rose 2.2 times faster than in the EU. Comparing EU economic growth to its main competitors further accentuates the dimension of this relative decline. In 1990, the GDP of the EU exceeded the GDP of the USA by almost 9 per cent, while by 2022 it lagged behind by 34 per cent. The difference is even greater compared to China. In 1990, China’s GDP accounted for only 6.7 per cent of the EU’s GDP, but by 2022, the EU’s GDP was already 7 per cent smaller than that of the Chinese economy (*Figure 4*), i.e. the ratio turned completely around in the course of three decades.

³ See footnote 1.

Figure 4
Growth dynamics of the EU, USA and China between 1990 and 2022



It is remarkable that until the mandate given to prepare the Letta and the Draghi reports, the existential question referred to above was not included on the agenda of European public debates. Finally, competitiveness was on the agenda of the 17–18 April 2024 meeting of the European Council.

This is the background against which the EU is engaged in the *next wave of enlargement*, in which the candidates' socio-economic structures and levels of development differ significantly *from the EU*. It should also be noted, however, they differ not only from the EU, but from *each other* as well. The most important

difference is that while the candidates from the *Western Balkans* do not represent an important challenge of absorption for the EU due to their size and economic potential, Ukraine certainly does due to the size of its territory, its population and its level of GDP per capita. GNI per capita in Ukraine was 11.5 per cent of the EU average in nominal terms and 26.3 per cent in purchasing parity (*Emerson 2023*).

3. Is the model of previous accessions to be applied in the case of the next enlargements?

The question is whether the European Commission plans to follow the accession model of previous enlargements. In the earlier enlargements, the principle was that it was the task of the applicant countries to take over the existing EU legislation and to ensure that the so-called Copenhagen criteria are fully met, including not only adhering to the common values but also the ability to withstand the competitive pressure in the internal market. It served also as basic principle, even if practice may not have been in compliance with the principle, that the process is driven by the individual performances of the applicants and the speed depends on their actual progress in the implementation of commitments. Political considerations in recent months have raised the question as to whether the principles upon which earlier accession were based remain applicable in the future, or if the intention is rather to move towards a Europe of concentric circles and the European Political Community or earlier ideas like core Europe may serve as elements of a “future of Europe” puzzle (*Lazarevic – Subotic 2022; Macek 2023; von der Leyen 2023; Lippert 2024*). Documents of the Commission (*EC 2024a, 2024b, 2024c*) clarify a number of the emerging issues, but many of the details are not clarified yet. The most important features are as follows:

- The enlargement process and *EU internal reforms* are considered as *parallel processes*. While in the case of earlier accessions the adoption of the totality of existing EU legislation with the exception of a limited number of transitional periods was not negotiable, the concept now seems to be that equal attention is paid to the review of existing EU policies. (The Cohesion report goes as far as to state that institutional reforms, first and foremost the cessation of unanimity in decision-making, is necessary even without enlargements.)
- The document seems to confirm that the principle that each enlargement wave must be accompanied by the *further deepening of integration*. That would be a continuation of earlier practice. Still, there are reasons to rethink that model in the case of an enlargement resulting in a hithertofore unprecedented increase in diversity among Members. A further drive for deepening may lead to an accumulation of tensions. The perception should be avoided that enlargement

is only used as justification of the ambitions of some Member States or institutions to reform internal policies.

- It is rightly confirmed, in my view, that the negotiation process must be merit-based, i.e. driven by the *individual performance* of the applicants. It is also confirmed that the *Copenhagen criteria* are to be fully met. Therefore, the time horizon and the sequence of accessions *cannot be foreseen* at this stage.
- The concept of *gradual integration* is also confirmed, but it is also made clear that as in the past this means only that parts of the membership rights and obligations can be applied *before accession*. Partial membership with parts of the rights and obligations after accession is not meant under this concept. This interpretation corresponds to the earlier practice where, for example, in the case of Hungary, asymmetric trade concessions were granted in the framework of the Association Agreement before accession.
- The emphasis on the *rule of law* situation is much stronger than in the past. It is a remarkable “gift” by the Commission that frontrunners are to be included in the annual rule of law reporting exercise. It may be considered, however, would it not be appropriate to slightly modify the exercise and to examine indicators of *good governance* since the tool kit to assess the rule of law situation in an objective manner⁴ still do not exist.
- The *relation* of the potential candidates to the *internal market* is of critical importance. Gradual access to the internal market is proposed, but at this stage no consideration is given to the Copenhagen criterion in relation to the ability of the candidates to withstand competitive pressure in their own markets. Before allowing access to the EU internal market, it also must be clarified how to ensure that all technical rules and standards, veterinary, phytosanitary and quality control regulations are fully respected. It is also not yet discussed whether it is acceptable that some applicants enjoy a competitive advantage compared to economic agents in the Member States because of unilateral concessions and where their cost level is lower as they are not bound by costly technical, environmental and other requirements (see the situation in the cereals market, for example). In general, whether the earlier undisputable principle of “Community preference” will continue to be applicable, according to which economic agents from the Member States should be in a more favourable position than those of third countries. The situation at present, however, is that EU economic players not only do not enjoy preference, but they are at a relative disadvantage in the EU markets for some important agricultural products compared to their Ukrainian competitors. That situation leads to further distortion of the competitive positions

⁴ See for example *Worldwide Governance Indicators of the World Bank*, 25 September 2023. <https://www.worldbank.org/en/publication/worldwide-governance-indicators>

due to the differentiated impact on the existing Member States with different geographical locations. Such a situation has not been seen in the past. It is true that the Commission documents admit that safeguard measures may be needed.

- The importance of *physical connectivity* is rightly emphasised. The existing significant differences between, for example, the transport infrastructure between Western Europe and the Member States which joined in 2004 and later are many times greater in case of the new applicants. Reducing these differences could be an important objective of the pre-accession phase.
- It is interesting to note that the Commission foresees involving applicant countries in “*strategic partnerships in ecosystems of mutual interest*”, naming specifically battery production as a possible area.
- *Cohesion policy* is potentially one of the policies most affected by the future enlargements. The convergence needs of possible future Members are huge, while statistical effects in the case of existing beneficiaries do not change economic realities. It does not come as a surprise that conflicts of interests among net contributors and net present and future beneficiaries cannot be avoided. When the number of plates on dining table increases, it has to be agreed if the size of the cake should be enlarged or the slices should be reduced or redistributed. According to *Darvas et al. (2024)*, based on the calculation methods applied in the case of the 2021–2027 Multiannual Framework, Hungary’s cohesion allocation would be reduced to a larger degree, by some 11 per cent, in the case of Ukraine’s accession.
- The *European Semester* exercise is referred to as an instrument of coordination. This may lead to a situation where requirements for reforms may be presented by the Commission beyond those directly related to alignment with EU policies and to the harmonisation of legislation. That would result in an enhanced role of the Commission and reduce the role of the Council as compared to earlier accession negotiations. It should also be noted that cross-border cooperation among applicants and bordering Member States is seen as important part of territorial cooperation.
- The Commission urges reforming the *decision-making* process, in particular to move from unanimity to qualified majority votes in most remaining areas of *Foreign and Security Policy*. The use of the *Passarelle clause*⁵ is suggested in order to avoid the need for Treaty modification. As long as this does not happen, “constructive abstention” is proposed.

⁵ <https://eur-lex.europa.eu/EN/legal-content/glossary/passarelle-clauses.html>

- Alignment with the *EU Foreign and Security Policy* is considered to be of specific importance under the new geopolitical circumstances. This could be particularly sensitive in the case of Serbia, where free trade agreements, including the one concluded with China need to be dealt with.
- As far as the EU budget is concerned, the Commission finds it necessary to consider future enlargement when preparing the next Multiannual Financial Framework. It believes that replanning of the budget would be necessary even without enlargements. It suggests using extra-budgetary resources and the introduction of new own resources. To ease possible budgetary tensions, existing Member States may need *phasing-out periods*, *safeguards* and *safety nets*. Concerning governance, the Commission does not rule out Treaty modifications, but believes most requirements can be addressed by the *Passarelle clause*, *emergency breaks* and *constructive abstention*. The idea is raised that the European Council could empower the Ministerial Council to take intermediate decisions by qualified majority vote. Thus, only decisions to close negotiating chapters and to conclude negotiations would remain subject to unanimity.
- The Commission suggests that each and every EU policy be reviewed by early 2025, so that the results can be incorporated into the negotiations on the next Multiannual Financial Framework Perspective.

4. New enlargements, new questions

As described above some uncertainties have been clarified, in many aspects in a positive way. A number of new questions emerge, however, which may require the definition of national interests and the clarification of details before entering negotiations on the negotiating framework and a possible launch of accession negotiations themselves. Let us focus on the following issues:

1. It will be important how the differences in the degree of liberalisation of the movement of *goods, services, capital and persons* under the Association Agreement and the Free Trade Agreement can be bridged to reach full liberalisation under full membership.

In the area of free movement of goods, most Ukrainian agricultural exports are limited by tariff quotas, and customs procedures differ significantly. Trade in goods continues to be restricted by customs procedures and conformity assessments, despite the generous concessions granted by the EU. Since the beginning of the Russian aggression, the EU has granted unilateral market access preferences on an autonomous basis. It will be a matter of decision if the contractual trade regime under the Free Trade Agreement or unilaterally granted EU regime is taken as a point of departure.

In the area of services, the degree of liberalisation falls far below the level under membership. Liberalisation of capital movement did not proceed as foreseen in the Free Trade Agreement, due to the war, and further capital restrictions have been introduced by Ukraine in respect of foreign investments and other capital movements. Liberalisation of the movement of workers is left to bilateral agreements between Ukraine and the Member States by the Free Trade Agreement. Despite the lack of EU-level liberalisation measures, a completely new situation is created by the fact that all Member States provide temporary protection permits to Ukrainian refugees, which grant such persons access to their labour markets. About 4.2 million Ukrainian citizens had used that possibility by November 2023.⁶

2. The Commission paper confirms that a regatta approach is not applicable. The cases, for example, of Ukraine and Montenegro are completely different in terms of their impact on EU policies, and therefore they need to be considered individually. GDP per capita in Ukraine in 2019 was 28.7 per cent of the EU average in purchasing power parity and 10.5 per cent⁷ in nominal terms. That value in purchasing power parity was only slightly above one half of the level of the poorest Member State (Bulgaria: 52.2 per cent). Due to their different dimensions, integrating the Western Balkan candidates does not necessitate the adjustment of EU policies and if so the needs are negligible. The implication of Ukraine's accession is qualitatively more demanding.
3. In the history of EU there are examples of conducting and even successfully concluding accession negotiations with countries with *frozen conflicts*. The conflict of Cyprus has been frozen for about fifty years. The Estonian border was challenged by Russia at the time of its accession in 2004. The territory of Germany was divided, and Soviet troops were present when the Federal Republic of Germany acted as founding member (*Darvas et al. 2024*). Still, the *EU has no experience* in accepting new members which are *at war*. Furthermore, the consequences of Article 42.7 need to be clarified, according to which “If a Member State is victim of armed aggression on its territory, the other Member States have toward it an obligation of aid and assistance by all means in their power”.
4. From the Hungarian viewpoint, the concept of *gradual integration* cannot be questioned, provided that it means particular benefits earlier than the totality of rights and obligations of membership that is applicable from accession. The Commission paper seems to confirm that interpretation. That happened in Hungary's case within the framework of the Association Agreement. However,

⁶ <https://www.consilium.europa.eu/en/infographics/ukraine-refugees-eu/>

⁷ IMF World Economic Outlook Database, 2023 April. (<https://www.imf.org/en/Publications/WEO/weo-database/2023/April>)

gradual integration cannot lead to partial application of some rights and some obligations after membership, i.e. to partial membership. That would pave the way for a Europe of concentric circles. The Brexit experience shows how difficult it is to find a fair balance of rights and obligations under the level of membership.

5. The strong interlinkage among *internal market and competition and state aid and cohesion* must be kept on the agenda. It would be important to protect the preference in terms of the degree and flexibility cohesion countries enjoy under the present system. Provision of fair conditions for competition is the biggest achievement of EU integration and it serves as its pillar. It is vital to avoid endangering or eroding it.
6. In the pre-accession phase, both at the theoretical and practical level, the issue of EU *preference versus dispreference* emerges, as already occurred in the case of agricultural *imports or dumping* from Ukraine. The principle of Union preference has been unchallenged for many decades. In the 1990s, however, there was a ruling by the European Court of Justice according to which under specific circumstances it may be justified that competitors from third countries are not in a disadvantageous competitive position. Recent references by President Macron to EU preference have been qualified as a manifestation of French protectionism.
7. It should be noted how correctly the Commission emphasises the importance of extending *Erasmus Plus* to applicants as a vehicle to strengthen attachment to the European idea.
8. The report of the high-level expert group (*EC 2024a*) also deals with the problem of brain drain as a side effect of the *free movement of people*. It may be worthwhile to refresh our earlier ideas about how countries benefiting from employing highly educated personnel, such as doctors, could compensate the universities of countries of origin.
9. *Cross border* cooperation opens new possibilities. Due to its geographic location, Hungary can benefit considerably from those possibilities, if properly prepared.

5. Conclusions

An analysis of the relevant European Commission documents confirms that the next enlargement is to be based on the model of the previous ones. Therefore, above and beyond the political will, meeting all of the Copenhagen criteria by the applicants will also be required. Accession will happen only with an applicant and at a time when it can be made certain that the preparedness of the acceding country reaches a level which ensures that the earlier achievements of EU integration are not endangered. When to set up the negotiating framework, how the implementation of

EU legislation can be monitored, and in which cases transitional arrangements can be negotiated are aspects that are subject to clarification at a later stage. Beyond that, existing Member States and institutions are, however, confronted with the loss of competitiveness and the declining share of EU in the global economy and trade. Consolidation of the role of the EU as a global actor or at least halting the trend of decline should be regarded as precondition to meet the original and still valid objective of the Treaty, namely to ensure that citizens of the present and enlarged Union can live in peace, security and prosperity. Beyond the widely discussed budgetary issues and impacts on EU policies such as cohesion or agriculture, that aspect should also be given serious thought.

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Proposal for a Stabilisation Mechanism for the EU Budget*

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The question of how to give the European Union budget a stabilising function in the event of shocks has long been a concern for economists and economic policy-makers. Our paper proposes a mechanism that is automatic and relies on unemployment figures, similar to the role of automatic stabilisers at the national level. A novel feature of the proposal is that, instead of considering the overall unemployment rate as most studies do in the literature, it uses excess unemployment data. As a result, structural unemployment differences between countries can be discarded. A system based on excess unemployment would not involve the modification of national systems, but would introduce a complementary, top-off system. Benefits are paid in addition to payments through the national unemployment systems and are channelled into a fund set up in advance for this purpose. Annual payments to the fund are made in proportion to GDP. The payment would represent an additional cost for Member States, which could be financed by jointly guaranteed long-term loan.

1. Introduction

The ability to smooth asymmetric shocks is a fundamental feature of a well-functioning economic and monetary union. Economists and economic policymakers have long been concerned with the question of how to provide the European Union budget with a stabilising function that could play a stabilising role in the event of shocks, even asymmetric shocks. Efforts have already been made to do so, notably *the European instrument for temporary Support to mitigate Unemployment Risks in an Emergency (SURE)*, set up in response to the Covid-19 pandemic, as well as the *Recovery and Resilience Facility (RRF)*. As both funds take into account the impact of country-specific shocks, the principle of solidarity is applied to some extent. However, these are one-off initiatives, with SURE terminated at the end of 2022, while amounts from the recovery fund are to be drawn down by 2026. What

* The papers in this issue contain the views of the authors which are not necessarily the same as the official views of the Magyar Nemzeti Bank.

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is needed is a permanent, automatic stabilisation instrument at the EU level, such those existing in national budgets. Typically, this role is fulfilled by unemployment benefit schemes. In our study, we propose a similar automatic stabilisation mechanism at the level of the euro area. We are aware that the introduction of such a system is fraught with difficulties, as it raises the delicate issues of risk sharing, solidarity and moral hazard. Our proposal would also require an additional payment from Member States. We acknowledge that such a proposal may be a distant goal, but we believe it is worth putting this new approach on the table alongside the previous proposals.

Our proposal is for a mechanism that acts as an automatic stabiliser based on unemployment, since unemployment is the most tangible and simplest automatic stabiliser in the budget. Our paper takes excess unemployment as a starting point and calculates the level of benefits that would have to be paid out each year, and the amounts that would need to be allocated from budgets or other sources.

2. Literature reviewed

A number of economists have published papers on the concept of a stabilisation budget for the EU or the euro area, aimed at enhancing stability and resilience within the EU or the euro area. In the following, we look at a selection of publications by authors dealing with this topic, which focus specifically on unemployment as a possible automatic stabiliser. Therefore, we do not describe in detail the numerous studies that have focused primarily on the concept of a euro area stabilisation budget, rather than specifically on the provision of a common unemployment benefit. Although some authors have touched upon the issue of unemployment benefit insurance in the context of a broader debate on fiscal capacity and risk-sharing mechanisms, this has not been the focus of their research (e.g. *MacDougall et al. 1977; Thygesen et al. 2022*). In this context, however, it is worth mentioning *Nikolov (2016)*, whose study provides a good summary of the channels through which automatic stabilisers can operate at the macro level. The study distinguishes between private and social channels. The most important element of the private channel is cross-border capital flows, where consumers and investors in one country that has suffered a negative shock can access capital in other countries. The other private channel is labour migration, where workers migrate to a country that has not been hit by a negative shock. Understandably, this effect is limited among European countries compared to the United States. The Community channel would be able to work through fiscal transfers, such as cross-border grants or a European-wide unemployment scheme. *Nikolov* rightly points out that the EU budget is small compared to the national budgets of EU members, and is mainly intended to help convergence and catching up, rather than smoothing out shocks. *P. Kiss (2020)*

provides a comprehensive review and analysis of the literature related to fiscal stabilisation, and criticises the calculation of automatic stabilisers applied in the literature.

Sebastian Dullien is one of the first pioneers of studies on an EMU-wide unemployment scheme. *Dullien (2007)* presents different scenarios for a European unemployment insurance system. It takes as a basis the euro area Member States at that time and *only the short-term unemployed are covered by an insurance scheme to supplement national unemployment benefit systems*. Short-term unemployment covers persons who have lost their jobs in the last 12 months. The scheme would be financed by a tax on wages and is calculated to balance contributions and receipts over the period 1999–2005.

Darvas et al. (2014) provide a comprehensive assessment of the possibilities for the founding of a European unemployment insurance scheme. *The authors outline the benefits of macroeconomic stabilisation, possible solutions and the difficulties that would inevitably be encountered in setting up such a system*. In particular, they draw attention to the dual problem of solidarity and moral hazard. According to the authors, setting up such a system would be a long-term task. No precise calculations were provided on the financial implications of the envisaged system.

Dolls et al. (2015) also addressed the introduction, the calculation methods and the prospects of a common unemployment system. A period from 1999 to 2013 was used as a basis for examining the possible introduction of a common unemployment insurance scheme in the euro area. The focus of the study was on the redistributive and stabilising effects of the *common euro area unemployment benefit system – which partly replaces national unemployment benefit systems – and the main difficulties and advantages of such a system*. Their main findings were that a basic common unemployment scheme with a replacement rate of 50 per cent over 12 months can be implemented with a relatively small annual budget. Over the period under review, average benefits would have amounted to EUR 47 billion, financed by a contribution rate corresponding to 1.56 per cent of earned income. *The scheme would not be set up for permanent redistribution; indeed, it would only be intended to help the short-term unemployed*.

Beblavy et al. (2015) also address the issue of macroeconomic stabilisation through a common European unemployment benefit scheme. *The authors' model takes the number of short-term unemployed within 12 months, compared to a ten-year moving average*. The system becomes functional when the actual short-term

unemployment rate exceeds the standard deviation of the 10-year average. The study assumed a benefit period of 12 months and a replacement rate of 40 per cent of average earnings, paid to 80 per cent of the short-term unemployed eligible for the benefits. There would also be an own contribution, which equals the national unemployment benefit rate. Funding would be provided by Member States. The fund would contribute 0.1 per cent of GDP per year until 0.5 per cent of EU GDP is accumulated in a dedicated fund. Contributions will then stop and restart if the fund falls below 0.5 per cent of EU GDP. Three different scenarios and a multiplier of 1.5 per cent are used to calculate the stabilisation effect. It is stressed that their figures are only rough estimates and depend heavily on the parameters chosen.

Arnold et al. (2018) have also produced calculations that take into account percentage changes in unemployment. They propose the creation of a Central Fiscal Capacity (CFC) for the euro area to help smooth macroeconomic cycles. To properly build the CFC, *the authors propose the establishment of a macroeconomic stabilisation fund*, financed by regular annual contributions, to accumulate capital in good times, and to make transfers to support the countries concerned in bad times. *Borrowing is also proposed. Potential transfers would be automatically triggered by a cyclical indicator* based on the deviation of the unemployment rate in the current year from the 7-year moving average unemployment rate. EUROMOD was applied to measure the extent of stabilisation that could be delivered under different shocks in the period between 1990 and 2017. Different scenarios were examined to see how the CFC would perform in a downturn such as the great recession or the euro area crisis. Preliminary research found that annual contributions would need to fall somewhere between 0.25 and 0.5 per cent of euro area GDP to ensure that contribution rates provide sufficient resources to replenish the fund. *The analysis of the authors shows that a contribution of 0.35 per cent of GDP would already provide significant stabilisation capacity*, although it would have required borrowing for a few years after the Global Financial Crisis. It was calculated that the CFC they envisioned could significantly reduce negative macroeconomic impacts. They did not *focus* specifically on the stabilisation mechanism and *its automatic operation*, but rather investigated stabilisation effects along different parameters.

Beblavy et al. (2015) and *Arnold et al. (2018)* attempt to estimate a possible stabilisation effect in their studies. They point out that their calculations are only rough estimates, but give an idea of the extent to which stabilisation effects could be expected. For the purposes of our study, we wish to highlight the calculations of *Arnold et al. (2018)*, because they focus on euro area Member States. They conclude that for most Member States, with an annual GDP contribution of around 0.35 per cent, the stabilisation effect may range between 1 and 3 per cent, depending on

the shock effect, i.e. that would be the amount by which the stabilisation effect could mitigate the adverse impact of a negative shock on GDP. As we will see, this is consistent with our estimated 0.33 per cent contribution; accordingly, we may conclude that our proposed excess unemployment scheme may have a similar stabilisation effect. We wish to stress, however, that the calculation of this effect strongly depends on the parameters selected. In our paper, we do not address the modelling of possible stabilisation effects, since we propose an automatic stabilisation mechanism based on excess unemployment, the design and parameters of which can be varied arbitrarily.

In the remaining part of this paper, we formulate our specific proposal and explain its details, supported by calculations. Finally, we draw policy-relevant conclusions. Like most of the literature reviewed, our focus is on the euro area. Coordinating economic policies and responding to challenges becomes more manageable when dealing with a more concentrated group of countries with a common monetary policy. Extending the calculations to the whole EU would no longer add value to the proposed mechanism. The *mechanism* is the crux of the proposal, which could be used for any group of countries; for example, it would be useful in the event of a two-speed Europe, an idea that sometimes comes up in political debates.

3. Proposal

Designing and automatically operating a common unemployment benefit system for the euro area is a difficult task. We are departing from the work of the authors presented in the literature reviewed in that we propose a new approach: instead of focusing on the total mass of unemployed, excess unemployment is at the centre of our attention. Due to differences in unemployment rates, the duration of the benefits, replacement rates and other differences, unemployment benefit systems in the countries of the euro area are varied and have evolved over decades alongside social and political commitments. Consolidating these systems does not appear realistic for the foreseeable future. In our article, we therefore propose to design the unemployment benefit system in a way that *complements already existing national schemes*. In a system based on excess unemployment, national systems would not be altered, but a complementary, *top-off* system would be introduced, i.e. payments would flow to countries in addition to the unemployment benefits received through national systems. The top-off payments would go into a fund set up in advance for this purpose; we may call this the *Unemployment Assistance Fund (UAF)*. A system based on excess unemployment would thus also

take into account structural unemployment differences; in other words, it would not provide higher support in countries where the unemployment rate is typically higher for structural or social reasons, but would *take into account the development of the excess, uniformly compared to the average of previous years* in the country concerned. It is worth noting at the outset that the top-off payments would be made to countries, not to the unemployed.

To calculate excess unemployment, we needed the unemployment rates for the year under review,¹ which we compared to the average unemployment rate for the preceding 7 years. Citing ECB and CEPR research, *Arnold et al. (2018) conclude that the average economic cycle in the European Union is 7 years*. Using this 7-year moving average allowed us to take into account a longer period in our calculations; this enabled us to eliminate outliers observed in a single year only, and to make the actual unemployment rate comparable with a trend. The last year of the moving average is the year preceding the calculation of the current excess unemployment. *The percentage-point value of excess unemployment can be calculated by comparing the moving average and the unemployment rate for the year under review*. In cases where the rate is lower than in the previous period, no additional benefits are paid to Member States, while in cases where the rate is higher, benefits are calculated using the percentage-point difference between the excess unemployment rate and the actual unemployment rate. The surplus percentage in the positive direction is obtained by multiplying the number of unemployed persons in the working age group (15–65 years; i.e. the age groups used to calculate the unemployment rates) by the number of unemployed persons in the working age group in the specific year.

The unemployment benefit system *has undergone significant changes in the wake of the global financial crisis*; therefore, we take into account data for the period of 2009–2022, both in terms of duration and replacement rate. *There are significant differences in the duration of the benefit period* between euro area Member States.² There are countries that only set a maximum period for claiming benefits (e.g. Cyprus, Malta), some countries have a minimum and a maximum period (e.g. Portugal, Germany), while in other countries even more factors (e.g. dates of previously claimed unemployment benefit; how many years the employee has worked in the past; how many years remained to retirement age; whether the employee has earned above a certain wage level; marital status; whether there are minor children in the family, etc.) are taken into consideration to determine how long an employee can receive the unemployment benefit and what the benefit entails. Taking into account a wide range of scenarios and the fact that basic benefits

¹ Source: https://ec.europa.eu/eurostat/databrowser/view/UNE_RT_M_custom_6679773/default/table

² Source: <https://www.missoc.org/missoc-database/comparative-tables/>

often cover 12 months and the median of the maximum values in the period under review is 12 months, *we assume a duration of 12 months for the unemployment benefits* (consistent with *Dolls et al. 2015*). As for the replacement rate,³ once again, there are significant differences between the minimum and maximum values in Member States. Both the average and median values hovered around the 66-per cent mark during this period; consequently, *we calculate with a replacement rate of 66 per cent*.

Relying on the parameters presented above, it is possible to calculate the unemployment benefit system (*b*) required to cover the excess unemployment observed from the adoption of the euro in 1999 until 2022. Thus, the working-age population⁴ (*p*) was multiplied by the percentage-point rate of excess unemployment (*u*) (only if the deviation from the moving average of the previous 7 years was positive), then the product was multiplied by PPP-adjusted GDP per capita⁵ (*g*), and then by the 12-month benefit duration (*t*) and the 66 per cent replacement rate (*r*). GDP is adjusted to the PPP value in order to ensure that the unemployed in countries at different levels of development receive an appropriate amount of money relative to their own income.

The calculation is therefore: $b = p * u * g * t * r$.

For the countries considered, we present three years as illustrations: a calmer mid-2000s year (2004), the year 2013, which required the highest payments, and the year 2022, which has the most recent complete data series available (*Table 1*).⁶

³ Source: <https://www.missoc.org/missoc-database/comparative-tables/>

⁴ Source: https://ec.europa.eu/eurostat/databrowser/view/DEMO_PJAN__custom_5668080/default/table

⁵ Source: https://ec.europa.eu/eurostat/databrowser/view/PRC_PPP_IND__custom_6701310/default/table

⁶ We have completed a considerable number of calculations based on various calculations and possible approaches for different scenarios (e.g.: replacement rates, duration, cycles, excess unemployment, amount of unemployment benefits, adjustments to the moving average); however, the presentation below is limited only to the most significant and interesting calculations.

Table 1
Breakdown of excess unemployment benefits by country (2004, 2013, 2022)

| Member State | 2004 | | | | | 2013 | | | | | 2022 |
|-----------------------|---|-------------------------------|--|--|---|-------------------------------|--|--|---|--|---|
| | Deviation of unemployment moving average (pp) | Excess unemployment (persons) | Excess unemployment benefits (EUR million) | Excess unemployment benefits (GDP PPP) | Deviation of unemployment moving average (pp) | Excess unemployment (persons) | Excess unemployment benefits (million) | Excess unemployment benefits (GDP PPP) | Deviation of unemployment moving average (pp) | Excess unemployment benefits (GDP PPP) | Deviation of unemployment moving average (pp) |
| Austria | 1.5 | 84,857 | 1,546 | 0.7 | 0.5 | 31,846 | 727 | 0.2 | -1.1 | | |
| Belgium | 0.4 | 25,469 | 440 | 0.2 | 0.8 | 62,919 | 1,308 | 0.4 | -1.1 | | |
| Cyprus | 0.5 | 2,494 | 35 | 0.2 | 9.7 | 59,885 | 870 | 4.6 | -3.2 | | |
| Estonia | -1.6 | - | - | - | -1.3 | - | - | - | -0.4 | | |
| Finland | -1.4 | - | - | - | 0.6 | 22,309 | 440 | 0.3 | -1.3 | | |
| France | -0.6 | - | - | - | 1.5 | 635,675 | 11,957 | 0.6 | -1.7 | | |
| Greece | -0.1 | - | - | - | 14.8 | 1,084,586 | 13,458 | 6.5 | -7.6 | | |
| Netherlands | 2.2 | 242,997 | 4,699 | 1.0 | 2.4 | 272,435 | 6,383 | 1.1 | -2.1 | | |
| Croatia | 0.2 | 5,636 | 45 | 0.1 | 5.8 | 169,751 | 1,793 | 2.6 | -3.2 | | |
| Ireland | -1.2 | - | - | - | 3.1 | 95,993 | 2,192 | 1.4 | -2.3 | | |
| Latvia | -1.8 | - | - | - | -0.9 | - | - | - | -1.4 | | |
| Lithuania | -3.7 | - | - | - | 0.9 | 18,241 | 232 | 0.4 | -1.5 | | |
| Luxembourg | 2.3 | 7,243 | 252 | 1.0 | 1.1 | 4,066 | 195 | 0.5 | -1.4 | | |
| Malta | 0.4 | 1,002 | 12 | 0.2 | -0.5 | - | - | - | -1.2 | | |
| Germany | 1.5 | 863,368 | 14,758 | 0.7 | -2.3 | - | - | - | -0.6 | | |
| Italy | -1.9 | - | - | - | 4.4 | 1,731,895 | 29,948 | 1.9 | -2.5 | | |
| Portugal | 1.8 | 130,235 | 1,504 | 0.8 | 5.5 | 382,700 | 5,102 | 2.4 | -2.7 | | |
| Spain | -2.4 | - | - | - | 10.1 | 3,226,102 | 49,824 | 4.6 | -4.0 | | |
| Slovakia | 1.8 | 68,786 | 563 | 0.8 | 1.5 | 60,440 | 806 | 0.7 | -1.7 | | |
| Slovenia | -0.5 | - | - | - | 3.6 | 51,906 | 740 | 1.7 | -2.1 | | |
| Total (EUR million) | | 1,432,086 | 23,854 | | | 7,910,751 | 125,974 | | | | |
| Euro area GDP PPP (%) | | | 0.3 | | | | 1.3 | | | | |

Note: *Source: https://ec.europa.eu/eurostat/data/browser/view/PRC_PPP_IND__custom_6701310/default/table

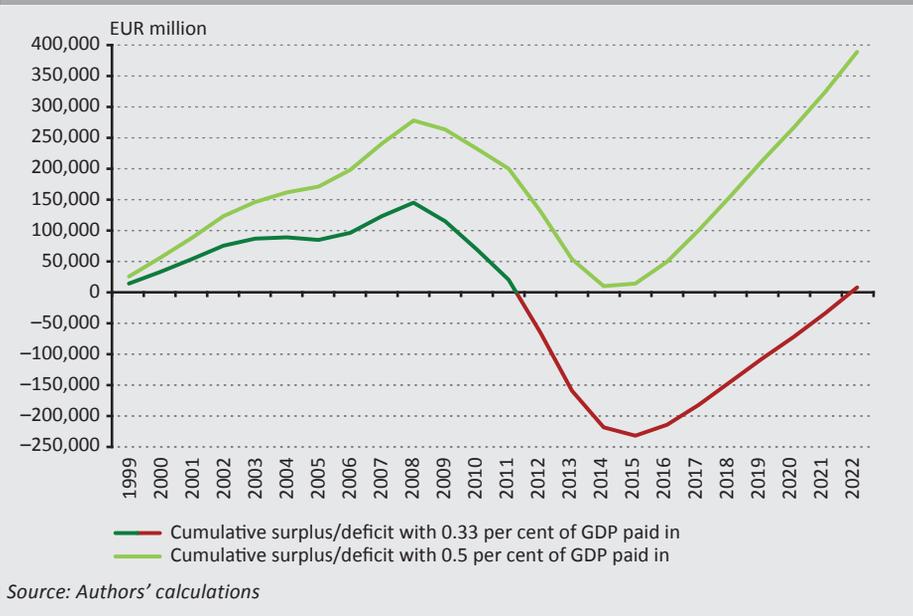
Source: Authors' calculations

The first data series presented above – for the year 2004 – contains typical data for the decade preceding the 2008 crisis. The decade was characterised by falling unemployment, rising GDP and a lack of major downturns and crises; it was a more peaceful period of growth. Accordingly, only half of the Member States would have received top-off payments. By contrast, following the global crisis and the euro area crisis, conditions worsened significantly, with rising unemployment and stagnating or falling GDP. In 2013, a year when unemployment was hit hardest by the crises, 80 per cent of euro area Member States – 16 countries – would have received payments from the excess unemployment benefit scheme. Mediterranean countries, in particular, would have benefited from substantial unemployment assistance. As a percentage of GDP, Greece would have received 6.5 per cent, Spain 4.6 per cent, Portugal 2.4 per cent and Italy 1.9 per cent. In 2013, excess benefits would have represented 1.3 per cent of the euro area's total GDP; i.e. EUR 126 billion. After the crisis wore off, by 2022 all countries had a lower unemployment figure than in the previous 7 years, which means that no extra payments would have been needed. This is why *Table 1* shows only one column for 2022, presenting the percentage-point deviation of unemployment from the moving average (all values are negative).

The example of the three years shown as an illustration demonstrates that the distributions of *excess unemployment benefit payments and the beneficiary countries can widely vary from year to year*. In practice, it would be impractical to fund a system where in some years there would be no payments or receipts at all, or where years with low payments would alternate with years exhibiting a sharp increase, as in 2013. In practice, *a feasible system would be one where a flat rate of contributions would be made each year* to the common fund (UAF). This would make the system simpler, more transparent and easier to predict. In years when the payments for excess unemployment benefits are lower than the constant rate contributions, the money accumulated in the UAF would be utilised in years of higher unemployment.

The next question to be answered is the optimal level of annual payments as a percentage of GDP to cover the amount of excess unemployment benefits. Based on the above parameters, the average annual payment for the period of 1999–2022 is 0.33 per cent of euro area PPP-adjusted GDP. However, such annual payments would have been insufficient to cover the high payment needs observed in the period of 2012–2021. In order to cover the payments for the whole period, 0.5 per cent of euro area GDP would have been required (see *Figure 1*). In this case, the funds in the UAF would have swelled substantially from 2015 onwards.

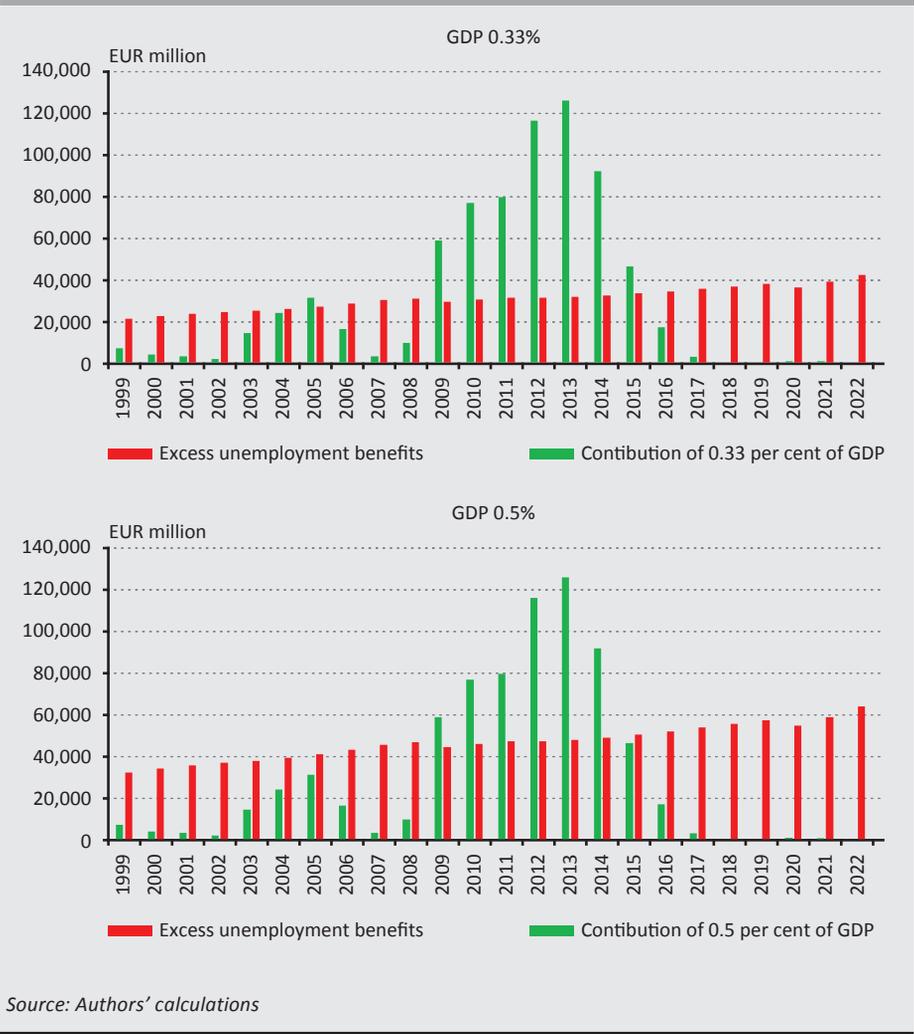
Figure 1
Cumulative excess unemployment benefits and contribution of 0.33 per cent vs. 0.5 per cent of GDP in the euro area



These calculations show that it is difficult to define a constant contribution rate that would always cover the payment of excess unemployment benefits in the long run. Much will depend on how unemployment develops in the coming years. The amount of the contribution can also be set on the assumption that severe crises, such as the global financial crisis, are likely to occur in the future, and accordingly, the annual contributions should also be higher in preparation for this. If this were to lead to excessive accumulation in the UAF, a maximum accumulation could be set, after which payments into the UAF would temporarily be suspended. Considering the data we examined where unemployment benefit claims would be the highest for 5 consecutive years – i.e. the 5-year period of 2010–2014 –, a total of EUR 490 billion would have been paid out in unemployment benefits and accordingly, a ceiling of EUR 500 billion would be a reasonable threshold to replenish the unemployment fund. If we consider that such major crises will be very rare, then we could decide on making smaller payments, and if these did not cover the benefits in some years, then UAF could borrow money for those years, the repayment of which would be jointly guaranteed by the Member States, as in the case of the Recovery Fund (RRF). The aim is to create an automatic stabiliser based on unemployment that is self-sustaining in the long term.

The annual breakdown of the scheme would be as follows, with contributions of 0.33 per cent and 0.5 per cent of GDP:

Figure 2
Annual evolution of euro area excess unemployment benefits and contributions of 0.33 vs. 0.5 per cent of GDP



For the three years illustrated above, the payments per country based on 0.33 and 0.5 per cent of GDP are shown in *Table 2*.

| Member State | 2004 | | 2013 | | 2022 | |
|---------------------|--|---|--|---|--|---|
| | Contribution at 0.33 per cent of GDP (EUR million) | Contribution at 0.5 per cent of GDP (EUR million) | Contribution at 0.33 per cent of GDP (EUR million) | Contribution at 0.5 per cent of GDP (EUR million) | Contribution at 0.33 per cent of GDP (EUR million) | Contribution at 0.5 per cent of GDP (EUR million) |
| Austria | 744 | 1,127 | 968 | 1,466 | 1,317 | 1,995 |
| Belgium | 901 | 1,365 | 1,161 | 1,758 | 1,629 | 2,468 |
| Cyprus | 51 | 77 | 63 | 95 | 97 | 148 |
| Estonia | 53 | 81 | 86 | 131 | 135 | 204 |
| Finland | 440 | 666 | 537 | 814 | 704 | 1,067 |
| France | 4,913 | 7,443 | 6,212 | 9,412 | 8,081 | 12,244 |
| Greece | 752 | 1,139 | 679 | 1,028 | 835 | 1,266 |
| Netherlands | 1,572 | 2,382 | 1,971 | 2,986 | 2,644 | 4,006 |
| Croatia | 171 | 258 | 224 | 340 | 332 | 503 |
| Ireland | 425 | 644 | 527 | 798 | 1,386 | 2,100 |
| Latvia | 75 | 114 | 109 | 164 | 161 | 245 |
| Lithuania | 119 | 180 | 188 | 285 | 294 | 446 |
| Luxembourg | 80 | 121 | 131 | 198 | 199 | 301 |
| Malta | 23 | 35 | 33 | 50 | 63 | 96 |
| Germany | 6,971 | 10,561 | 8,641 | 13,092 | 11,406 | 17,281 |
| Italy | 4,596 | 6,964 | 5,209 | 7,892 | 6,553 | 9,928 |
| Portugal | 607 | 920 | 696 | 1,054 | 923 | 1,399 |
| Spain | 3,025 | 4,584 | 3,602 | 5,458 | 4,684 | 7,097 |
| Slovakia | 221 | 334 | 361 | 547 | 437 | 662 |
| Slovenia | 123 | 186 | 147 | 223 | 226 | 343 |
| Total (EUR million) | 25,860 | 39,182 | 31,542 | 47,792 | 42,106 | 63,797 |
| Euro area GDP PPP % | 0.33% | 0.5% | 0.33% | 0.5% | 0.33% | 0.5% |

Source: Authors' calculations

The next question is how excess unemployment benefits would be financed and from what source. Raising funds at the EU level does not seem realistic because it would mean earmarking funds for euro area members to pay into the unemployment fund. Member States would be free to decide how to raise the money: they could raise taxes, introduce new taxes or cut spending, but they would always have to respect the EU's fiscal rules under the Stability and Growth Pact.

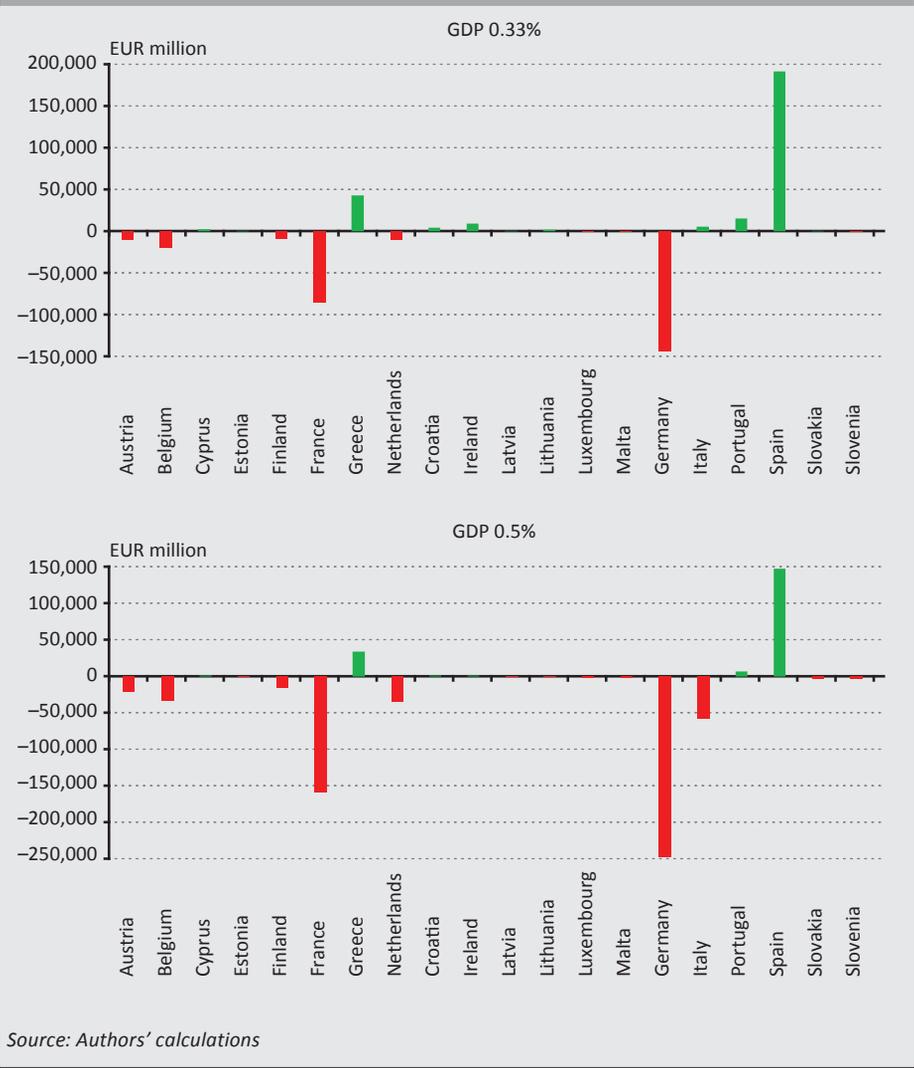
The best solution would be for the UAF to issue long-term bonds, similar to the Recovery Fund, with repayments guaranteed by Member States in proportion to their GDP. If 10-, 20- or 30-year bonds were issued, the interest burden on national budgets would be reduced and there would be several years available to gain experience on how the automatic stabiliser works.

The European Council and the European Parliament adopted the Stability and Growth Pact (SGP) reform in April 2024. The main objective of the reform is to ensure sound and sustainable general governments, while promoting sustainable and inclusive growth and job creation in all Member States through structural reforms and investments. The SGP's general objectives of reducing debt and deficit ratios in a gradual, realistic, sustainable and growth-friendly manner was agreed upon, while safeguarding reforms and investments in strategic areas and providing adequate room for counter-cyclical policies and addressing macroeconomic imbalances. The main novelty of the reform is that a differentiated approach is applied to each Member State to take into account the heterogeneity of fiscal positions, public debt and economic challenges across the EU. Thus, the new framework would allow for multi-annual, country-specific fiscal paths for each Member State, while ensuring effective multilateral surveillance and respecting the principle of equal treatment. A new feature would be that Member States could request an extension of the fiscal adjustment period by up to seven years. With these proposals, there would be more room for country-specific reforms. The reformed SGP is expected to stimulate reforms within the framework of the European Semester. The new SGP can provide a wider scope for the reforms that will be required to make the proposed unemployment assistance mechanism work in a sustainable manner.

There is no getting around the moral hazard issue stemming from the fact that the higher a country's GDP, the more it would pay in euros, but also the more assistance it would receive. Therefore, the *net position should be considered*. Figure 3 shows the cumulated net balance by each country for the period of 1999–2022. For most countries, the net position is around zero or shows a small positive or negative balance. However, two countries – Germany and France – would have been significant contributors because their excess unemployment rates were low throughout the period. Spain and Greece, however, would have been significant net beneficiaries due to their high excess unemployment rates. This aptly illustrates the problem of *moral hazard*: high performers pay more to the benefit of low performers. This is a serious obstacle to the adoption of an assistance system that is based on unemployment. This has been pointed out by most authors focusing on the EU-wide unemployment benefit system (e.g. *Arnold et al. 2018; Dolls et al. 2015; Darvas et al. 2014*). Nevertheless, an unemployment benefit scheme with an *automatic budgetary stabilisation* role would be particularly necessary

for the economic stabilisation of the euro area. Furthermore, it is not necessarily the case that it is always the same countries that will be net contributors and net beneficiaries, as this will depend on the number of excess unemployed. For example, in 2004 (see *Table 1*), Spain and Greece would not have received assistance, while Germany would have.

Figure 3
Cumulative net balance by country based on contributions of 0.33 per cent and 0.5 per cent of GDP, 1999–2022



In theory, the money from the UAF received by a country could be used for any purpose. This is why conditionality is essential: to develop a set of conditions that would reduce chronically high unemployment levels and curb the growth of unemployment in a crisis. It is important that the conditionality rules focus on a few narrowly defined reforms, which would be easy to monitor and would not undermine the automatic role of the system. The UAF should be managed by one of the institutions of the Union. The most obvious would be *the European Stability Mechanism*, because it already has the infrastructure to manage assets, borrow and enforce conditionality.

4. Conclusion

Our paper *presents a new approach focusing on excess unemployment*, which is intended to *complement national systems* without the need to change them. The proposal includes a supplementary Unemployment Assistance Fund (UAF), which would pay countries based on the excess unemployment calculated as a percentage-point deviation from the 7-year moving average. The system aims to smooth shocks, manage economic fluctuations and structural unemployment differences between Member States.

The study proposes annual contributions ranging between 0.33 and 0.5 per cent of euro area GDP to an unemployment benefit fund in order to cover excess unemployment benefits. Funding would be provided by Member State contributions or by issuing long-term bonds guaranteed jointly in proportion to GDP. We believe that the latter solution is probably the most realistic.

However, the proposal also faces the challenge of moral hazard, as consistently better performing countries pay in more, while countries with high excess unemployment levels benefit more, which in itself could undermine the incentive for reforms. To mitigate this, measures would also be needed to encourage specific, verifiable reforms to reduce chronically high excess unemployment without jeopardising the automatic stabilising role of the system. Long-term borrowing may give some extra time to implement these reforms.

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“Respect the past so that you can understand the present and work on the future.”

István Széchenyi

The Bretton Woods System as the Cornerstone of the United States’ Hegemony*

Ágnes Solti 

The Bretton Woods agreement was the most important milestone in the development of the financial system that characterised the new world order after the Second World War. Amidst the ongoing war, on 1 July 1944, 730 representatives from 44 Allied countries met at Bretton Woods to lay the foundations for a new international monetary regime after the end of the global conflict. It also meant a significant strengthening of the United States of America and the consolidation of the economic foundations of the Pax Americana. In this flashback, we focus on the shaping of US interests, the details of the Keynes-White debate and the long-term effects of the Bretton Woods system.

1. Precedents for the establishment of the post-World War II monetary system

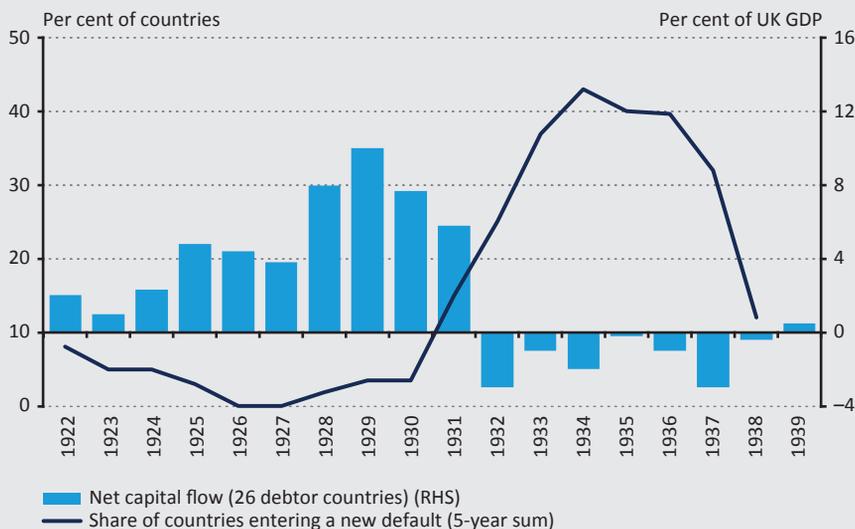
In 1944, despite five years of war, the Great Depression of 1929–1933 was still deeply ingrained in the memory of economists, and the final consensus was that it was caused by the flow of so-called “hot money” (Bernanke 1995). Before the Great Depression, significant amounts of money flowed into securities that offered high short-term returns. The unequal capital flows not only led to an abundance of liquidity in the world’s major economies (US, UK and Germany) (Figure 1), they also distorted the optimal level of leverage both in the corporate and the financial markets towards excessive risk-taking (Postel-Vinay – Collet 2023). For this reason, reducing the possibility of speculation in the capital markets was also a priority in US economic policy from the early 1930s onwards, leading to the adoption of the US Banking Act of 1933 (the Glass-Steagall Act).

* The papers in this issue contain the views of the authors which are not necessarily the same as the official views of the Magyar Nemzeti Bank.

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Figure 1

Net capital flows in the world economy between the two world wars

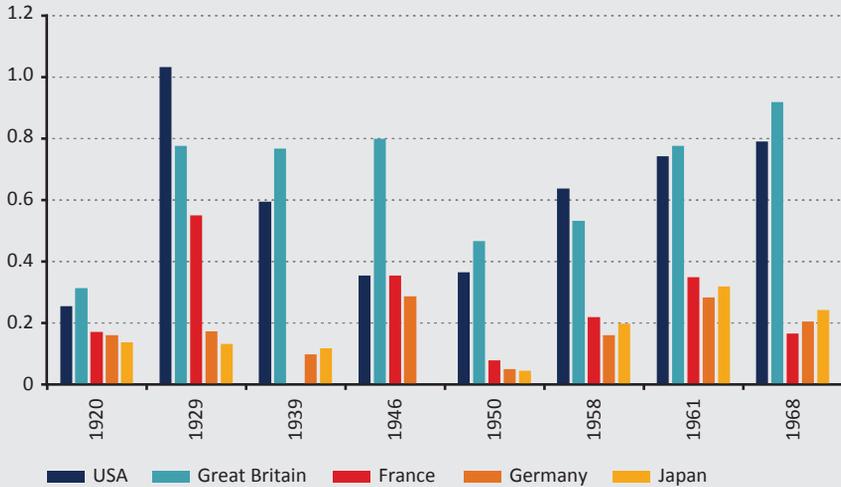


Note: The 8 creditor states: Belgium, France, Ireland, the Netherlands, Sweden, Switzerland, United Kingdom, United States of America. The 26 debtor states: Argentina, Australia, Bulgaria, Czechoslovakia, Canada, Denmark, Estonia, Finland, Germany, Greece, Hungary, India, Iraq, Italy, Japan, Latvia, Lithuania, the Netherlands Indies, New Zealand, Norway, Poland, Romania, South Africa, Turkey, Yugoslavia.

Source: Reinhart et al. (2020)

In response to the banking panic and sudden liquidity shortages that followed the bursting of the stock market bubble in 1929, economies turned towards protectionism. Exchange rates became unstable and the emerging currency war made it impossible to pursue a predictable monetary policy, while the lack of exchange rate stability further complicated fiscal stabilisation efforts. Therefore, economists viewed ensuring international control over speculative capital movements as the foundation for restoring a stable, multilateral financial system. This led to a rapid contraction of international capital flows from 1932 onwards, the consequences of which can be seen in the evolution of US capital market capitalisation as a share of GDP between the Great Depression and the Second World War (Figure 2).

Figure 2
Evolution of financial capitalisation rates as a share of GDP between 1920 and 1968



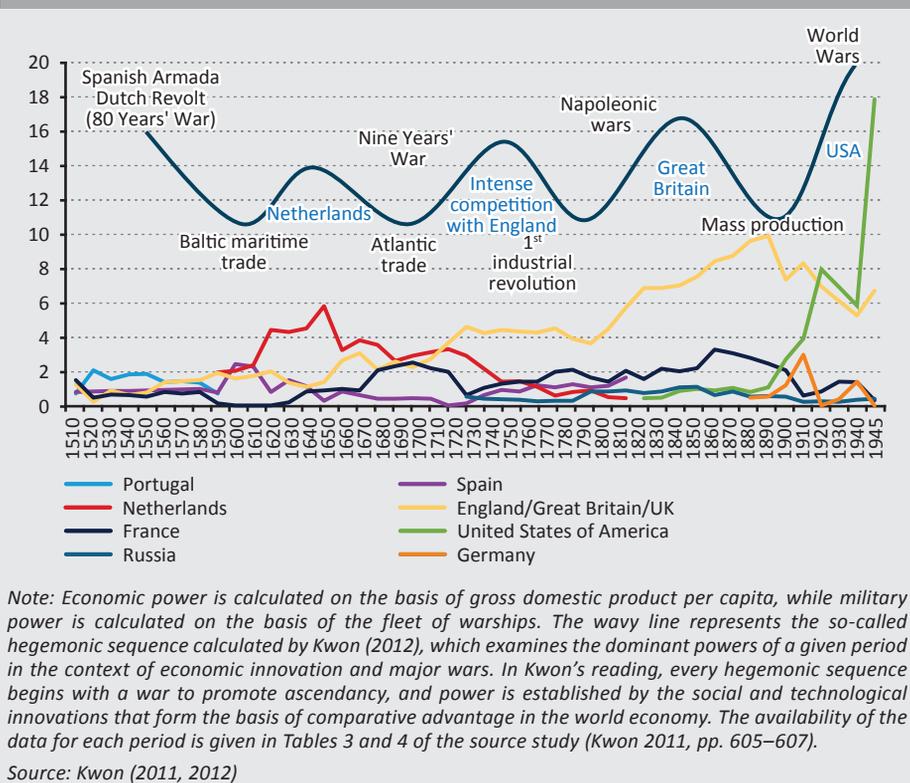
Note: The original research analysed data for 17 developed economies. This figure shows the ratio of the volume of capital market capitalisation in their own currency to nominal GDP only for the United States, the United Kingdom, France, Germany and Japan.

Source: Kuvshinov – Zimmermann (2022)

2. Great power motivations behind the new monetary order

The Bretton Woods arrangement, through the contributions of British economist *John Maynard Keynes* and American economist *Harry Dexter White*, can essentially be seen as an economic diplomatic struggle for global economic influence. The situation of the two states, which was crucial to the outcome of the negotiations, was very different. By this time, Britain’s earlier great power status was already shaky: its global financial dominance had gradually been eroded by the financial burdens of the two world wars, and with the ongoing World War II, the situation of its Far Eastern colonial possessions had also become unstable. At the same time, the position of the United States had strengthened, as a result of its elevated manufacturing capacity and booming export performance since the 1870s, as well as its involvement in World War II (*Figure 3*). Although the UN conference was attended by 44 government delegations, the agreement adopted at the conference represented the resolution of the fundamental debate between the UK and US Treasury departments (*Steil 2013*).

Figure 3
Hegemony index changes in global power positions between 1500 and 1945 by economic and military power

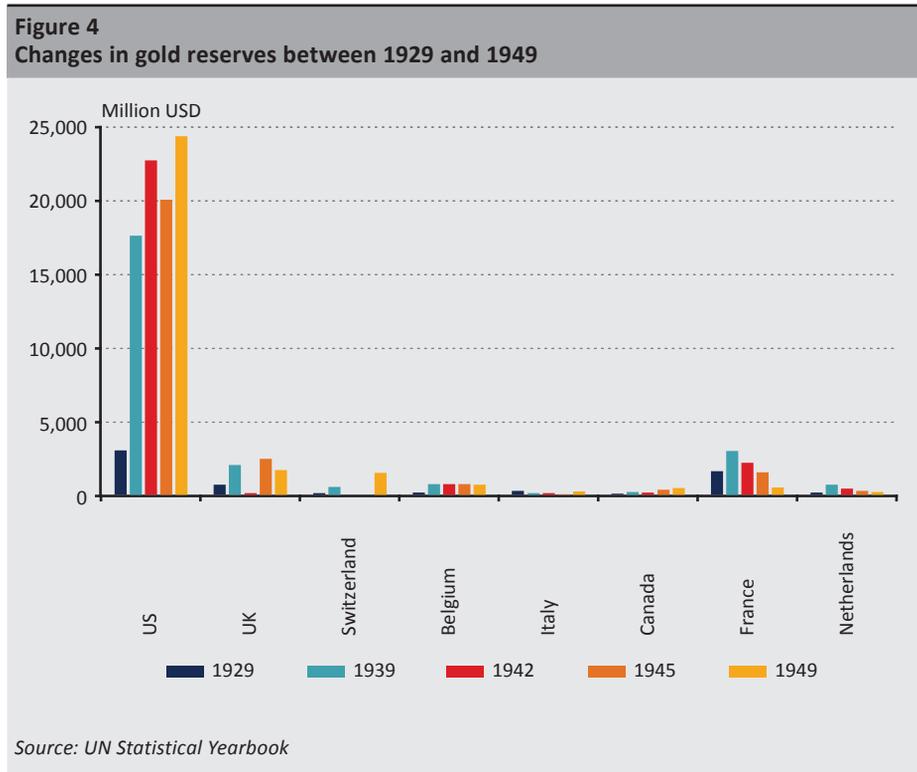


In this situation, the United States had the opportunity not only to achieve military victory but also to consolidate its role in the global economy by strengthening the US dollar's role in international trade. While the British pound started to decline, the dollar started to rise in the 1910s (Karlstroem 1967), thanks to the establishment of the Federal Reserve (1913) and the repeal of overseas bank branching regulations (Greenwald 2020). During the First World War, the US dollar was the only currency that remained linked to gold.

An integral part of the United States' agenda at Bretton Woods was to position New York as a global financial centre, taking away this role from London (Kindleberger 1974), and to achieve this the US identified the abolition of currency zones and the creation of US dollar hegemony as the first steps. One of the foundations of this plan concerning New York may have been that between 1929 and 1933 a significant amount of gold flowed into New York through the Federal Reserve's Gold Settlement

Fund from those US regions that were hit the hardest by the banking panic resulting from the Great Depression (*Bordo 2014*).

The United States was also in a favourable position compared to earlier great powers because it was the only major economy that had not suffered war damage. Moreover, it even experienced a boom thanks to the growth of military industries and had become one of the world’s most important creditors. The latter is also illustrated by the flow of gold to the Western Hemisphere: according to the statistics of the *Bank for International Settlements (BIS 1944)*, Washington held 57 per cent of the global gold reserves in 1944 (*Figure 4*), while the huge amount of loans it provided to London further aggravated the situation of the British economy.



The US State Department was not caught off guard by the need to devise a new strategy: it began to plan the economic foundations of the European and Western order, based on its experience of building its hegemony in Latin America (*Domhoff 2020*). From 1939, with the involvement of private research institutes, including the Council on Foreign Relations (CFR), the so-called “War and Peace Studies” programme (WPS or “Studies of American Interests in the War and the Peace”)

was developed in great secrecy. The starting point was the “Grand Area”, initially consisting of the United States and the United Kingdom, based on the model followed during the establishment of US hegemony in Latin America (*Costigan et al. 2017*). In consolidating economic and monetary relations in the Western Hemisphere, capital flows were ensured under the military, economic and political control of the United States. As in the case of Bretton Woods, the foundations of the system were essentially built on the production and solvency of the United States. At home, among its citizens, the Washington government promoted the agreement to be concluded at the conference as if it were a job creation programme. This is partly the reason why the International Monetary Fund (IMF) included high employment and increasing real wages among its goals.

It was important for Washington to reduce Britain’s global influence in the greatest possible extent and position itself as the sole great power. The existence of the British Empire would have been an increasing obstacle to the realisation of US post-war plans, especially as the oil reserves of the Middle East and Venezuela were under British influence (*Costigan et al. 2017*). At the same time, another factor that steered the United Kingdom towards consultation with the United States was that in 1940 Germany began to design a post-war European monetary system (*Iwamoto 1995*). The United Kingdom sought to respond to this, and the alternative monetary system to be created was formed under Keynes’ direction (*Gross 2017*).

3. The main points of the Keynes–White debate

The different economic situations and economic historical experience of the United States and the United Kingdom brought different perspectives to the two ends of the negotiating table. While Keynes highlighted the problems of the 1920s (global liquidity shortages, inadequate global distribution of liquidity and rigid exchange rates), White was concerned with the challenges of the 1930s (competitive foreign exchange devaluations and unstable currencies) (*Boughton 2002*). Keynes stressed the need for a free exchange rate policy, while for White the importance of exchange rate stability was the top priority. Keynes also challenged the long-term viability of the parity system that had fixed the price of gold at USD 35 per ounce since 1934 (*Bordo 2017*).

At the same time, the US and the UK agreed that the international trading system could be based on a properly functioning global monetary system, which should be designed to avoid a return to the “excessively free” capital flows of the 1920s and 1930s, or the capital market speculation that directly caused the economic crisis, and to provide a corrective mechanism to deal with short-term balance of payments problems (*Ghosh – Qureshi 2017*). They also had a common interest in avoiding a repeat of the mistake of the Versailles peace treaties after the First World War,

in which politics settled borders, ignoring the financial and economic conditions of damage and reconstruction and the burden on the defeated states (*James 2012*).

As a precursor to the Bretton Woods Agreement, the first Keynes Plan in 1942 sought to attempt to eliminate the macroeconomic trilemma of the open economies by establishing an international clearing system, and proposed an international banking system to resolve to some extent the “impossible trinity” of free capital flows, independent monetary policy and a fixed exchange rate system. In the international monetary organisation proposed by Keynes, called the International Clearing Union, settlements between countries were to be entrusted to the central banks of the member states, along with the introduction of an international bank-money called the *bancor*. The latter was primarily intended to balance the trade account in order to eliminate the persistent deficit and related problems. The original idea was that the value of the *bancor* would have been fixed in gold (with the possibility of adjusting the conversion value). Keynes proposed a more flexible exchange rate regime than previously, in which exchange rates would be adjusted based on the trade balance (*Szakolczai 2017*). The system would have been cooperative through *bancor* settlements, as opposed to the export-oriented, asymmetric model, where the cost of adjustment is borne unilaterally by deficit countries (*Ábel 2019*). Keynes also called for the creation of an international trade organisation to support this idea.

White emphasised the importance of stability of the international order rather than the primacy of national economic policy, and instead of advocating for a global banking system, fearing that the Keynesian plan might lead to uncontrolled lending, he proposed a stabilisation fund. He supported the idea of the gold-based system rather than the introduction of *bancor*, and due to the size of the US gold reserves, he preferred the use of the US dollar. Previously, the concept of the White plan had been tested in Latin America. After President Franklin D. Roosevelt announced the US strategy of Good Neighbor Policy in 1933 (fearing potential German expansion in the region) and a fundamental decision was made to establish the Inter-American Bank (IAB), intensive work began to institutionalise regional financial relations (*Helleiner 2014*). In this endeavour, White himself played an active role and under his leadership, a system of short-term loans to deal with exchange rate problems (which later became a cornerstone of the IMF), as well as the basis for long-term development loans (now managed by the International Bank for Reconstruction and Development, part of the World Bank Group) were soon developed. Washington’s motivation was to support Latin American development goals in order to ensure that these countries would later provide a strong export market for US production and capital. The IAB outlined by White also had the explicit aim of strengthening the local industries, which was the basis for the long-term loans. Although the IAB proposal was not supported by the US Congress, the concept served as a model for the creation of the World Bank and later the Inter-American Development Bank (IDB).

Keynes's second draft of April 1943 (the "White Paper") was built on the idea that a clearing union would create symmetric adjustment, relieving deficit economies of their burden and thus continuing to emphasise the principle of fairness (Szakolczai 2017). Keynes argued for the need to put expansionist rather than contractionist pressure on world trade in order to restore growth (Szakolczai 2018). And he still envisaged the control of international capital movements remaining within a national framework. A significant change was that he finally abandoned the idea of the bancor in the context of the International Clearing Union, in favour of proposing currency zones.

In the end, the UK had to accept the system based on the members' capital subscription to the stabilisation fund instead of a clearing union, and also the general adoption of the gold exchange standard. In their "response", the United States and White continued to stress the importance of exchange rate stability and the establishment of bilateral convertibility. As a result of the 1944 agreement, the International Monetary Fund (IMF) was finally established in December 1945, and in 1946 the International Bank for Reconstruction and Development (IBRD), the first institution of the present World Bank Group, started its lending activities (Szakolczai 2017).

However, Keynes' bancor plan did not disappear without a trace. In the context of the financial technology advancements seen in recent years, there is an increasing emphasis the concept of a "single hegemonic currency" (SHC) within the context of central bank digital currency (CBDC) (Tout 2023). With regard to the model of CBDCs managed by multiple central banks, research has not yet found a conceptual model that better approximates it than the Keynesian bancor. Its main merit today remains in offering a symmetric and democratic system that can provide liquidity to any of its members at any time in a sustainable way, i.e. ensuring international balance between countries (Rahman 2022).

4. Hungarian evaluation of the plans as of early 1944

Developments in the negotiations in New Hampshire were also followed in Hungary. A related study by József Judik, an economist and former staff member of the Magyar Nemzeti Bank (1925–1937), was published in January 1944 in *Közgazdasági Szemle*. In it, he stated that the Hungarian quota to be paid into the Keynesian Clearing Union would have been 740 million pengő, but only one quarter of this amount, i.e. 185 million pengő, could have been drawn without limit (Judik 1944).

According to Judik, the potential amount Hungary would have received under the Clearing Union would have barely satisfied the initial needs. In his study entitled "A Keynes- és White-terv" (The Keynes and White Plan), he compared the amount of one quarter of the quota with the highest (1928: 411 million pengő) and lowest

(1933: 112 million pengő) actual gold and foreign exchange holdings, and the largest annual decreases (1927–1928: 108 million pengő) registered by the Magyar Nemzeti Bank since its foundation (1924). Judik added one quarter of the quota to the level of the foreign exchange stock at that time (1943: roughly 160 million pengő) and found that the aggregate was below the 1925–1928 level, especially considering the price increases compared to the pre-war period.

In his study, primarily based on the developments of April and July 1943, Judik also attempted to calculate the quota of the international stabilisation fund under the White Plan. Based on pre-World War II figures, the Hungarian quota in this case would have been 200 million pengő, which was close to the amount that could be drawn down freely under the Keynes plan. Judik notes that under the White plan, any borrowing exceeding 30 per cent of this quota (roughly 60 million pengő) would also entail obligations such as granting influence to the fund over the domestic economic policy. He further stresses that upon entry, an equivalent amount of gold reserves were to be transferred to the fund.

Judik concluded that in the case of small countries like Hungary, the Keynes plan would have been preferable to the White plan. In his opinion, the Keynes plan would have been better than the US proposal in terms of the settlement of international payments and the replenishment of gold and foreign exchange reserves, which had been depleted during the world war. He pointed out that, unlike the Keynesian plan, in the case of the White plan the financial assistance to weaker economies would not have been automatic, and that in the event of a balance of payments problem, the stabilisation fund would have put more pressure on the debtor countries (*Judik 1944*).

5. The forces that overturned the Bretton Woods system

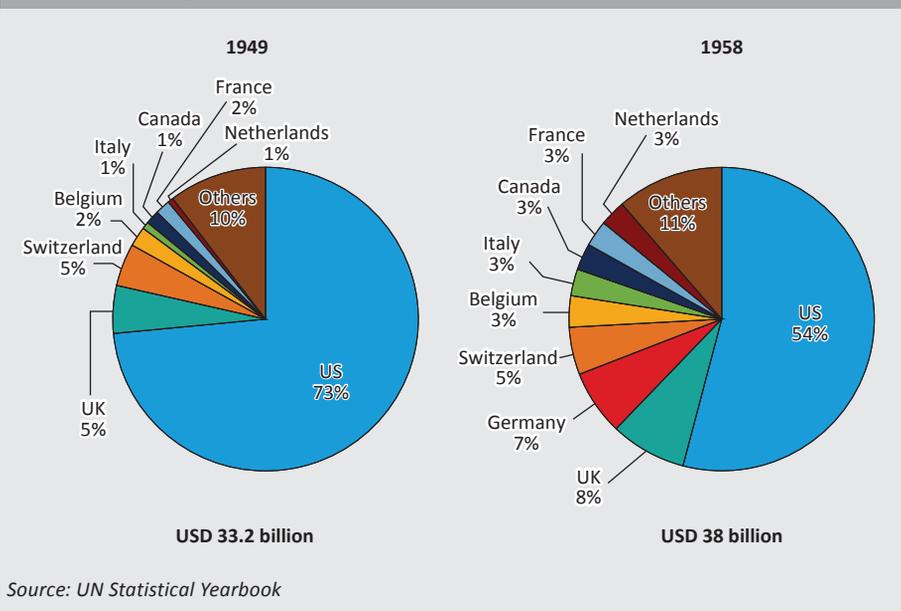
The new international monetary system established at the Bretton Woods conference departed in several respects from the gold standard system of the pre-World War I period and the gold exchange standard of the interwar period. In the dollar-based system, the relationship between the United States and other countries became asymmetric: countries outside the US were obliged to adjust fixed exchange rates to maintain equilibrium. On the other hand, central banks other than the Federal Reserve were not bound by the obligation to convert to gold. One striking difference compared to the period 1879–1914 was the restriction on the free movement of capital. Another feature of the system is that from the 1960s onwards cooperation between central banks began to take root, with swap agreements as the backbone of this cooperation (*McCauley – Schenk 2020*).

However, the shortcomings of the system soon became apparent in practice. Already in 1947, the Marshall Plan was set up and action had to be taken to alleviate the international dollar shortage. Bretton Woods was also challenged by the creation of

the European Payment Union (EPU) in 1950, based on Keynesian theory, to ensure the convertibility of Western European currencies (Faudot 2020). Without a common reserve currency, the EPU functioned as an international clearing house, so the United States considered this initiative that existed until 1958 (i.e. until the establishment of full convertibility at Bretton Woods) as a challenger to the IMF (James 1996).

An unexpected turn of events for the United States was that foreign central banks began replenishing their gold reserves relatively quickly (Figure 5). The subsequent development of gold reserves was also seen as a negative development by the United States because in the initial years following the agreement, the dollar's importance was increased by the fact that a significant part of European gold reserves was transferred to the United States. According to contemporary data from the St. Louis Fed, between January 1946 and March 1948 alone, USD 4.9 billion (roughly USD 50.7 billion at 2023 prices) worth of gold went to the United States from foreign governments. Meanwhile, the level of gold reserves in the future Marshall countries fell by USD 2.3 billion between 1946 and 1947 (USD 25.3 billion at 2023 prices) in favour of the United States (Federal Reserve Bulletin 1948). This allowed the new US financial centres to (partially) take over the management of capital flows between the two continents. This reinforced the process whereby the United States had already rapidly increased its share of global capital market capitalisation between 1880 and 1930 (Kuvshinov – Zimmermann 2022).

Figure 5
Evolution of the gold reserve ratio between 1949 and 1958



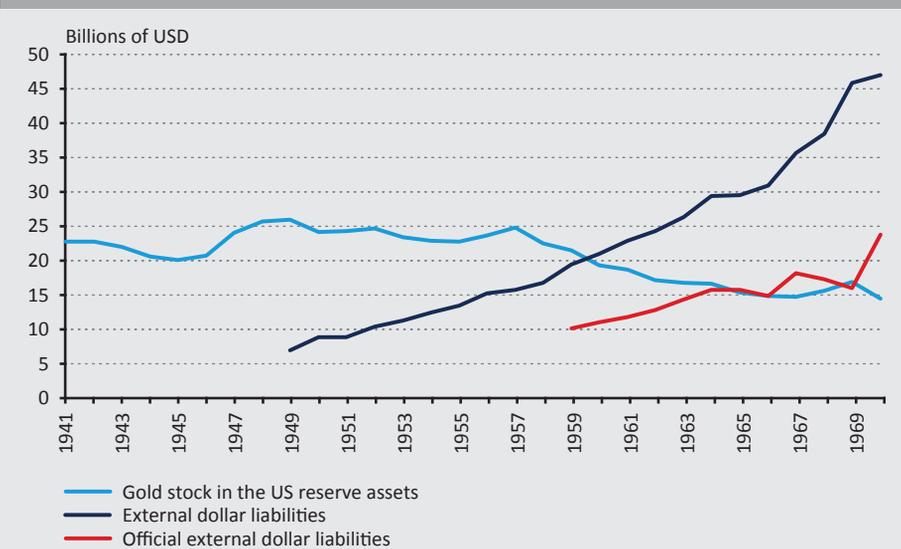
However, the system that had consolidated the favourable position of the US was soon threatened by the growing competitiveness of Japan and Germany, and it collapsed in the early 1970s. Bretton Woods was in fact supposed to have come into operation when the reconstruction of Europe was already underway with the help of the United States, although experience showed that while the mechanism was useful during reconstruction, from the 1960s onwards it was only held together by necessity. The main reason for the change was the different economic situation: in the 1960s the United States had to compete with its growing competitors at an initial disadvantage because of its obligations towards the Bretton Woods system, since its currency was the anchor of the system (*James 1996*). This situation was exacerbated by the fact that the United States experienced an inflationary impact from the mid-1960s onwards, mainly due to the financing of the Vietnam War and the Great Society initiative (*Figure 6*), which already reduced the purchasing power of the dollar, while in the case of the gold it remained unchanged, thus upsetting their parity.

Figure 6
Inflation in the United States between 1960 and 1990



While central bank swap arrangements were a cohesive force in the system, the growing dollar claims of foreign countries began to put a strain on it. According to Fed data, the claims of foreign central banks exceeded the US gold reserves as early as 1965 (*Figure 7*).

Figure 7
USD-denominated foreign liabilities and the value of gold as collateral from between 1941 and 1970



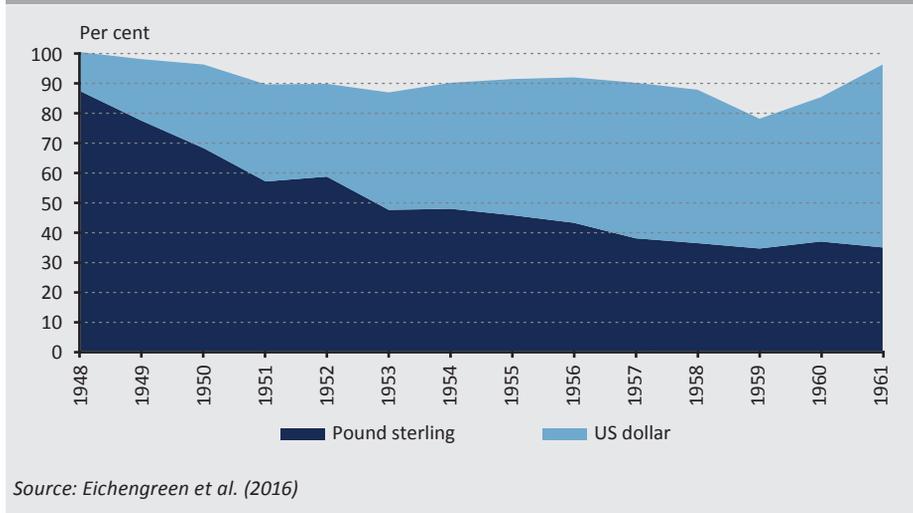
Source: Board of Governors of the Federal Reserve System (1976): Table 14.1 and Table 15.1.

By the early 1960s, the eurodollar market had also been consolidated, taking advantage of the Bretton Woods system and its loopholes to alleviate the international dollar shortage. This reinforced the trend initiated by the Q legislation adopted as part of the Glass–Steagall Act of 1933, which among other things, limited the interest rate on deposits and imposed a reserve requirement on domestic deposits. This encouraged US banks to account for large deposits as foreign, which in turn supported the creation and international development of money market funds (*Gilbert 1986*). The UK’s economic and diplomatic situation, including high inflation and the Suez crisis, led to restrictions on sterling lending to protect its international reserves and prompted London banks to prioritise dollar savings in terms of foreign lending. Ironically, the strengthened eurodollar market also played a major role in the collapse of the Bretton Woods system (*Restrepo-Echavarría – Grittayaphong 2022*).

However, the “death” of the dollar standard did not mean the end of the dollar’s hegemony. The Bretton Woods Agreement consolidated the role of the US dollar in international credit and trade transactions, as well as in foreign exchange reserve accumulation (*Eichengreen et al. 2016*), and the dollar became the basis of the international financial system (*Figure 8*). This was complemented by two important factors: on the one hand, the United States was able to support the maintenance of its global economic hegemony through the IMF, and on the other hand, the

economic and military agreement signed by the US and Saudi Arabia in June 1974 (Vicquéry 2022) also contributed to the further strengthening of the dollar's global position, establishing the USD-based settlement of oil trade transactions, and thus the petrodollar system at the global level.

Figure 8
Global foreign exchange reserves in pound sterling and the US dollar between 1948 and 1961



The cost-benefit analysis of the Bretton Woods system is a divisive topic in the literature. According to some of the research, maintaining the system involved a sacrifice for the US and the global economy if we look at the consumption side of the issue. In an examination of the effects of the Bretton Woods agreement, the St. Louis Fed concluded that the system brought welfare gains, at least in terms of consumption growth, for Northern and Western Europe, as well as East Asia, Latin America, Canada, Australia and New Zealand. By contrast, in the United States, participation in the regime led to a 4.5 per cent drop in consumption. Their analytical model also showed that without the Bretton Woods system global output would have been higher than it actually was (Cancelada 2022).

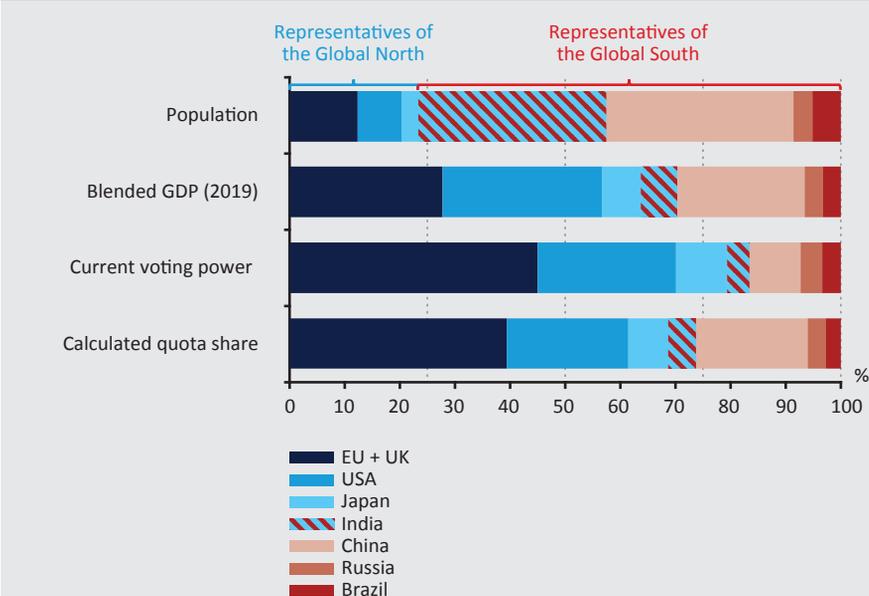
Other analyses point out that, as far as the United States is concerned, some actors are winners (Wall Street) and others are losers (such as US workers and companies in the real economy) in a system based on the international dominance of the dollar (e.g. Pettis 2023).

As one of the lasting legacies of the Bretton Woods system, the US Federal Reserve still has a special international role (Báger 2017). With the 1944 agreement, it took over the former function of the Bank of England: as long as the Bank of England

was able to fulfil the role of lender of last resort in the world economy, the United Kingdom was the central actor in the international monetary and financial system. After the First World War, it became clear that this role could only be filled by the Fed. This also explains why a single, comprehensive global monetary system could not have functioned during the interwar period.

However, the post-World War II system is not sufficiently equitable: today, an increasing number of developing and emerging economies are expressing the view that the international financial system is determined by US domestic interests, and they continue to see the most effective solution as central banks increasing and diversifying their international reserves (Choi 2023). Discontent with this is also behind the calls for reform of the IMF and the World Bank Group, which were established by the Bretton Woods agreement. The quota system of the globally influential lending institutions continues to reflect the global leadership of the United States, which is a source of increasing dissatisfaction at the international level (Figure 9).

Figure 9
Quota system of the International Monetary Fund today



Note: In addition to the current voting power, the IMF periodically calculates the so-called "calculated quota share", which represents an approximate value based on the real economic weight of a member country, calculated using fresh data, and which can be taken into account during a forthcoming quota review. The calculation of "blended GDP" compresses GDP adjusted for exchange rate fluctuations and purchasing power parity into an adjusted value. In this study, we consider the "calculated quota share" as the potential voting power of a country. More information on definitions: <https://www.imf.org/external/np/spr/glossary.pdf>

Source: IMF (as of September 2023)

6. Conclusion

The preparation of the Bretton Woods Agreement was an important moment for the protection of US foreign policy and foreign economic interests and the implementation of long-term US strategy. For the United States, it was a fundamental objective to spearhead the financing of reconstruction for its wartime allies and to enforce the Monroe doctrine (the policy of “America for Americans”) in Latin America to exclude foreign influence. A further motivation, as the supporter of developing countries, was to expand this alliance network, and at the same time the external market. The so-called Bretton Woods twins, the IMF and today’s World Bank, as the institutionalised executors of the agreement, also supported the achievement of these goals in a previously unprecedented international monetary cooperation. And although the regime – after the US changed from a low-inflationary to a high-inflationary economy during the “Great Inflation” and the changes in the global economic environment overturned the model based on a fixed exchange rate regime and international restrictions on capital flows – was abolished in the early 1970s, the legacy of the US dollar standard system lacking gold parity continues to define global financial conditions.

In the context of the international system as a whole, the creation of the agreement can also provide a relevant lesson for today’s economic diplomacy: the 44 participating countries acted swiftly and spared no resources in addressing a common problem, namely the restoration of the international monetary regime. In 1944, world leaders could not yet foresee how economic trends would evolve after the war, or whether the challenges of the post-World War I era would be repeated. At the same time, learning from the economic policy and diplomatic mistakes of the interwar period, a clear objective was set in 1944 to guarantee financial and economic stability, accepting the economic realities of the time. Although today we are witnessing a slowdown in globalisation, the world is still much more complex than it was 80 years ago because of the economic interdependence, and thus multilateralism in global affairs needs to be strengthened. The closing speech of US Secretary of the Treasury Henry Morgenthau at the 1944 conference conveyed a message that remains relevant to this day: *“We have come to recognize that the wisest and most effective way to protect our national interests is through international cooperation — that is to say, through united effort for the attainment of common goals”* (Morgenthau 1944:2). The reform of the international institutions is now essential: as the example of the Bretton Woods system shows, without a fair system that keeps pace with the development of the world economy, it is difficult to build lasting cooperation.

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Lessons from the Fed's Monetary Policy*

Katalin Botos 

Ben S. Bernanke:

The 21st Century Monetary Policy: The Federal Reserve from the Great Inflation to COVID-19

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Ben Bernanke received the (shared) Nobel Prize in 2022 for his research on banking and financial crises. His voluminous book, which is briefly described in this article, is partly a summary of his work, but also a search for answers to the question of what has changed in the world. It analyses how the Federal Reserve's activities will transform in the 21st century as a result of these changes.

Bernanke's 8-year term as Chairman lasted until 2014 and coincided with the international financial crisis. Prior to this, he was an outstanding academic and researcher. Starting from 2002, however, he was a senior Fed official. More important than his academic work is his professional achievement in steering the US economy through the biggest financial crisis in a century, in 2008–2009. He averted the collapse of the international financial system and developed the methods that, as the title of his book suggests, may become the tools of the Federal Reserve System in the 21st century.

The book assumes knowledge of how the Fed came into being, its legal basis, its role in the US financial institutional system, how this role changed after the collapse of the gold standard, and the role of the US dollar as the global currency in the world today. The work deals with the above only tangentially and *focuses on the role of the Fed in the US domestic economy*.

As is well known, the Fed is essentially a mixed public-private institution. It is structured like a joint-stock company, but its statutes were approved and can be amended by Congress. It is not "owned" by the state, but rather by private banks which subscribe its shares. These shares are special, non-negotiable securities,

* The papers in this issue contain the views of the authors which are not necessarily the same as the official views of the Magyar Nemzeti Bank.

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in exchange for which holders are entitled to a statutory, 6-per cent dividend on their capital contributions and receive free services from the Fed. (One not too well-known fact is that only 38 per cent of US banks are covered by the Fed. Non-member banks are only allowed to operate in the private sector and cannot conduct any transactions with the government. Only the Fed can do this. Non-Fed banks have a separate clearing centre; the Fed provides this service free of charge to member banks.) The Fed's governing body, the Board of Governors (the Board), its Chairperson and Vice Chairperson are appointed by Congress. Members are appointed for 14 years. The chairperson may be elected only from among the members, but s/he and her or his deputy may be appointed for a term of only four years, or possibly, with extension, for another four years. The long-term appointment of board members is a guarantee of independence from political "winds". Which is obviously not perfect, because cooperation with the government in power is necessary. The Fed had a dual mandate (until adoption of the Dodd-Frank Act). Its main objective was to ensure the stability of the value of money, which was ultimately aimed at keeping inflation low. This task was supplemented in the 1970s by the provision of an adequate level of employment. *Finally, after the financial crisis of 2007–2008, the Dodd-Frank Act added a third mandate: supervision of the stability of the financial system.*

Of course, inflation is of fundamental importance to government, which is an elected body; after all, it is a broad economic phenomenon that affects voters first and foremost. Inflation "eats away" at the real value of the incomes of small people. But it is not only for them that low inflation is important: it is also important for the capital-owning classes, as this is how their accumulated wealth retains its value. Which aspect is more important to the Fed is open to debate. Many have raised the question of which of the two core tasks it has focused on over the past half century. In this book, Bernanke admits that for a long period of time, the preference was to keep inflation low.

As we know, and the author deals with this in detail, the Philips curve expresses the relationship between inflation and employment. For a relatively long time, it seemed to hold that employment could be expanded at the "cost" of some inflation. As the book points out, this has changed today, and monetary policy has had to change accordingly.

Inflation is not only caused by excess demand due to money abundance: there is also cost inflation. (There is not only demand-pull inflation, but also cost-push inflation.) The two will merge if wage demands are strengthened by price increases. For companies, an increase in wage costs causes cost inflation in the same manner as unexpected increases in energy or material costs. The explosion in energy prices in the 1970s led to *stagflation* in America. Trade union wage demands put pressure on businesses, and as a result growth changed to stagnation. Bernanke's book

describes how Volcker, the Fed chairman at the time, broke this down by drastically raising interest rates. Bernanke does not say much about the international implications of this, even though we know that it had consequences outside the US. Developing countries became heavily indebted as their dollar loans became much more expensive. (We Hungarians suffered the same...)

The author also points out that the drastic signs of the crisis soon forced interest rates to be cut, as many sectors of the US economy went bankrupt. After the easing, the recovery started, and we know that under Greenspan, interest rates stayed very low for a long time. (Today, it is considered to have been perhaps too low.) In any case, the US entered a prosperous period. The functioning of the economy was positive, partly due to the resulting developments in the labour market. With unemployment relatively low, Bernanke *described* the labour market *as healthy*.

Here, the reviewer allows herself some critical remarks. Bernanke says nothing about what many US economists, such as Nobel Prize winner J. Stiglitz, sharply criticised that real wages had not risen since Volcker. However, the US economy had been growing steadily. Question: where did the new value generated flow to? Answer: obviously to the owners of the capital, it could not go anywhere else. Previously, workers and capitalists had shared proportionally in the surplus from productivity growth. But for more than 40 years, it has been flowing *only to the rich*, widening income inequalities that are now a source of serious social problems.

But in connection with this statement, we must also quote a third Nobel Prize winner, Angus Deaton, who together with his wife wrote a high-impact book in 2020 entitled *Deaths of Despair*. In their work, they showed the tragic proportions of the suicide rates in America due to alcoholism, drugs and hopelessness, especially among the white working male population... Obviously, because of the increased number of job losses or the fear of losing one's job. The phenomenon also caught the attention of Obama and Trump. Can the labour market then be called "healthy"?

Of course, inflation is not only, and not even primarily, influenced by the Fed's actions. It has a real economic basis. With the advance of globalisation, cheap labour appeared on the world market in large masses, and this depressed wage demands. China's transition to a market economy was a crucial step, as there was significant foreign investment in the Far East and outsourcing in the US made everyone worried about their jobs. The author does not really address this in his book either.

It should be noted that Bernanke does not even give too much thought to the significance of the collapse of the Soviet empire for the economic situation in the developed West. Eastern Europeans represented a well-trained, but cheap workforce. The income flowing from this region brought windfall profits for the

Western countries. And for America, it was also accompanied by a reduction in military spending (although this may not have been such a positive phenomenon for those with a stake in the defence industry). But the unipolar world economy certainly benefited the US politically and economically, at least in terms of economic growth. Low-wage workers in developing and emerging countries *limited the wage demands of American workers*. This led to a situation where workers' real wages did not increase. This was not so tragic for them because low inflation allowed them to expand their consumption with cheap credit and to even start buying their own homes. The US mortgage market boomed! This was a consequence of the big interest rate moderation. But when workers in this "healthy" labour market lost their jobs and could no longer afford their loans (mortgages), the market collapsed. Of course, other factors also played a role in the outbreak of the crisis. Financial innovations proliferated – which Bernanke admits were not brought under real control – and transparency was severely damaged. In the various "repackaged" securities, the buyer's or seller's side and position were not visible at all, and distrust rose exponentially. The liquidity crisis erupted and soon took otherwise solvent financial institutions with it.

The question arises for everyone: how did the supervisory authorities not recognise the dangerous situation? It is important to understand that the US has a very fragmented institutional oversight of the financial sector. Banks are also supervised by the Comptroller of the Currency, the Fed, and the FDIC. The securities market is supervised by the Securities and Exchange Commission, the SEC. (The FDIC and SEC were created in the wake of the 1929 crisis.) The supervisory authority for the securities market was not responsible for macro-prudential supervision, and it did not have the powers and tools to regulate the market properly. And the Fed only supervised the banks. In the end, it managed to avoid the collapse of the financial institutions by multiplying the money available almost without limit. It not only saved commercial banks, but investment banks too! This task, as Bernanke writes, was not very popular with the public. Legislative action always had to contend with public aversion to banks, which obviously influenced Congress's decisions.

The Fed's crisis management was based on the addition of a paragraph (Section 13/3) to the Fed's charter during the Great Depression of 1929–1933, which allowed the *Fed to provide funds to non-banks* in the event of a serious and urgent problem. The paragraph was "dormant" for 70 years, and then "deployed" during the 2007–2008 crisis. Among the huge companies that were bailed out in 2008 were Bear Stearns and AIG... The institutions that received loans had to provide collateral to the Fed, and they repaid the loans once the crisis was over. Thus, taxpayers did not suffer a loss; but the public still found the bailouts difficult to accept. The Dodd-Frank Act therefore clarified the conditions for its application: individual bailouts are no longer allowed, but the Fed is allowed to help troubled

groups. The law, as noted above, essentially added a third important issue to the Fed's core responsibilities: the supervision of financial stability. But this cannot be ensured if only the supervision of banks, in the strict sense, falls within the Fed's remit... Because *the institutional composition of the financial sector itself has fundamentally changed*.

Why? This is because over the past twenty years changes have taken place, and for a long time neither society nor the experts grasped the essence of these changes. The Fed's attention used to be focused on banks, which converted short-term funds into long-term loans, not realising that this function had been taken over by the so-called *shadow banks* by the end of the 20th century. These are investment banks, insurance companies and other institutions: venture funds, mortgage lenders, etc., and they represent a very large share of financing around the world... (According to the Financial Stability Board (FSB), they accounted for 49.2 per cent of all financial assets in 2021, and thus ignoring them is a fatal mistake!) Unfortunately, until the summer of 2023, this area was not really regulated in the US, although the role of shadow banking is very large there. It is therefore important for financial stability that the Fed has a way to engage with this sector. In other words, the application of Section 13/3, which is considered exceptional, is becoming increasingly necessary.

For a long time, the main way to fight the crisis was to raise money supply by cutting interest rates, but when the lowest limit of interest rates was reached, *new types of instruments had to be used*. The Fed was not willing to stimulate using negative interest rates (as Switzerland, the ECB and Japan did). The new tool was *quantitative easing*. The book deals in detail with this instrument, which involves the Fed influencing money supply and interest rates on long-term bonds by selling and buying securities with different structures. It operates in a more sophisticated way than the Bank of Japan, which bases its actions on a mechanical quantitative monetary theory. However, the Fed was far less selective in these operations than the ECB, for example, which in some cases explicitly sought to help specific countries. Not always by increasing the money supply, but also by simply changing the maturity composition, the Fed was able to influence the evolution of long-term government bond rates, which was crucial for economic growth. Bernanke describes in detail the types of securities purchased: which government securities were covered, the timing, and the conditions under which they were used. It was debated whether the open market operations should be linked to specific conditions (e.g. subject to which indicators, how much and when these operations were planned to be implemented) or whether it was appropriate to use certain loose phrases in the communication ("in the event of a significant fall in employment"; "in the near future", "subject to economic recovery", etc.). After all, the Fed basically influences the market indirectly. The reader is left with the constant feeling that monetary policy, which focuses on market reactions, is *increasingly* using the tools

of *psychology*. Indeed, the market reacts nervously to every sentence from the central bank governors. The speculation starts immediately... Bernanke discusses this in great detail.

What was certainly revolutionary was the Fed's purchase of securities other than government bonds. For decades, we were taught that the central bank is only a bank for banks and has no direct relationship with companies. But when it also bought GM's commercial paper, it was clearly a discretionary move, a direct relationship with a non-bank real economy player. As the crisis subsided, the Fed tried to return to traditional instruments. The author also discusses in detail the events that occurred after his own time in office. This is when *new types of problems* arose.

The *coronavirus crisis* caused serious difficulties for specific companies and entire sectors. International supply chains were disrupted; the pandemic made personal service businesses impossible. These changes were not management failures; they were force majeure. A variety of "subjects" needed temporary help: funds, local authorities, small and medium-sized enterprises, companies, commercial paper dealers. Once again, Section 13/3 was applied.

How the US economy managed to weather this extraordinary situation depended on the cooperation between the Fed and the government. Bernanke shows that the problems caused by the coronavirus crisis required close cooperation between the government and the Fed. There were also arrangements where the government injected some capital into special purpose vehicles (SPVs) set up by the Fed, e.g. to finance the small business sector. These budget funds could be multiplied by the Fed's loans. The funds thus made available helped to overcome the difficulties.

Janet Yellen, who succeeded Bernanke as Fed Chair, was appointed as Treasury Secretary in 2021. In this capacity, she immediately launched the American Rescue Plan. Her experience as a central banker made her aware of what the Fed could and could not do. She saw fiscal sacrifice as necessary, and even inevitable, since capital replacement was sometimes needed. Fed credit is not suitable for this. Because a loan is not a fiscal subsidy; it must be backed by collateral; and it must be repaid. The government also became active, as it specifically used budget resources to help specific actors in the real sector, for final use (p. 274). (Of course, some Fed analysts immediately began to check whether this would have an inflationary effect...) Bernanke clearly points out that monetary policy can *only* strengthen the economy *indirectly* in general, and that this is the only way it can contribute to better living conditions for business and workers. However, he stresses that the use of fiscal instruments is indeed cumbersome; changing the revenue and expenditure side of the budget requires laws and political debates. Monetary policy can adapt more flexibly to unexpected situations (p. 355).

In any case, it shows that the Fed has less discretionary power than other central banks. It refers to the ECB, which subsidised some lending by commercial banks at the expense of its profits. However, the law in the US also delegated certain discretionary powers to the Fed in the CARES Act (e.g. when it set up joint ventures with the Treasury, as I referred to above). Here, in order to survive, lending could take place that could result in losses, but ultimately at the expense of the budget. The line between the Fed's and the government's actions is definitely getting blurred, according to Bernanke.

It can be seen that solutions that were previously considered exceptional are increasingly being incorporated into the monetary policy toolbox of the new phase. That is why the change I mentioned above, namely the introduction of *the third function* into the Fed's statute and practice, was inevitable. How the Fed can achieve this in the future is a fascinating question of monetary theory and practical economic policy.

This is why the Fed is trying to get a more and more accurate picture of the actual state of the economy, including the real economy, not just the financial world. This is the purpose of the so-called "Fed Listens" events, i.e. conferences at which the Fed meets a wide range of economic actors. It listens to them, and asks questions to understand more clearly how its policies affect everyday practices and people's lives. The process was launched in 2019 and has only intensified in the following years, driven by the coronavirus crisis and increasing geopolitical turmoil. The Fed's increasing role in economic policy seems to call for more information.

At the end of his book, Bernanke raises three important questions for the future.

First, to what extent will the task of reducing inflation play a role in the future, compared to the other two basic tasks, especially employment? During his own tenure, Bernanke treated the two variables of the Phillips curve as issues of roughly equal importance, but in 2023 he saw his successors (J. Powell, for example) as allowing for greater volatility (possibly overshooting) in the inflation numbers where appropriate, because employment developments had become such a key issue (reflecting the strengthening of the central bank's role in economic policy mentioned above). Bernanke stresses that it is very important for the Fed to maintain its credibility, and therefore, despite all the problems, in terms of monetary stability, it must strive to keep inflation low.

The second question, not unrelated to the first, is how the neutral (natural) interest rate, R^* , evolves. This concept refers to the inflation-adjusted interest rate at which the economy operates efficiently over the long run, using its full capacity, because this interest rate has neither a restraining nor an expansionary effect. It depends

on the state of the real economy; it can only be estimated; it is not determined by the Fed – or any central bank. The question is, at what level will it stabilise?

It has been observed that the R^* rate has decreased by about 3 percentage points since the mid-1980s. For central banks, a low neutral rate means that they have less scope to cut interest rates to stimulate the economy. Demographic and technological trends are working towards lower rates and the maintenance of low interest rates. Under these conditions, the Fed should continue to be prepared to use a new set of monetary tools that is not traditional. Monetary policy then requires more fiscal policy intervention when a severe recession occurs. In such a case, fiscal policy would need “automatic stabilisers” to stimulate the economy. In 2023, Bernanke said that interest rates were unlikely to remain low. Slightly higher inflation and large budget deficits in the US require investors to be compensated more for their long-term bonds, but higher interest rates at least provide more room for more flexible monetary policy accommodation.

Bernanke sees the *third task* as the most difficult. Ensuring financial stability would require very significant changes to supervisory and institutional systems. As we pointed out, regulators in the shadow banking sector and in housing finance do not have sufficient tools in the US. More serious consideration should therefore be given to ensuring that entities performing the same functions are subject to the same regulation. Only then would the Fed be better able to fulfil its macroprudential regulatory role.

A Frank Sinatra at the Helm of Deutsche Bank?*

Dietmar Meyer 

Josef Ackermann:

Mein Weg

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A few weeks ago, the memoir “Mein Weg” by Josef Ackermann¹ was published on the book market. This will be an unusual review for an unusual book. Unusual because his work is not a specialised book in the strict sense, but also because this is more of a review than a critique. But it is particularly unusual because, as a reader, I am interested in the man himself, who, as one of the key drivers of international finance, had a major impact on economic policies in many countries. How did he manage to get to the top and how did he feel at the top, where every breath is often a challenge? How does the former successful banker see himself now? (Incidentally, the book also tells us that he was most successful in the javelin.)

I am sure that the choice of the title is based on one of Paul Anka’s most successful compositions, which Frank Sinatra elevated to the level of an anthem and which has featured in the repertoire of many other artists. The song’s content is well-known: at the end of his career or life, a man looks back over the previous decades to see what he has put on “life’s table”. The answer is that whatever he has done – whether the results are positive, which he can be justifiably pleased with, or negative, which he looks back on with shame – he has done it all; either he did it himself or it was done on his initiative. It is not only the pride of achievement that resonates from the song, but also the responsibility – to be taken! – for what he has done.

Reading the book of one of the most successful, but also one of the most controversial, bankers of the last few decades, the dichotomy of “individual choice – individual responsibility” is evident throughout, and this is apparent without the readers having to constantly remind themselves of this. It is, so to speak, a thread running through the volume, from the first page to the last.

* The papers in this issue contain the views of the authors which are not necessarily the same as the official views of the Magyar Nemzeti Bank.

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So let's look in a little more detail at this 460-page book, about fifteen per cent of which is personal, covering family, childhood, adolescence and personal relationships, with the bulk of the book covering events in his career. It also discusses the causes of financial crises and the lessons to be learnt from them.

The attitudes and behaviours that would shape his later career were almost automatically instilled in Ackermann by his family, where respect for knowledge and a desire for and commitment to culture in its broadest sense were core values. In retrospect, he was also able to succeed in his profession because the vast knowledge he acquired and the healthy self-confidence – generally – supported by his family became the basis for his almost boundless confidence in his abilities. It was this that drove him to new challenges, and it was also reinforced by the saying “*Qui veut, peut.*” he heard from his mother very often. It's a corollary of the motto “Trust your own strength”: “If you have a problem, try to solve it yourself, and ask for outside help only afterwards!” This attitude, which within continental Europe is perhaps most prevalent in Switzerland, proved, in the author's words, to be a cultural legacy that led him to experience some “culture shock” (pp. 95 and 101) when he started working in Germany in 1996, a country that was “characterised by confidence in a strong state” (p. 97). At the same time, this attitude helped him to make responsible decisions, and he maintains this attitude later in life as well, almost unchanged, in his assessment of his work as chairman of Deutsche Bank (pp. 277–279).

During his studies, Professor *Hans-Christian Binswanger*, under whose guidance Ackermann completed his doctoral thesis, became a key figure, and he remained so for the rest of his life. Binswanger's influence can be attributed partly to his unconventional personality and partly to the fields he studied (monetary theory, environmental economics). Most of the work on Ackermann's dissertation was done in the years during which Binswanger wrote his 1985 book,² in which he also attributed to money some mystical quality, referring to Goethe's *Faust*. One of the most important results of the dissertation is that money – besides its functions as a unit of account and as a means of holding wealth – should be considered primarily as a means of payment (p. 55), which is very close to Binswanger's mysticism.

Of course, there is much more in the first part: for example, the impact of military service on his life and his subsequent rise to the rank of colonel; the beauty of his secondary grammar school years; a bet with a child of a Hungarian family who settled in Switzerland after 1956 that he would learn Hungarian in two months as well as the Hungarian boy had learned English, a bet he lost. But instead of such interesting and important questions, let's take a look at his career as a banker.

² Binswanger, H.-Ch. (1985): *Geld und Magie*. Edition Weitzbrecht, Stuttgart.

If we look at the main stages of his career, it is clear that he reached high positions in a very short time. In 1977, he was approached by Schweizerische Kreditanstalt with a job offer, and they soon reached an agreement. This marked the beginning of his 19 years at this long-established financial institution. In 1979, he was sent to the USA for a year to deal with lending. On his return to Switzerland, he was given the opportunity to manage the financial institution's payment flows. He held positions in several branches and did important work at the financial institution's headquarters in Zurich. In the mid-1980s, he was sent to London, where he had his first taste of investment banking with Credit Suisse First Boston. In his book, it is repeatedly mentioned that he is seen by many as always having worked in investment banking, a view that Ackermann consistently rejects: like most Swiss graduates in finance, he started his career as a "classical banker", i.e. he worked for a long time in lending. This was obviously the case. On the other hand, when Schweizerische Kreditanstalt acquired Credit Suisse First Boston in 1988, and thus took on another major business area, Ackermann, unlike many of his former colleagues, already had a wealth of knowledge and experience in the field of investment. Hence, it comes as no surprise that he was put in charge of the investment unit at his financial institution. In 1990, his successes led him to become a member of the board of Schweizerische Kreditanstalt, which had been part of Credit Suisse for a year, and from 1993 he was appointed chairman.

During his first three years on the board, his work continued to focus on the "non-classical" areas: investments, derivatives, etc., which his fellow managers still tried to avoid. Not least because this helped the financial institution successfully weather the crisis, he had an almost direct path to the chairmanship of the board of the now "most American" bank. But more instructive is how Ackermann looks back on his resignation three years later. Perhaps it is not wrong, and certainly not offensive to the person concerned, to describe the situation after three successful years as follows: the bank had become too small for him, in two senses. On the one hand, he was clearly looking outwards, believing that with his knowledge and experience he could find a more important position in the international monetary system. On the other hand, he found that the strategy that had made the bank successful was not accompanied by the organisational transformation needed to continue. Both factors clearly point to the family "heritage": the unquestionable existence of self-confidence and the duality of decision-making and responsibility in the sense that "if I take responsibility for the institution, the decision should be mine".

Already a widely known and respected banking expert in 1996, he was approached by several institutions. From them, he accepted the offer of Deutsche Bank, among other reasons because "I saw a lot of potential there," he wrote, "in the field of investment" (p. 89). Thus, between 1996 and 2012, he established his battle position

in the international competition in Frankfurt am Main, initially as a member of the Board of Directors and later as Chairman of the Board of Directors of Deutsche Bank.

His work for Deutsche Bank could certainly be the basis for at least one more book, mainly because of the innovations introduced in the field of management. Exciting, of course, are the events that unfolded in 2008 without external help from the Bank – cf. his “Qui veut, peut” attitude which he got from his family – and the many subjective elements of the financial and debt crisis. Instead, let us focus here on a single theme: the role of the media and the author’s relationship with it. Trust is a fundamental element of well-functioning financial systems. The latter is the result of individual assessments and is influenced in no small measure by the media. Consequently, the glorification or denigration of a (financial) institution or one of its representative who is constantly in the limelight can have a major influence on economic developments. Ackermann may have experienced this (see e.g. the sub-chapters “Communication problems”, “The Kirch drama” or “The Mannesmann trial”), in both directions, where negative perceptions obviously hurt. However, when he expresses his resentment for some newspapers or some journalists, it is obviously not because of what is rightly and categorically put down in writing, but because they are repeatedly stirring up essentially marginal issues with their somewhat “rewritten” portrayals of the real situation, until – independently of them! – the situation is resolved.

Here again, the duality of power and responsibility comes into play: if the media are already gaining quite extraordinary power, they should use it responsibly, not to sensationalise and not to boost their circulation and revenue. And yet another earlier concept returns: mysticism, magic and alchemy. Just as people have long struggled to produce gold from existing materials, the media produces stories from information crumbs to create a devaluation of news for society that would have been caused by artificial gold in economic life. The difference is that those who control the media have succeeded in comparison to the alchemists. The thought can be continued: how are the alchemists’ attempts, the media-induced information inflation, different from the Binswanger mystique of money? Are the banks’ money creation operations not causing the same kind of inflation, now “real”, as the other two areas?

At about the same time as his position as Chairman of Deutsche Bank, Ackermann took on another important assignment as Head of the International Institute of Finance. In this clearly global capacity, he became, in his own words, a “political animal” (p. 290). The debt crises that raged in Latin America in the 1980s, but especially the global financial crisis of 2008, created a new context, as economic turmoil became more global and the interaction between banking and fiscal problems increased significantly. Thus, regionality has become an increasingly important consideration for banks, and on the other hand, there has been a demand

from fiscal institutions for the private sector, and here I am thinking mainly of banks, to take a greater share in debt management. Consequently, new structures and mechanisms need to be put in place and developed to solve the problems that arise with a view to success or, more importantly, to prevent similar developments. Ackermann gives a number of concrete examples of how, in close cooperation with the Basel Committee on Banking Supervision, progress has been made in this area.

Ackermann's last two positions – at the head of the Zurich Insurance Company and the Bank of Cyprus – were much smaller than the previous ones. But by then he had already reached the age at which people usually retire.

Finally, a more general comment: The book is “human” because it not only offers insight into the author's personal traits, but also clearly shows how human relationships are crucial in an often “inhuman” financial world. Working alongside the right person and learning from them can give a career a serious boost; a rash move by a superior can open the door to higher positions; a well-functioning administration is worth its weight in gold, but the suicide of an important colleague can lead to resignation, and the list goes on. After all, was Ackermann “just” lucky to be in the right place at the right time? The answer is clearly no! Luck may be a necessary condition for a successful career, but it is by no means sufficient, because for sustained success you need to show performance. Only then can one really say, “I did it my way”.

Outsmarting Smart Contracts – or Does Man Always Win?*

Blanka Kovács 

Ari Juels:

The Oracle

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Since the publication of Satoshi Nakamoto’s Bitcoin whitepaper, a number of books and studies have been published on blockchain technology, the crypto market, the technological and financial innovations based on it, including speculation and fraud, and the impact of such on society. The development of the technology is followed with great interest not only by professionals but also by the media. Thus, it is not surprising that literary minds and imaginative people have also been inspired by the topic, and browsing Amazon, you can find many books in the crypto sci-fi genre.

The Oracle, published in February 2024, stands out for being written by an academic with considerable expertise in the world of blockchain. *Ari Juels* is a Professor in the Department of Computer Science at Cornell University, co-founder of IC3 (Initiative for CryptoCurrencies and Contracts) and Chief Scientist at Chainlink Labs. This is not his first foray into literature: he is also co-author of the 2010 techno-thriller *Tetraktys*. Juels is the author of more than a hundred widely-cited studies, his h-index¹ is high. His key areas of research include security, smart contracts cryptography and blockchain technology.

The novel’s inspiration comes from three sources: Juels’ passion for ancient culture and mathematics, a place that is special to him, and a study published in 2016. The author studied Mathematics and Latin, and this provides the historical thread of the story. The bridge motif recurs several times in the book. According to the main character’s definition, blockchain oracles form a bridge between the real world

* The papers in this issue contain the views of the authors which are not necessarily the same as the official views of the Magyar Nemzeti Bank.

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¹ H-index, a measure of a researcher’s scientific performance. The more citations to a researcher’s publication, the higher the h-index. An h-index of 20–30 indicates an internationally recognised performance. Ari Juels has an h-index of 100. <https://scholar.google.com/citations?user=uf0D-u0AAAAJ&hl=en>

and closed blockchain systems. The protagonist works in a Manhattan skybridge office, a setting inspired by the writer's fascination with skybridges and his previous office. The central idea of the novel was inspired by a publication that explored the potential use of smart contracts and blockchain oracles for criminal purposes. The thriller aims to entertain and raise awareness of the stories that blockchain solutions combined with artificial intelligence can tell.

The plot of the book starts when a software developer working for a blockchain company becomes the target of "rogue smart contracts". The open source code is published on the internet by an organisation called Delphian. There was a contract out on the protagonist for allegedly disrespecting and "desecrating" the ancient Greek god Apollo. Given the vast amount of information on the internet, this could even be a bad joke. But when the first target is actually murdered, the contract is activated, and somebody actually gets the reward, it arouses the FBI's attention.

The blockchain technology, according to the protagonist, is conceptually not complicated, and is like a digital bulletin board that is accessible to all. Its main features: transactions are immutable and verifiable by third parties, i.e. transparent. The radical change is that you can run smart contracts on it. These smart contracts are also unalterable and are not controlled by a central body. The code is available to and can be run by anyone. The blockchain oracle is the secret ingredient, as these systems are closed, the challenge is to load authentic and correct data into the smart contracts (blockchain oracle problem). The Oracle of Delphi was one of the most important sites in ancient Greece, where rulers and commoners could turn to the Greek god of truth, Apollo, for advice and guidance. The original meaning of the word oracle is also mediator. Oracles served as a kind of bridge in Greek mythology. In Juels' novel, the modern analogue of the oracle of Delphi is the blockchain oracle, a source of information for smart contracts, allowing them to perform transactions based on authenticated data.

Juels' characters reflect a variety of subcultures. We meet the protagonist as an anonymous person who, as a technical expert, is also interested in history. In his spare time, he blogs about technology with an educational purpose. As a snub to the academic world, he says: "I don't read this Cornell professor's papers, because I can predict what he will write about". Among others, an FBI detective character we know from American films, a researcher with a passion for ancient Greek mythology, a Generation Z cryptocurrency native and the manager of a leading investment bank, also join the story. These characters represent a broad spectrum of people who (also) operate in the world of blockchain and cryptocurrency.

In addition to the twists and turns, the story also includes technical details, e.g. about a new financial product, the multi-block flash loan. A flash loan is a decentralised financial product, and a multi-block flash loan is a variant of this.

The idea behind a flash loan is that the loan is taken out and repaid in a single block, which means the whole process can take a few seconds depending on the speed of the blockchain. Flash loans are often used for various financial strategies, such as arbitrage, without the user having to use his or her own funds. Since the loan and the repayment are made in one transaction, the loan will only be successful if the loan amount is repaid in full by the end of the transaction. If the repayment is not made, the transaction is reversed as if it had never taken place. This minimises risk for the lender, but requires a high level of technical knowledge and market expertise from the user. Multi-block flash loans allow transactions to be spread over several blocks. This means that the user is given more time to use and repay the amount borrowed, which allows for more complex financial transactions, such as complex arbitrage strategies or other more time-consuming transactions. With multi-block flash loans, the user must ensure that the loan and associated fees are repaid over several blocks, which offers greater flexibility and opportunity, but also entails the challenges of ensuring successful repayment.

The story also explores ethical dilemmas, highlighting that combining blockchain technology with artificial intelligence can have unexpected consequences. The protagonist, whose faith in the integrity of smart contracts is unquestioned, is faced with a dilemma when the FBI asks him to hack the blockchain oracle. It also raises the question of whether open source code and publicly available smart contracts require profound knowledge, are safe for everyone to use, or whether they are only safe for skilled professionals.

Smart contracts are essentially computer code, with the advantage that they are unambiguous and can be used to enforce precise “contracts” between us. In reality, however, we communicate in a human language, which gives rise to a myriad of associations. However, large language models (LLMs) can act as a kind of interface, a translator between people, institutions and blockchain systems. The overall message of the book is that technology is essentially neutral, and can be used for good or bad. Without exposing the Delphian “criminal organisation”, the other message of the book is that it is worth looking at our micro-environment first.

Ari Juels’ novel is rich in twists and turns, and its characters reflect the mindset and behaviour of the industry’s players. It explains the basic workings of blockchain technology and the technical details in a way that is easy to understand, but assumes a higher-than-average level of interest in the subject. To sum up, I recommend the book to all those interested in technology and finance, reminding them that they have a science fiction thriller in their hands.

Financial Stability Challenges – Report on the “Financial Stability Conference: Turbulent Times” in Budapest*

László Máté Csontos  – Katinka Szász  – Márton Zsigó 

For the second time in two years, on 25–26 March 2024, the Magyar Nemzeti Bank (MNB, central bank of Hungary), with the professional support of the Center for Latin American Monetary Studies (CEMLA) and the Official Monetary and Financial Institutions Forum (OMFIF), organised its international conference entitled “Financial Stability Conference: Turbulent Times”, addressing the financial stability issues facing central banks. The 2-day conference featured 8 main sessions with 21 distinguished international speakers discussing issues affecting the financial system, the short-term challenges of financial stability and its longer-term future. Participants discussed the risks of geopolitical segmentation, the high inflation and the interest rate environment intended to curb it, as well as the current crisis management framework. The event also provided a platform for knowledge-sharing on financial stability risks associated with climate change and technological developments, which are crucial to our future and are increasingly shaping central bank decision-making.

The conference was opened by *Barnabás Virág*, Deputy Governor of the MNB, *Manuel Ramos-Francia*, Director General of CEMLA, and *Christopher Garnett*, Senior Adviser at OMFIF. In his opening speech, *Barnabás Virág* emphasised that 2024 is a special year, as we celebrate the centenary of the founding of Hungary’s central bank. This anniversary also draws attention to the need to assess the current crisis phenomena and geopolitical risks in the light of lessons from a historical perspective. The financial system has recently been hit by a number of extreme shocks, such as high inflation, the high interest rate environment, and the associated high volatility and uncertainty. At the same time, since the great financial crisis of 2008, the efforts of central banks and financial supervisors to keep the financial system stable have been successful. The return to a period of high inflation is another example of the importance of close cooperation between monetary and macroprudential

* The papers in this issue contain the views of the authors which are not necessarily the same as the official views of the Magyar Nemzeti Bank.

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policy. Finally, the Deputy Governor of the MNB welcomed the conference as an opportunity to share practical experience and deepen international relations.

In his opening speech, *Manuel Ramos-Francia* highlighted the importance of the long-standing professional cooperation between CEMLA and the MNB and underlined the significance of the strong interaction of the current high inflation and the monetary policy aimed at curbing it with financial stability risks. He argued that in the future, central banks should aim to promote price stability and financial system resilience together, through the coordinated use of monetary and macroprudential measures and supervisory tools. Finally, he also pointed out that the most pressing and complex challenges for central banks worldwide were the megatrends that affect the functioning and risks of the financial system and require significant adjustments, in particular in the context of climate change and the digital transition.

Christopher Garnet also agreed on the topicality of the conference themes and briefly presented OMFIF's activities and commitment to promoting cooperation, research and knowledge sharing among central banks. He also underlined the success of the development of the Hungarian financial system since the change of regime and the many years of successful joint professional work between the MNB and OMFIF.

In his keynote presentation, *Thorsten Beck*, Director of the Florence School of Banking and Finance and keynote speaker of the conference, discussed the current state of financial stability risks and lessons from the turbulent period of 2023, which deserved particular attention for the evaluation and fine-tuning of macroprudential regulatory frameworks. Among other things, he stressed that some business models based on excessively rapid growth remained good indicators of banks' vulnerability. Most bank runs were the result of a combination of solvency problems and coordination failures, and the joint prevailing of market discipline and supervision was key to the stability of the financial system. He argued that, while the financial system was currently in a more resilient position to face emerging systemic risks, further regulatory improvements could be identified in the areas of capital markets and banking union. A stronger resolution framework would be necessary, inter alia, providing institutions with more flexibility and a broader range of tools, in particular at the euro area level and in terms of European deposit insurance.

1. Macroprudential strategies for inflation scenarios and monetary policy normalisation

The first panel discussion addressed the financial stability implications of the high inflation and interest rate environment, and the correlations between monetary and macroprudential policy. The opening speech for the topic was delivered

by *Anke Weber*, Advisor and Mission Chief for Hungary at the IMF, who noted that the macroprudential framework put in place since the 2008–2009 global economic crisis had successfully increased the resilience of the financial system. This allowed central banks to raise interest rates sufficiently without endangering financial stability, thereby increasing the room for manoeuvre of monetary policy. Strengthening shock resilience remained a key macroprudential priority, and thus in the current economic environment it might be advisable to continue to build in a set of usable capital buffers that are available to deplete, including the use of a so-called positive neutral countercyclical capital buffer, which is calibrated to country-specific characteristics, as a new idea that had recently emerged. At the same time, the management of financial stability risks should not be based solely on macroprudential policy in the future, but should be strongly coordinated with microprudential, resolution and fiscal areas.

Barnabás Virág (MNB) moderated the panel discussion following the introductory presentation, and was joined by *Anke Weber* (IMF) and *Jan Frait* (Deputy Governor at the CNB). *Jan Frait* gave a brief overview of the Czech central bank’s macroprudential activity over the past 20 years and presented several key components thereof, including the cornerstones shaping decisions on the countercyclical capital buffer and the rationale behind recent changes to the borrower-based measures. The panellists then discussed the key financial stability implications of the turning point in the global credit cycle. According to *Anke Weber*, we had re-entered a period of positive real interest rates following a high inflation and interest rate environment, in which strong labour market and tighter credit market conditions coexisted. She identified the risk of higher interest rates as firms would only be able to refinance low-interest loans taken out before the monetary tightening at higher interest rates when they would have to be renewed in the next few years. Participants agreed that, despite high bank profitability and along with discretionary bank taxes, it should be allowed to continue to build up bank buffers that could be released in the event of a future shock. The final question of the panel was on the relationship between climate change risks to the financial system and macroprudential policy. While the Czech central bank took a more conservative approach due to the overarching nature of climate policies beyond central bank objectives, *Anke Weber* argued for a green calibration of existing macroprudential instruments instead of introducing new ones.

2. Geopolitical and economic fragmentation risks: shifting linkages and financial stability

The second panel discussion of the conference focused on the elevated geopolitical risks, as well as the systemic risks of supply chain disruptions and international financial decoupling. In his opening presentation, *Stefan Thurner* (Complexity

Science HUB Vienna) presented the potential use of deep analysis of corporate supply chains for financial stability purposes. The programme of his research centre involved studying the economy at the “atomic level”, i.e. the networks formed by a multiplicity of supply relationships, and assessing how their structural characteristics and the dynamics of their transformation affected macroeconomic processes. Its essential components were the firm’s supply and demand relationships, the formal description of production technologies, the possibilities of substituting and replacing partners and the modelling of pricing behaviour. The model also offered new tools for identifying financial system risks, such as network systemic risk indices, which estimated the impact of financial distress or insolvency of a company or group of companies on the financial state of customers and suppliers, but could also be used to detect the indirect losses of financial institutions financing companies vulnerable to supply chain shocks.

In his introductory presentation, *Manuel Ramos-Francia*, moderator of the panel discussion on the risks of global fragmentation, pointed out the multiple drivers of decoupling and the reversal of international economic integration, which were also influenced by political processes. Geo-economic fragmentation had multiple channels of impact, such as rising costs of global trade, disruptions of supply chains, technological decoupling (which could hit technology-importing developing economies particularly hard), restrictions on the free movement of capital and labour, more costly financing of public debt due to creditors forming blocs, and the uncertainty caused by the above processes. Adverse consequences could amplify financial stability risks such as increased funding costs for financial intermediaries, undermining bank profitability, uneven market liquidity conditions in some regional markets and increased market volatility, limited cross-border liquidity management facilities, regional regulatory differences and regulatory arbitrage exploiting this, and increased counterparty risks due to shrinking funding relationships concentrated in regional markets.

Stefan Turner (Complexity Science HUB Vienna), *Carlos Quicazan* (Banco de la República – Colombia, BRC) and *Mahvash S. Qureshi* (IMF) joined the rest of the panel discussion. The participants said that over the last 30 years, diffuse production networks had become longer and less transparent, while interdependence had increased to enhance efficiency and production buffers had decreased. At the same time, countries with a high level of financial development or sufficiently large foreign exchange reserves were less vulnerable to adverse effects. In the future, geopolitical factors may become even more important, and investors may pay more attention to them than in the past. Greater concentration of external exposures would lead to increased macro-financial volatility, and it would therefore be important to ensure that individual financial institutions should adequately be funded, and the global financial safety net must be strengthened overall.

3. Financial stability through the lens of historical economics

In the third session, which assessed financial stability from a historical perspective, *Jorge Ponce*, an expert in historical economics from the Central Bank of Uruguay, illustrated with various examples how reinterpreting financial crisis events in economic history could help us better understand the financial processes of our time and even the risks of innovative financial products. By way of introduction, he recalled the tulip fever in Amsterdam in the 17th century, drawing a parallel between past experiences and the price explosion in cryptocurrencies, which in some respects showed a similar trend. He also recalled that the financial intermediation of the Bank of Amsterdam in the 17th and 18th centuries could be compared to the so-called stable coins, offering many lessons for understanding digital currencies. He summarised the lessons from other historical examples, from the history of the French *Banque Générale* (1717) to the crisis events of the 20th century: financial stability crises often resulted from regulatory and supervisory failures, excessive risk-taking, and inadequate management and regulation of the risks associated with financial innovation.

4. The optimality and reality of the current financial crisis management framework in light of recent stress events

In the closing session of the first day, *Dominique Laboureix*, Chair of the Single Resolution Board (SRB), gave a speech on the European crisis management framework (regulation, resolution, deposit insurance and other policy interventions). He argued that the framework had basically worked well, as European banks were not severely affected by the banking system stress of 2023. At the same time, several important implementation issues were identified. He suggested that, given the diversity of possible crisis scenarios, resolution authorities should have a choice of resolution strategy and tools and be able to combine them flexibly, tailoring their intervention to the specificities of the crisis at hand. Further work would be needed to ensure that loss-absorbing instruments finance banks across borders with uniformly interpreted rules and information disclosure. Adequate liquidity is essential for the banking system in times of stress. It would be useful to strengthen information sharing and international cooperation in crisis management among the large international banks. In addition to the above, common communication should be improved at all times, even before crisis situations. The recent review of the EU crisis management and deposit insurance legislation also aimed to incorporate these elements.

In the panel discussion that followed, which was moderated by *Krisztina Földényiné Láhó* (MNB), *Dominique Laboureix* (SRB), *Ruth Walters* (BIS) and *Thorsten Beck* (EUI FBF) discussed the experiences of the crisis management framework and the

opportunities for improvement. *Krisztina Földényiné Láhm* noted that by the end of last year, banks had significantly improved their loss-absorbing capacity. The resolvability of institutions has improved significantly, however going forward it would be important to strengthen cross-border resolution capacity, complete the operationalisation of resolution tools, extend resolution strategies to small and mid-sized institutions, facilitate the financing of resolution by making liquidity and DGS resources available, and to shift from resolution planning to resolution testing. During the rest of the discussion, among other things, the panellists pointed out that the EU banking system had entered the last crisis period in a much stronger position than before. They mentioned that the regulatory treatment of unsecured deposits should be reconsidered, including in the liquidity coverage requirements, to ensure that their risks are properly reflected. The current international trend in deposit insurance is that depositors are most effectively protected when the deposit insurance scheme is able to support the resolution process and provide resources for measures to maintain the continuous availability of deposits. Digitalisation and social media have accelerated the pace of deposit withdrawals, which is a novel challenge for resolution authorities. Cyber-attacks are an increasingly important risk factor as well; even if they do not affect a bank's solvency, but they might affect its reputation, which could also increase vulnerability considerably.

5. Turbulent times: The example of Hungary

In his opening speech on the second day, *Ádám Banai*, Managing Director of the MNB, recalled that throughout the history of the MNB, achieving financial stability had always been an important part of the central bank's objectives. After a brief historical overview, he presented the macroprudential policy approach of the MNB. The Hungarian central bank has been given a very strong macroprudential mandate as a result of the excessive risk-taking by banks in the past. Currently, the MNB applies a number of requirements to prevent past lending practices in the form of macroprudential capital buffers, liquidity and funding rules and borrower-based measures. As a result, the banking sector now faces financial stability challenges in a much more resilient state, with banks having more and better quality capital, more liquid assets and a stable funding structure. As an important example of consistency between monetary and macroprudential policies, he mentioned the issue of interest rate fixation on household mortgages. Fixed-rate mortgages offer a number of financial stability benefits, which is why the MNB used a number of instruments in 2017 to steer the mortgage market towards longer interest rate fixation. However, in a tight monetary policy environment aimed at bringing down high inflation, being stuck with high interest rate fixed loans, relatively low loan refinancing activity and banks' hedging of interest rate risks have emerged as new challenges, which the central bank has also addressed with multiple policy responses. Finally, *Ádám Banai* concluded that a well-timed and proactive macroprudential approach could

strengthen the balance sheets of both borrowers and lenders, limit the interest rate risk exposure of borrowers and promote stable financing structures. This would allow monetary policy to achieve its price stability objectives without jeopardising financial stability.

6. The impact of technological change on the liquidity and financial risks of the financial system

Digital technological advances are revolutionising the delivery of financial services, but they can also present financial institutions and regulators with significant new financial stability challenges. In the session on this topic, *Manuel Ramos-Francia* (CEMLA) presented the turbulence associated with international capital flows of global bond funds and other investment products (such as ETFs) that also used algorithmic trading. In the decade following the Global Financial Crisis (GFC), capital flows in emerging capital markets had become more volatile, which the speaker explained by the increasing role of global asset management firms and the rise of passive investment strategies such as algorithmic, automated and high-frequency trading. Based on weekly bond market flow of capitals for five major Latin American economies, the magnitude of extreme outflows increased when the share of foreign investors in the market became larger or the exposure to the bond market increased in the largest ETF portfolios. Vulnerability due to higher volatility was mitigated if the central bank had adequate foreign exchange reserves. Regulatory options include the use of fees and limits to help control the immediate mass redemption of investments during periods of stress.

In his presentation, *Efraim Benmelech* (Kellogg School of Management NU) examined the decline of bank branches and the role of this aspect in the development of three US bank failures (Silicon Valley Bank, Signature Bank and First Republic Bank) between March and May 2023. The significant digital transformation of the US banking sector was illustrated by the fact that while the number of branches fell by almost one-sixth between 2016 and 2022, deposits nearly doubled at banks with a high level of IT investment. The typical examples of banks going bankrupt were credit institutions that rapidly expanded their uninsured deposit base through digital channels and maintained very small branch networks. Over the same period, the event study conducted by the presenter indicates that banks with a smaller number of branches as a proportion of deposits suffered a larger expected fall in share prices. One of the lessons for supervisors from the bank failures of spring 2023 is that it is worth paying attention to the specific risks of deposit portfolios, which are growing very dynamically through digital channels.

7. Systemic risks associated with the technological transformation of the structure of financial markets and intermediation

In the session on the development of information technology in financial services, *Leonardo Gambacorta* (BIS) spoke about the rise of artificial intelligence. In his presentation, he outlined how AI would affect productivity, the impact on inflation and output, and its opportunities and challenges for the financial system. In his view, the financial system is one of the most exposed sector to AI compared to other industries, due to the high proportion of cognitive tasks and intensive data management. While the application of AI in financial intermediation may bring enhanced credit scoring, improved customer service, enhanced financial literacy and inclusion, easier regulatory compliance, or even further improvements in fraud detection and Anti-Money Laundering (AML) applications, it also poses challenges. The so-called black box mechanism, poor quality of data, increased market concentration, data protection concerns and collusion between actors are problems that need to be addressed. Risks to financial stability include herding and uniformity in robo-advising, pro-cyclical credit supply in digital channels, over-reliance on non-representative samples, and the macroeconomic effects of labour displacement. Given the borderless nature of AI, coordination between jurisdictions is needed for effective regulation.

Ania Zalewska (University of Leicester School of Business) and her colleagues modelled the possible risk-taking consequences of the changing competition in the banking market with open banking. In their theoretical model, following the spread of open banking, some banks specialise in serving passive depositors who do not take advantage of the option of open banking, offering relatively low deposit rates, while other financial institutions pursue an innovative banking strategy to serve active depositors seeking the best service, in an intensely competitive environment and at higher interest rates. The distribution of institutions with these two different business strategies, however, equalises the marginal profit of banks following these two strategies. As capital requirements increase, an intricate situation from a systemic risk perspective may arise whereby some banks that previously served passive depositors switch to the strategy of higher-risk, highly competitive banks. The explanation in the model is that banks serving captive depositors, who are more reluctant about technological change, set deposit rates close to the lower payout of traditional but imperfect deposit substitutes. In turn, this narrows their scope to compensate for the higher cost of capital with lower deposit rates, while innovative banks participating in active price competition are left with the option to do so.

8. Recent contributions of stress tests and systemic risk modelling to macroprudential policy making

In the session on stress testing applications for macroprudential purposes, *Serafín Martínez-Jaramillo* (CEMLA, Banco de México) presented a modelling framework that is one of the first to combine network research methods that can capture forward-looking climate stress scenarios, asset pricing dependencies and financial contagion. Lately much attention has been paid to the analysis of the long and shorter-term financial risks associated with climate change, with the adaptation of stress testing methodologies for financial institutions. To estimate the potential losses of the green transition that has already begun, but is still largely ahead of us, the starting point for modelling in the research is provided by stress scenarios describing late and disorderly economic adjustment shocks to climate policy goals. In the first stage, these cause direct losses on the future corporate bond and loan exposures of banks and investment funds that financial institutions use to finance real economic sectors vulnerable to climate policy tightening (climate policy relevant sectors, CPRS). The subsequent second-round effects then synthesise multiple contagion channels, covering losses on direct inter-bank exposures to credit institutions and funds, on the one hand, and on the other, fire sales of indirect exposures with identical or closely related pricing, and finally, potential losses on external liabilities above bank capital, which are ranked in the order of satisfaction. Lessons from a stress exercise calibrated on the Mexican financial system show that losses can be as high as 2–4 per cent of total assets, depending on the timing of the shocks, and that in a weak financial stability environment, second-round losses can be several times higher than those estimated in a stable system which might even be tighter with climate policies.

After this, *Bence Méréö* (MNB) gave a presentation on the development of the agent-based modelling (ABM), which plays a key role in the impact assessment of financial stability regulations and is currently used mainly for the evaluation of housing market scenarios. One of the achievements of ABM is its ability to exploit individual data from a large number of observation units in granular, anonymous databases: for example, the MNB model estimates regional housing market and macro-financial developments based on data on individual demographic characteristics, localisation, property quality, credit conditions and other characteristics of 4 million domestic households and properties, and 700,000 loan transactions. This allows the MNB’s experts to assess the likely impact of borrower-based measures (debt service-to-income ratio and loan-to-value ratio requirements) on house price growth, credit supply, credit risk or economic growth, and also in more detail on narrower social groups, such as young generations who are first-time home buyers.

9. The impact of climate change and natural capital degradation risks on financial markets: Is a macroprudential response warranted?

The final session of the conference featured presentations from speakers whose research is helping to explore whether the potential impacts of climate change and widespread degradation of the natural environment could amplify systemic risks in the financial sector. As discussed in a study by *Matias Ossandon Busch* (CEMLA) and his colleagues, the degradation of natural capital, local ecosystems and biodiversity may be demonstrated by the migration of wildlife, but also by the migration of industries that depend heavily on such, along with the banks that finance their activities. Their empirical study shows that over the past decade, bank branches in some municipalities of Mexico that suffered significant natural capital damage and had extensive, albeit declining productivity, agrarian economies, have shifted their deposit-taking activities to less damaged municipalities, presumably following a reallocation of labour, while bearing the costs of branch relocation. A double consequence of the relocation could be, on the one hand, a deterioration of natural capital in the target area and, on the other hand, an increase in consumer and quick loans in the composition of new lending in the area affected by the partial exodus.

Paola D’Orazio (Chemnitz University of Technology) reviewed the opportunities and elements of a green paradigm shift in central bank strategies in five different categories of financial regulatory instruments: green prudential requirements (capital, liquidity or large exposure rules), direct capital allocation requirements (see for example the Reserve Bank of India’s Priority sector lending guidelines), green financial principles to support financial markets that promote sustainable finance, disclosure requirements, and support for green bond issuance. She noted that by 2022 the vast majority of central banks, especially in the slower-moving developed countries, were still in the experimental phase, but that green aspects were already being incorporated into regulations (additional disclosures, extended risk monitoring, fine-tuning of regulatory tools, support for green securities standards, etc.).

In his closing presentation, *András Borsos* (Complexity Science Hub Vienna, MNB) presented his joint work with fellow researchers to map the inter-firm trading network using a highly granular database of millions of transactions between anonymised domestic firms, which records transactions between firms every year. The resulting network model could be used to look beyond the conventional industry breakdown and select subsets of companies on the basis of more specific criteria, or to examine the economic links and role of individual companies in supply chains. A possible topic to be investigated is, for example, whether companies operating with high carbon dioxide emissions or those participating in the EU Emissions Trading Scheme (EU ETS), are subject to climate change shocks, for example through the stricter pricing of carbon allowances. The propagation of

shocks could be traced through the edges of the network, i.e. the sale and purchase links, from the companies directly affected to the real economy partners and the potential losses to the credit institutions that finance them.

More information on the “Financial Stability Conference: Turbulent Times” is available at the event website and the presentations and panel discussions can be viewed on the MNB’s official YouTube channel: Financial Stability Conference: Turbulent Times ([youtube.com](https://www.youtube.com))

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Manuscripts should be submitted in accordance with the following rules:

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Thank you!

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