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Phone: +36-1-428-2600

Fax: +36-1-429-8000

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How Finance and Firms Can Accelerate the Green Transition*

Ralph De Haas

Access to bank credit and the quality of firms' management both play important roles in determining how much businesses invest in energy efficiency and pollution reduction. While credit constraints can hinder firms' ability to invest in capital-intensive clean technologies, such as machinery and vehicle upgrades, bad management practices often also pose a significant barrier. Firms with better green management practices – as measured by their environmental objectives, targets and monitoring systems – are more likely to invest in a wide range of green projects, from waste reduction and recycling to energy and water management. Based on a comprehensive survey of the recent literature, this article argues that policies aimed at facilitating access to green finance should be combined with initiatives to help business leaders become better green managers.

Journal of Economic Literature (JEL) codes: D22, G38, Q5

Keywords: Carbon emissions, financial system, green finance, green innovation, banks, equity

1. Introduction

Irrefutable evidence shows that human activity, chiefly carbon emissions from industrial production, is causing the Earth to warm at a rate unmatched for at least the past 2,000 years (*IPCC 2021*). The day-to-day consequences of this warming planet are becoming ever more apparent. Extreme temperatures, droughts, floods and severe storms are already inflicting substantial human suffering, ecological damage and economic losses.

In the absence of scalable technologies to remove carbon dioxide from the biosphere, mitigating climate change will require a drastic reduction of new carbon emissions. For this reason, and in line with the Paris Climate Agreement, many countries aim to produce zero net greenhouse gas emissions by 2050 at 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.

Ralph De Haas: EBRD, Director; KU Leuven, Professor; CEPR, Fellow. Email: deHaasR@ebrd.com

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latest (*Millar et al. 2017*). This green transition (that is, the road to net zero) will require massive public, private and public-private investment to develop and then implement cleaner technologies. For example, several governments are currently investing heavily in the development of better lithium-ion batteries and electrolysers to produce hydrogen. At the same time, some private enterprises are investing to make their production methods more energy efficient and to develop new, greener technologies from scratch.

How can the financial system – banks, bonds, as well as public and private equity – facilitate this green transition?[1] A well-established body of literature now convincingly shows that deeper financial systems can foster economic growth (*Levine 1997*). One open question is whether the financial sector also influences the 'greenness' of economic growth? For example, large-scale investments to invent and then implement green technologies may only be possible if firms can access external finance. Moreover, some sources of finance may be better suited to fund green investment than others. The financial *structure* of a country – i.e. whether it is predominantly bank-based or market-based (*Levine 2002*) – may then co-determine how polluting its development path turns out to be.

This article explores the interrelationships between the financial system, carbon emissions and economic growth, focusing on the specific case of Hungary, a country characterised by a predominantly bank-based financial system. Furthermore, the article investigates the extent to which the quality of firms' management has an independent impact on corporate energy efficiency and carbon emissions, distinct from the firm's capacity to secure external financing. By examining these factors, the article aims to provide some insights into how the financial system[2] and managerial practices jointly shape the corporate climate impact in Hungary and potentially other comparable economies.

I will make three main points:

- Access to bank credit can enable firms to curtail toxic emissions and, to a certain degree, enhance the energy efficiency of their ongoing production processes.
- Organisational obstacles, notably deficient firm management, frequently pose a greater hindrance to green investment than credit constraints.
- Green innovation thrives more readily in environments where the financial sector is more equity-oriented and less reliant on bank-based financing.

[1] I focus on conventional financial instruments and abstract from specific financial contract to make firms more climate friendly, such as green bonds. For a recent empirical analysis of green bond portfolios, see *Németh-Durkó and Hegedűs* (*2021*). See also *Manasses et al.* (*2022*) for a broader discussion.
[2] For a detailed overview of financial systems in Emerging European Economies see *Mérő – Bethlendi* (*2022*).

2. Financial and managerial constraints to green corporate investment

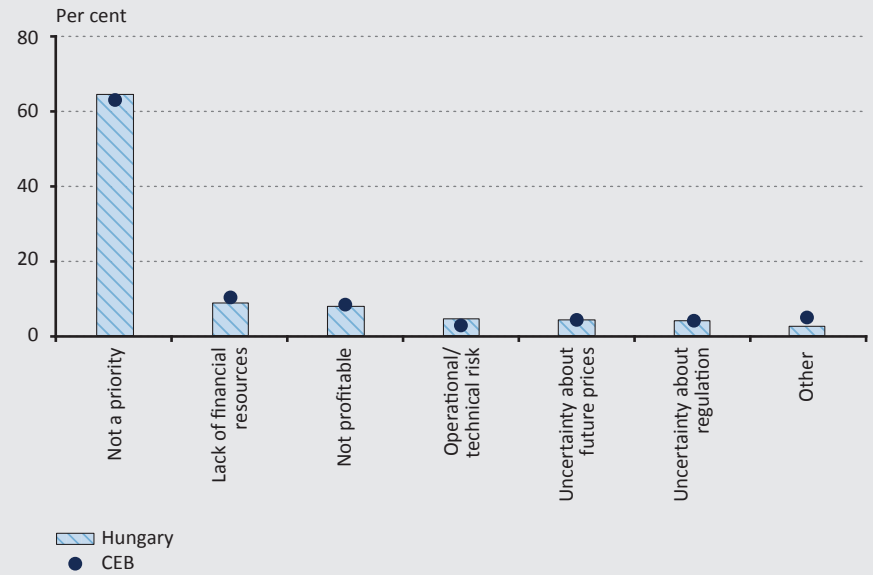
In the early phases of the green transition, substantial emissions reductions can be achieved by enhancing energy efficiency in corporate production and buildings. According to the *International Energy Agency* (*IEA*) (*2018*), energy efficiency measures could account for over 40 per cent of the carbon abatement required by 2040 to align with the Paris Agreement. This highlights the need for large-scale industrial investment in cleaner technologies to reduce firms' carbon footprints. However, many firms, especially smaller ones, face challenges in financing energy efficiency initiatives. Not only do they lack internal funding, but they often struggle to access bank credit for such investments. When credit constraints are present, climate-related investments may suffer setbacks.

An emerging body of literature shows that when firms get better access to bank loans, the amount of toxic pollution they emit locally often declines.[3] This is presumably because bank credit allows them to invest in, and hence clean up, their production processes. For example *Levine et al.* (*2018*) show how positive credit supply shocks in US counties help to reduce local air pollution. Likewise, *Götz* (*2019*) finds that financially constrained firms reduced toxic emissions once their capital cost decreased as a result of the US Maturity Extension Programme. *Xu and Kim* (*2022*) also find that financial constraints increase firms' toxic releases. Their evidence suggests that firms trade off pollution abatement costs against potential legal liabilities: the impact of financial constraints on toxic releases is stronger when regulatory enforcement is weaker.

To what extent does access to bank credit not only allow firms to reduce their emission of locally-polluting toxins but also of globally-harmful carbon? Carbon emissions are less visibly harmful at the local level and hence tend to expose firms to less legal risk. Firms may therefore deprioritise investments to reduce such emissions. Recent evidence confirms that while access to bank loans can help firms to limit carbon emissions, credit constraints appear not to be the most binding organisational constraint. For example, a cross-country survey of firm managers shows that, despite the potential environmental and efficiency benefits of green investments, many firms refrain from implementing such measures (*EBRD 2019*). As can be seen in *Figure 1*, 64 per cent of all interviewed firms in Central and Eastern Europe and the Baltics see investments in energy efficiency as low priority relative to other investments. This percentage is the same in Hungary. A lack of financial resources is the second-most cited reason not to do so, but this answer is only given by about 11 per cent of all interviewed managers (9 per cent in Hungary).

[3] For a comprehensive overview of the literature on the role of banks during the green transition, see *De Haas* (*2023*).

Figure 1
Reasons why firms do not invest in measures to improve energy efficiency

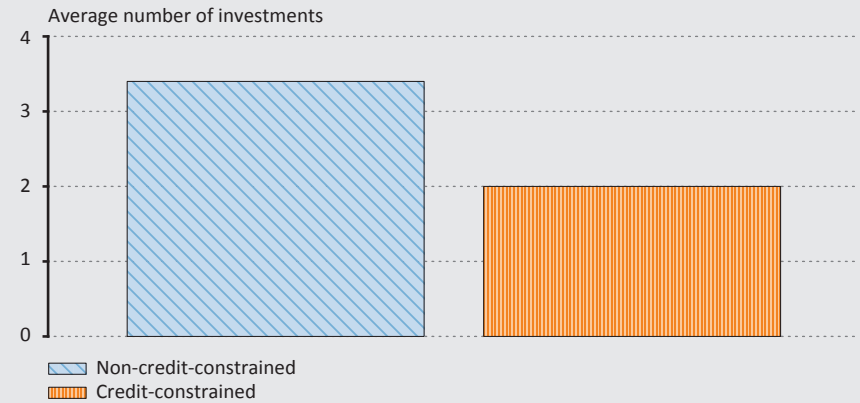


Source: EBRD-EIB-World Bank Enterprise Surveys and author's calculations. Sample of firms which had not taken any measures to enhance energy efficiency over the last three years prior to the survey.

De Haas et al. (*forthcoming*) investigate these data in more detail and focus on the relative importance of credit constraints versus managerial constraints. They measure each firm's green management practices using standardised data on firms' strategic objectives concerning the environment and climate change. This includes whether there is a manager with an explicit mandate to deal with environmental issues, and how the firm sets and monitors targets (if any) related to energy and water usage, carbon emissions and other pollutants. In addition, they track which green investments firms have made in the recent past. Green investments include machinery and vehicle upgrades; heating, cooling and lighting improvements; on-site generation of green energy; waste minimisation, recycling and waste management; improvements in energy and water management; and measures to control air or other pollution.

Their analysis shows how both credit constraints and green management influence the likelihood of green investments. Credit constraints hinder capital-intensive green investments in particular, such as machinery and vehicle upgrades and improved heating, cooling or lighting. They do not significantly reduce the likelihood of investing in air and other pollution control, potentially due to the 'low-hanging-fruit' nature of such investments. *Figure 2* shows how, also in the case of Hungary, credit-constrained firms implement fewer green investments as compared with firms that are not credit constrained.

Figure 2
Green investments by credit-constrained and non-credit-constrained Hungarian firms



Note: Credit-constrained firms are firms that indicate in the Enterprise Surveys that they need additional credit, but were either rejected by a bank when they applied for credit or were discouraged from applying in the first place. Non-credit-constrained firms are firms that indicate that they do not need additional credit or that they needed additional credit and received such credit when they applied for it. The number of green investments is defined as the number of investments to i) purchase fixed assets that have a greener technology embedded in them; or ii) explicitly target an increase in the firm's energy efficiency and/or a reduction in pollution or other negative environmental impacts.

Source: EBRD-EIB-World Bank Enterprise Surveys and author's calculations

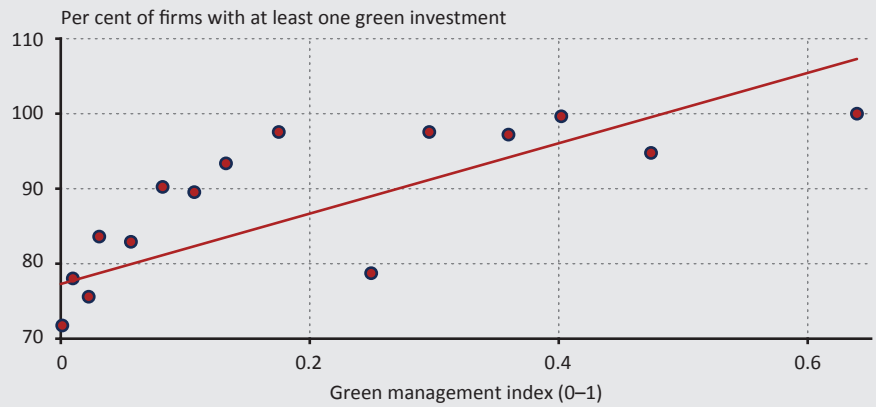
Firms with good green management practices, on the other hand, are more likely to invest in *all* types of green investment, with the effect larger for those kinds of investments that are more typically thought of as green: waste and recycling; energy or water management; air and other pollution controls. This positive relationship between the quality of a firm's green management and the likelihood that it makes green investments is also observed in Hungary, as can be seen in the binscatter plot below (*Figure 3*).[4]

If credit constraints and weak green management reduce firms' green investments, then this may eventually also hamper decarbonisation efforts. To investigate this, the authors use the European Pollutant Release and Transfer Register (E-PRTR) and focus on a sample of Eastern European countries. The E-PRTR contains data on pollutant emissions of a large number of industrial facilities. Their estimates indicate that, although there was a secular emissions reduction in 2007-2017, this decline was smaller in localities where banks had to deleverage more after the global financial crisis and where, as a result, more firms were credit-constrained.

[4] While the data shown in *Figure 3* are purely correlational, evidence on the causal relationship between the quality of a firm's green management and its propensity to make green investments is given in *De Haas et al.* (*2024*). Information on the size of green investments is unfortunately lacking.

In sum, a growing body of evidence indicates that when firms have better access to bank credit, they may invest more in cleaner production technologies. This may not only reduce (local) toxic emissions but also (global) carbon emissions. At the same time, for many important energy-efficiency measures that firms can take, access to credit is less of a constraint than the quality of firms' (green) management. Better-managed firms tend to produce more cleanly, and this is often unrelated to their ability to access bank credit.

Figure 3
Quality of Hungarian firms' green management and their green investments



Note: Higher values of the green management index indicate better green management practices, as measured by the extent to which firms incorporate environmental considerations into their strategic objectives, the clarity and attainability of their environmental targets and the regularity and thoroughness with which they monitor and manage their energy consumption, water usage, carbon emissions and other pollutants to minimise their environmental footprint. All Hungarian firms that participated in the EBRD-EIB-World Bank Enterprise Surveys are ranked by the quality of their green management and then divided into 15 buckets of increasing average green management quality. For each bucket, the percentage of firms that undertook at least one green investment is shown on the vertical axis.

Source: EBRD-EIB-World Bank Enterprise Surveys and author's calculations

3. Funding green innovation and reducing carbon emissions

The previous section shows that banks can help, to some extent, with funding investment in tried-and-tested technologies that enhance firms' energy efficiency. Nevertheless, the steep emissions decline needed to achieve net zero by 2050 also requires developing entirely new production technologies. There are at least three reasons to believe that banks may be less willing (or able) to finance R&D for such innovative, greener technologies.

First, many banks tend to be inherently technologically conservative. They fear that funding new (and possibly cleaner) technologies will erode the value of collateral that underpins their existing loans – and which firms used to finance

older technologies (*Minetti 2011*; *Degryse et al. 2022*). Second, green innovation (as any innovation) often involves assets that are intangible and highly firm-specific. Many banks would instead be more comfortable with funding tangible and easily collateralisable assets. Third, banks often have a shorter time horizon (the loan maturity) than equity investors and are hence less interested in whether assets will become less valuable (or even stranded) in the more distant future. For example, banks have only very recently started to price some of the climate risk related to firms with large fossil fuel reserves (*Delis et al. 2024*). Even then, many (large) banks continue to provide syndicated loans to fossil fuel firms at spreads that underprice the risk of stranded assets – as compared to bonds issued by those firms. As a result, carbon producers are gradually switching from bond to bank funding (*Beyene et al. 2021*).

Stock markets may be better suited to financing innovative and environmentally friendly technologies. Equity contracts, by their nature, are more appropriate for funding projects with high risks and high potential returns. If stock prices rationally discount the future cash flows of polluting industries, equity investors may be more attuned to the long-term costs and risks associated with pollution, even if these consequences may not materialise until the future.

One key question is therefore to what extent equity investors take carbon emissions into account when assessing longer-term corporate risk. A growing body of evidence suggests that especially institutional investors are increasingly doing so. Survey evidence by *Krueger et al.* (*2020*) shows that a large proportion of investment managers believe that climate risk is already affecting their portfolio companies. Almost 40 per cent of the surveyed investors are therefore aiming to reduce the carbon footprint of their portfolios, including through active engagement with management.[5] Such investors may also benefit from pushing companies to reduce carbon emissions because this helps to attract environmentally responsible investment clients (*Ceccarelli et al. 2024*). Because institutional investors are taking carbon emissions into account when assessing corporate risk, *Bolton and Kacperczyk* (*2021*) find that stocks of US firms with higher carbon emissions earn higher returns. Moreover, investors appear to shun carbon-intensive companies, although this effect is limited to direct emissions from production and to the most carbon-intense industries. Recent evidence shows that also *private* equity providers can help to clean up production processes. *Bellon* (*2021*) find that private equity investors have helped to reduce pollution (both CO_2 and toxic chemicals) in the oil and gas industry.

[5] This not only holds for investors in developed markets but increasingly also for those investing in emerging market securities (*EBRD 2021*).

The above discussion raises the question whether, on aggregate, countries with deeper stock markets relative to their banking sectors may in fact follow steeper decarbonisation trajectories. To help answer this question, *De Haas and Popov* (*2022*) compare the role of banks and equity markets as potential financiers of green growth. Using a 48-country, 16-industry, 26-year panel data set, they assess the impact of both the size and the structure of the financial system on industries with different levels of carbon intensity. In particular, they distinguish industries on the basis of their inherent, technological propensity to pollute, measured as the carbon dioxide emissions per unit of value added. The authors then investigate two channels through which financial development and financial structure (the relative size of equity markets relative to banking sectors) can affect pollution: between-industry reallocation and within-industry innovation.

Using this empirical framework, the authors derive three findings. First, industries that pollute more for technological reasons start to emit relatively less carbon dioxide where and when stock markets expand. Second, there are two distinct channels that underpin this result. Most importantly, stock markets facilitate the development of cleaner technologies within polluting industries. Using data on green patents, the authors show that deeper stock markets are associated with more green patenting in carbon-intensive industries. This patenting effect is strongest for inventions to increase the energy efficiency of industrial production. In line with this positive role of stock markets for green innovation, carbon emissions per unit of value-added decline relatively more in carbon-intensive sectors when stock markets account for an increasing share of all corporate funding. There is also more tentative evidence for another channel: holding cross-industry differences in technology constant, stock markets appear to gradually reallocate investment towards more carbon-efficient sectors. This is in line with the aforementioned tendency of (some) institutional investors to avoid the most carbon-intensive sectors. Polluting firms in these sectors will then find it more difficult to access external finance, putting them at a competitive disadvantage compared with cleaner companies.

Third, the domestic green benefits of more developed stock markets ‘at home’ may be offset by more pollution abroad, for instance because equity-funded firms offshore the most carbon-intensive parts of their production to foreign pollution havens. Analysis shows that the reduction in emissions by carbon-intensive sectors due to domestic stock market development is indeed accompanied by an increase in carbon embedded in imports of the same sector. However, the domestic greening effect dominates the pollution outsourcing effect by a factor of ten. This means that stock markets may have a genuine cleansing effect on polluting industries and do not simply help such industries to shift carbon-intensive activities to foreign pollution havens.

4. Conclusions and policy recommendations

This article has discussed some emerging evidence on the nexus between the financial system, carbon emissions and economic growth. The evidence shows that while bank lending can help firms to improve the energy efficiency of their current production processes, other organisational constraints, in particular weak firm management, often hold back green investments more than credit constraints. While policy measures that ease access to bank credit may be useful (for example, credit lines that are contingent on the adoption of state-of-the-art energy efficiency technologies) this might just be one element of a broader policy mix to stimulate green investments to boost firms' energy efficiency.

Governments and development banks may also consider measures to directly help strengthen firms' green management practices. Advisory services, training programmes and other consultancy-related, firm-level interventions can help managers to become better 'green managers'. Such interventions effectively teach managers how to not leave money at the table by postponing much-needed investments in energy efficiency.

Efforts to increase green investments by reducing credit constraints and by enhancing firms' managerial skills, will only pay off when the broader institutional framework is supportive. This means in particular that highly distortionary fossil fuel subsidies need to be eradicated. Recent evidence reveals that better-managed firms tend to reduce the fossil-fuel intensity of their production *unless* they can exploit high fuel subsidies (*Schweiger and Stepanov 2022*). The introduction of carbon pricing, either through a carbon tax or a cap-and-trade system, can incentivise firms to invest in measures that make their production more energy-efficient, rather than procrastinating. The financial sector plays a complementary role by mobilising funding for energy-efficiency improvements and new technologies as firms respond to price signals, such as carbon taxes. However, it is the responsibility of politicians and policymakers to create a policy framework that sets the right incentives for firms to transition to net-zero emissions. The financial system's role is to then facilitate this transition efficiently by supporting firms with the necessary financing.

A second lesson from recent research is that green innovation tends to flourish more where and when finance is more equity-based and less bank-based. Countries with a bank-based financial system that are on the transition path towards net-zero carbon emissions, may therefore also consider measures to stimulate the development of conventional equity markets. This holds especially for middle-income countries where carbon dioxide emissions may have increased more or less linearly during the development process. There, stock markets could play an important role in making future growth greener, in particular by stimulating innovation that leads to cleaner production processes within industries.

One way of doing so, especially in smaller economies, is through the regional integration of smaller equity markets. Such integration could target cross-border market infrastructure (such as links between stock exchanges and securities depositories), the harmonisation of regulations, as well as capital market accelerator funds with regional mandates. One example is the successful consolidation of national stock markets in the Baltic region. Nasdaq Baltic operates the stock exchanges in Estonia, Latvia and Lithuania, as well as a common Central Securities Depository. It provides capital market infrastructure across the whole value chain, including listing, trading and market data, as well as post-trade services including clearing, settlement and safe-keeping of securities. This makes it easier for investors to transact cross-border and, ultimately, for firms to raise equity. Similar efforts are ongoing to integrate several stock exchanges in the Balkans.

Another way to help develop equity markets that can provide firms with the equity needed for green innovation is by levelling the playing field between the cost of equity and the cost of debt. Countries that want to limit the negative environmental externalities stemming from a financial system that is overly reliant on bank lending (and debt more generally) can reduce tax-code favouritism towards debt (such as the deductibility of interest payments and double taxation of dividends). An example is the notional interest deduction that Belgium introduced in 2006. Similarly, as part of the European Commission's work on the Capital Markets Union, a common corporate tax base has been proposed to address the current debt bias in corporate taxation. A so-called Allowance for Growth and Investment will give firms equivalent tax benefits for equity and debt.

In parallel, countries can take measures to counterbalance the tendency of banking sectors to (continue to) finance relatively 'dirty' industries. Examples include the green credit guidelines and resolutions that China and Brazil introduced in 2012 and 2014, respectively, to encourage banks to improve their environmental and social performance and to lend more to firms that are part of the low-carbon economy. From an industry perspective, adherence to the so-called Carbon Principles, Climate Principles, Equator Principles, UN Principles for Responsible Banking, as well as the Collective Commitment to Climate Action should also contribute to a greening of bank lending. Strict adherence to these principles can potentially make governmental climate change policies more effective by accelerating capital reallocation and investment towards low-carbon technologies.

To incentivise and enable banks to adhere to these Principles in a meaningful way, supervisory climate stress tests, such as currently being undertaken by the European Central Bank, can be useful. Moreover, a growing number of banking supervisors – as part of developing a Pillar 3 framework on ESG risks and in line with the Financial

Stability Board's Task Force on Climate-related Financial Disclosures – is moving towards mandatory disclosure of climate-related financial risks.[6] The meaningful disclosure of climate risks will allow depositors, investors and other stakeholders to make more informed decisions and hence to enhance market discipline. Such corporate disclosure of climate risks is also a precondition for banks and other providers of capital to understand and manage climate-related risks. This work is likely to be facilitated by that of the recently established International Sustainability Standards Board (ISSB), a new board created by the IFRS Foundation to develop a global baseline of sustainability disclosure standards.

Lastly, the so-called Net-Zero Banking Alliance (NZBA), a United Nations initiative, brings together banks that are committed to align their portfolios with net-zero emissions by 2050. A useful aspect of this alliance is that it helps banks to set (and publicly commit to) an intermediate target for 2030 or sooner, thereby accelerating their decarbonisation strategies and making them more credible. Even then, voluntary commitments may not suffice, as evidenced by the fact that many global banks that signed up to the NZBA and similar initiatives continue to finance fossil-fuel extraction at scale. Banks looking for more credible decarbonisation strategies may choose to have their strategies validated by the Science Based Targets initiative (SBTi), an independent body that assesses whether banks strategies are aligned with the Paris goal of limiting global warming to 2° C.

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[6] See *Ritter* (*2022*) for a recent analysis of transition risks in the Hungarian banking system, using two complementary risk assessment methodologies.

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Spatial Distribution of Hungarian Innovation-Driven Enterprises*

Mihály Szoboszlai

The Magyar Nemzeti Bank's 2023 Growth Report identified 1,100 innovation-driven enterprises that demonstrated exceptional growth in the 2010s. These enterprises not only exhibited rapid expansion, but they also engaged in significant innovation during the previous business cycle. According to the descriptive findings of the report, these firms are mostly located in the capital and in counties where there are universities with multiple faculties. This study investigates whether the concentration in the capital city is a unique phenomenon considering the firm demographic characteristics of the counties. The prevalence of innovation-driven enterprises did not significantly differ in six counties compared to Budapest, when considering the scope of activity, size, ownership structure and age of these firms. These counties were Baranya, Csongrád-Csanád, Fejér, Hajdú-Bihar, Heves and Szabolcs-Szatmár-Bereg.

Journal of Economic Literature (JEL) codes: C21, O12, O39, O49

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1. Introduction – Identifying Hungarian innovation-driven enterprises

The Hungarian economy reached a pivotal juncture at the beginning of the 2020s. The extensive factors that had supported output through the utilisation of additional resources, which propelled the Hungarian economy in the 2010s, are now no longer sufficient to sustain growth without intensive efficiency gains. Hungary needs renewed impetus in innovation- and growth-oriented entrepreneurship, both of which are crucial foundations for a robust growth trajectory. While rapid growth and the domestic presence of distinct innovative production systems are necessary, they are not a sufficient condition for sustained and accelerated economic convergence. In line with literature recommendations, the entrepreneurial and innovation

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Mihály Szoboszlai: Magyar Nemzeti Bank, Senior Expert; University of Pécs, PhD Candidate.
Email: szoboszlaim@mnb.hu

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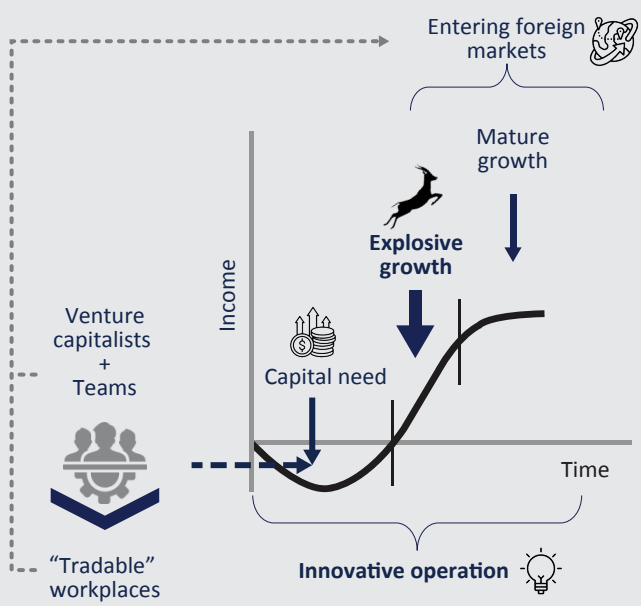
capacities of the Hungarian economy motivated a study analysing innovation activity and business performance at the firm level (*MNB 2023*). This dual focus led to the definition of innovation-driven enterprises (IDEs) in Hungary, as first introduced in the Magyar Nemzeti Bank's (the Central Bank of Hungary, MNB) Growth Report (*MNB 2023*).

The foundational basis for the definition was a paper by *Aulet and Murray* (*2013*), who delineated the fundamental differences that distinguish IDEs from traditional small and medium-sized enterprises (SMEs). These differences encompass five key aspects: (1) explosive growth following an investment-intensive start-up phase; (2) competitive advantage rooted in innovation; (3) addressing regional or global market demands beyond local needs; (4) the creation of tradable jobs; and (5) diverse ownership structures. These criteria have facilitated the adaptation of elements specific to the Hungarian economy and have enabled the identification of domestic innovation-driven enterprises through data analysis. Revisiting the concept proposed by *Aulet and Murray (2013*), this paper is unique in presenting considerations for domestic conceptualisation (*Figure 1*) along the growth trajectory of innovation-driven enterprises.

Figure 1
Growth curve of innovation-driven enterprises



Source: Based on Aulet and Murray (2013)

The theoretical growth curve of IDEs can be divided into three phases: the early phase, the explosive growth phase and mature production. The primary operational stages of the innovation process include research, development, pre-production, production and sales. Due to the capital-intensive investments required prior to manufacturing and product launch, IDEs encounter specific challenges during the early stage. A significant portion of the expenditure of innovation-driven enterprises occurs during this initial phase of the company's life cycle, leading to negative cash balances at start-up.

The initial stage of the schematic *growth curve* of innovation-driven enterprises integrates several elements from the list presented by *Aulet and Murray* (*2013*). To commence operations, IDEs require substantial investments, which have significant resource implications. Unlike typical small and medium-sized enterprises (SMEs), IDEs are characterised by external fundraising. The most well-known form of equity financing for IDEs is venture capital (VC), whereby investors acquire an ownership stake in the financed business. This practice has been a prevalent method of raising funds for high-growth start-ups in the United States for many decades. Venture capital firms provide not only financial support, but also valuable services to start-ups such as accelerating time to market, enhancing corporate governance structures and assisting in actively seeking and securing partners. Equity investors place significant emphasis on the founding team, attributing the outcome, whether success or failure, primarily to the team itself rather than to the business (*Gompers et al. 2020*). In economies with developed capital markets, the diversity of the founding team is a feature that enhances business performance through a variety of skills and knowledge (*Ruef et al. 2003; Beckman et al. 2007*). Consequently, the ownership of IDEs can be diverse, encompassing investor ownership and multiple founder members (criterion 5).

Aulet and Murray (*2013*) observe that innovation-driven enterprises typically, although not invariably, require a more highly skilled and heterogeneous workforce. It is important to note that the authors do not offer further clarification on the concept of tradable jobs (criterion 4). The term 'tradable jobs' can be interpreted in three distinct ways. Within the context of their paper, the first interpretation provided below most accurately conveys the notion of (foreign) tradable jobs.

Firstly, in the context of foreign market orientation, jobs in international industries often require skills and qualifications that are adaptable to the evolving demands of global markets and are subject to competition from foreign labour.[1] Secondly, literature on international economics, including the majority of recent studies, typically associates the tradable sector with the primary and secondary branches

[1] The export-specific experience of founders influences the export propensity of the IDEs; however, it does not correlate with export intensity (*Stucki 2016*).

of the economy, implicitly categorising services as non-tradable 'goods' (*Gervais – Jensen 2019*). Thirdly, the development of information and communication technologies (ICT) and the globalising world economy have facilitated and even augmented the international exchange of services. Consequently, the scope of tradable jobs has expanded to encompass service sector positions that can be performed remotely via internet access. This shift has led to the perception of tradable jobs as being location-independent.

The phenomenon of business growth, particularly rapid expansion, has been a significant subject of study in the fields of economics and statistics for several decades. The phase of the *explosive growth stage* is referred to as gazelle growth in the relevant literature, characterised by a sales revenue growth ratio of at least 20 per cent per annum, sustained over a period of three consecutive years. However, the definition of gazelle growth can vary depending on the selected growth criteria, size growth options and scope. Additionally, efforts to standardise these concepts are further complicated by the existence of various individual growth trajectories (*Delmar et al. 2003*).

For the foundation of exponential growth, the methodology of *Birch and Medoff* (*1994*) was employed, excluding the employment conditions. Commonly used headcount thresholds of 5 or 10 employees may exclude numerous microenterprises that typically exhibit high growth rates. Such exclusion can result in misleading policy implications, given the share of fast-growing microenterprises varies across countries, regions and industries; nonetheless, they contribute to nearly two fifths of job creation (*Daunfeldt et al. 2015*). *Daunfeldt et al.* (*2015*) stress that the inclusion of innovation performance within this group due to the high risk of failure of microenterprises is high. *Birch and Medoff* (*1994*), followed by *Birch et al.* (*1995*), investigated the job creation capacity of firms with sales of USD 100,000 or more during periods of rapid growth over different time horizons, maintaining consistency. *Birch and Medoff* (*1994*) examined US firms from 1988 to 1992, while *Birch et al.* (*1995*) analysed US firms from 1990 to 1994. In 2016, the annual average exchange rate was HUF 281.44 per US dollar. On average, the US price increase for 2016 was 1.62 times higher than during the period 1988–1994. As a result, USD 100,000 in HUF from 1988–1994 is equivalent to HUF 45.6 million in 2016 (281.44×1.62×100,000). This has been validated by the rounded HUF 50 million threshold chosen for the turnover threshold (*MNB 2023*).

Considering the specific characteristics of Hungary, it can be concluded that the success of a significant portion of domestic gazelles is illusory. Their exceptional performance is neither sustainable nor replicable, as it is not supported by internal company factors such as innovation, foreign trade orientation, highly qualified

human resources and managerial skills (*Szerb et al. 2017*). The unexplained increases in performance may be attributed to several factors, including:

- a periodic local demand recovery,
- temporary competitive advantages (including cost advantages),
- operation in contestable markets[2] (*Baumol et al. 1982*),
- rapidly saturating market niches,
- forward partnership agreements,
- corporate mergers and acquisitions,
- closure of loss-making departments,
- mergers and divisions, and
- one-off cash grants and selective incentives.

In the majority of countries where *high growth* has been analysed at the company level, the findings are consistent. Within this context, enterprises exhibiting unexplained rapid growth (*Szerb et al. 2017*) are often referred to as 'erratic one-shot grower' (*Delmar et al. 2003*) or 'one-hit wonder' firms (*Daunfeldt – Halvarsson 2015*).

Similar to the gazelle profile, knowledge production alone is insufficient for rapid economic development. In other words, high and sustained growth is not guaranteed in the innovative business sector. Although the types of innovation and their impact on firm growth have been studied extensively, many questions remain unanswered. *Szerb and Komlósi's* (*2016*) meta-analysis of the literature on high-growth firms also discusses the intricate relationship between innovation and growth. On the one hand, not all firms and types of innovation generate growth (*Samuelsson – Davidsson 2009; Parker et al. 2010; Heimonen 2012; Audretsch et al. 2014; Guarascio – Tamagni 2019; Bianchini et al. 2017*). On the other hand, both theoretical and empirical evidence suggests that innovation can, in certain cases, result in shrinkage (*Coad – Rao 2008; Goedhuys – Sleuwaegen 2010; Heimonen 2012*; more recently on failures, see *Bong – Park 2023, 2024*; and *Ponta et al. 2024*). Furthermore, the capacity to innovate varies across companies, and the impact of innovation on growth is influenced by several factors, including:

[2] *Magas* (*2017*), among others, provides an overview of the theory of contestable markets in his obituary of William J. Baumol.

- the state of the business cycle and macroeconomic factors (*Spescha – Woerter 2018*),
- technological readiness (*Lee 2010*),
- market structure (*Mazzucato – Parris 2015*), and
- demographic characteristics of the company (*Ács – Audretsch 1987*), as well as
- geographic location (among others *Audretsch et al. 2006*).

Szoboszlai et al. (*2024*) investigated the factors associated with rapid growth in the Hungarian innovative business environment. Their findings indicate that even in a robust segment of companies, such as innovative enterprises, the primary growth drivers include technological excellence, a highly skilled workforce and a focus on foreign markets. Additionally, *Szoboszlai et al.* (*2024*) found that potential access to venture capital increases the likelihood of rapid growth, although the coefficient is significant only at the 10-per cent level. Conversely, conventional loans reduced the probability of firm expansion. The authors attribute this negative statistical relationship to the fact that investments were made in the low-interest-rate environment at the end of the 2010s, but were not capitalised.

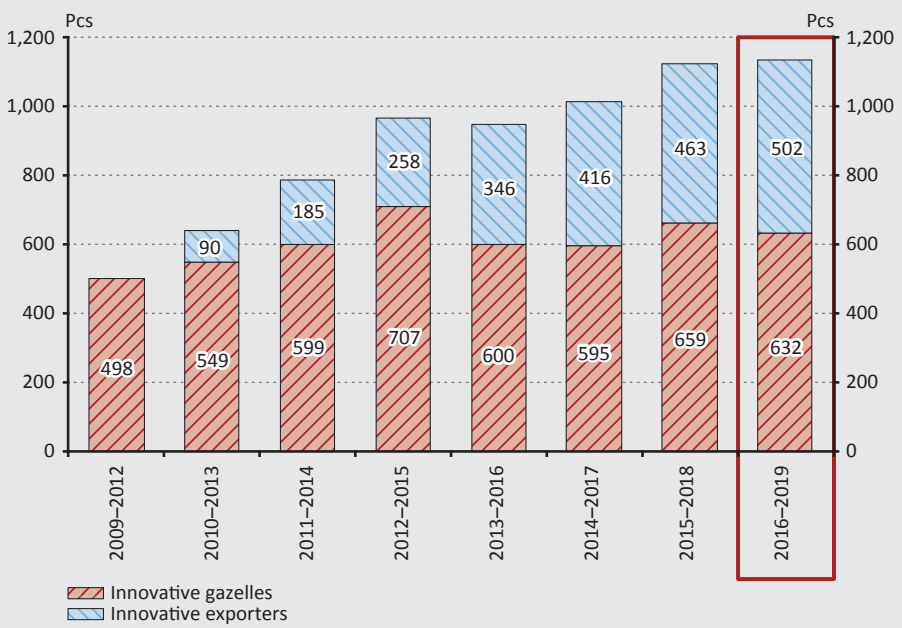
In the initial stages, innovation-driven enterprises, akin to traditional small and medium-sized enterprises, prioritise local markets to evaluate their product or service. Innovation serves as the pivotal factor facilitating expansion into international markets. When a product or service demonstrates success in the domestic pilot phase, a growth-oriented enterprise can secure a competitive edge in new markets through a dedicated innovative approach. As previously discussed, presence in export markets is a result of innovation-driven growth, either concurrently with or subsequent to the fulfilment of local demands. Consequently, entry into export markets may occur during the rapid (explosive) growth phase, although this is not explicitly defined as a prerequisite in the context of innovative gazelles.

The empirical literature continues to grapple with causal links and endogeneity issues concerning the relationship between innovative behaviour and foreign market activity. Empirical studies, such as those based on *Melitz* (*2003*), highlight a self-selection mechanism whereby the most productive and innovative firms emerge as successful exporters. Conversely, research focusing on firms engaged in foreign markets examines how export activities influence innovation performance and productivity changes (*De Loecker 2007*). Furthermore, foreign trade facilitates knowledge transfer. Through their export activities, firms participate in a learning-

by-exporting process, which subsequently impacts their R&D investment, innovation capacity and production efficiency (*Wagner 2007*).

In the 2010s, venture capital financing in Hungary was predominantly state-involved, and founder members were not considered in the identification process. Consequently, the classification of Hungarian innovation-driven enterprises was primarily based on innovation activity, rapid growth and export orientation. The data sources are detailed in the following section. Using a data-driven approach, the Hungarian IDE group comprises two categories: innovative gazelles and innovative exporters. The initial core group (2009–2012) consists of innovative and fast-growing enterprises (innovative gazelles), for which external market participation is not a prerequisite (*Figure 2*). An innovative gazelle remains classified as innovation-driven if it transitions to exporter status following rapid growth. This subgroup is referred to as innovative exporters. It is crucial to note that there are no qualitative distinctions between the two groups.

Figure 2
Types of innovation-driven enterprises (2009–2019)



Source: From Hungarian Central Statistical Office (HCSO), MNB, National Tax and Customs Administration (NAV), NRDIO, NIPO, crunchbase

2. Data

The economic performance of Hungarian businesses is reflected in their financial statements. For this analysis, we utilised a firm database derived from the balance sheets and profitability metrics of Hungarian corporate taxpayers. The primary income statement items pertinent to IDE identification are net turnover and, notably, turnover from exports. Companies were classified as exporters if their export sales accounted for at least 10 per cent of their net sales. Innovation-related characteristics were linked to economic data using tax identification numbers and company names (*Table 1*).

In addition to the accounting data, we incorporated information data from tax returns that detail explicit innovation activities beyond R&D tax incentives. We also utilised data from the National Research, Development and Innovation Office (NRDIO) and patent and trademark data provided by the National Intellectual Property Office (NIPO) to map innovation capacities. The basic business demographic characteristics used in the regression modelling are derived from the business register. The analysis focused on the segment of the multiply linked database that could become innovation-driven enterprises, defined as those with a turnover of at least HUF 50 million in the relevant sectors. These segments included 55,786 enterprises out of 1,134 innovation-driven enterprises resulting in 56,920 observations. The treatment group in the cross-sectional estimates presented later comprises the innovation-driven firms from the period 2016–2019.

Table 1
Definition and source of variables used in regression analysis

Variable	Type	Definition	Source
Dependent variable			
Revenue	Basic	Net turnover	NAV
Export revenue	Basic	Portion of net turnover derived from export sales	NAV
Gazelle?	Calculated	D=1 if the average real income growth over 3 years was at least 20 per cent per year on average	NAV
Does it export?	Calculated	D=1 if at least 10 per cent of net turnover is derived from export sales	NAV
Does it innovate?	Basic	D=1 if the company either holds a patent or trademark, or has received development aid from the NRDIO, or has claimed a tax credit for R&D activities conducted within its own field of activity	NIPO, NRDIO, NAV
Is it innovation-driven?	Calculated	If the company demonstrated rapid, gazelle-like growth through innovation, or is poised to engage in export activities	
Explanatory variables			
Age	Calculated	Number of years since the establishment of the company, or, if this information is unavailable, number of years since the first recorded entry in the database	Organisation register, NAV
Age square	Calculated	Variable square of age	Organisation register, NAV
Balance sheet total	Basic	Report data	NAV
Workforce	Basic	Statistics from tax returns	NAV
Size	Calculated	Eurostat definition; the European Commission's definition of SMEs is set out in Recommendation 2003/361/EC	NAV
Is it a foreign company?	Calculated	A foreign company is defined as an entity with at least 50 per cent of its capital registered by a foreign entity	NAV
County	Basic	Supplementary information is obtained from the tax return, or from the organisation register in the absence of such data	NAV, Organisation register
Sector	Basic	Supplementary information is obtained from the tax return, or from the organisation register in the absence of such data	NAV, Organisation register
Sector groups by technology and knowledge intensity	Calculated	Eurostat classification	NAV
Is it a special purpose enterprise? Community companies Non-profit companies	Basic	Statistical information is used to narrow the scope of companies within the competitive sector	Organisation register

Note: Variables in bold are included in the regression equations. The other variables are needed to define the dependent variable and the covariates.

The explanatory variables encompass firm demographic characteristics as outlined by *van Wissen* (*2002*), including firm age, size and location. The continuous variable for enterprise age is based on the date of establishment; if this is unavailable, the year of foundation is taken as the first year of publication in the firm panel. The size category variable, defined by Eurostat, considers the limits on the number of employees, turnover and balance sheet total.[3] The county variable indicates the location of the company's head office. These variables are complemented by the ownership structure and the square of the company's age. A company is classified as foreign if the non-resident ownership of its registered capital exceeds 50 per cent. The inclusion of the squared company age is justified by the observation that younger firms are often more inclined to innovate as they seek a competitive advantage and are more adaptable to change. As firms mature, their innovation activity may decline due to risk aversion and commitment to existing products and services. However, older firms may re-intensify their innovation efforts to maintain their market position leveraging their resources and experience (*Coad et al. 2016*). Additionally, a variable grouping firm activities is included, justified by the empirical relationship between a region's industrial history and the creation and operation of new firms, including innovation-driven enterprises. Regions with a history of certain industries are more likely to support entrepreneurship and business start-ups (*Lux 2016*). Sectoral groupings by technology and knowledge intensity are constructed following the statistical classification of economic activities in the European Community at the 2-digit level, based on R&D expenditure/added value ratio.[4] The 2-digit classification is summarised in *Table 2.* Innovation-driven enterprises showed a significant concentration by activity (*MNB 2023; Szoboszlai 2023*) with almost two fifths of enterprises concentrated in 23 specialised activities. However, it is not feasible to include all sectoral activities in the 4-digit breakdown due to the large number of degrees of freedom (620) bound. Even with a 2-digit activity representation, there would be fewer than 13 observations per binary sectoral variable in the innovation-driven domain.

[3] See: https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=LEGISSUM:n26026 .
[4] See: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:High-tech_classification_of_manufacturing_industries

Table 2
Sectoral group classification

Sectoral group	2-digit sector codes
High-tech manufacturing	21, 26
Medium high-tech manufacturing	20, 27, 28, 29, 30
Medium low-tech manufacturing	19, 22, 23, 24, 25, 32, 33
Low-tech manufacturing	10, 11, 12, 13, 14, 15, 16, 17, 18, 31
Knowledge-intensive services	50, 51, 58, 59, 60, 61, 62, 63, 69, 70, 71, 72, 73, 74, 75, 78, 80, 85
Less knowledge-intensive services	35, 36, 37, 38, 39, 45, 46, 47, 49, 52, 53, 55, 56, 68, 77, 79, 81, 82, 90, 91, 92, 93
Agriculture	1, 2, 3

Source: Eurostat glossary

3. Methodology

The Growth Report 2023 (*MNB 2023*) and *Szoboszlai* (*2023*) examined the distribution of our innovation-driven enterprises based on a single criterion. To accurately model the probability of IDE occurrences, it is essential to filter out of cross-effects and include IDE categories. Identifying relationships between variables is a crucial aspect of data analysis. Multivariate regression enables the consideration of potential interactions among variables which is necessary for modelling the occurrence of IDEs. For instance, varying levels of company concentration and competitive conditions across sectors[5] may be observed. When size and sectoral classification are analysed separately, these co-movements (covariances) are not accounted for. Furthermore, multivariate regression analysis allows for the simultaneous quantification of the effects of all explanatory variables, resulting in more reliable estimates for predicting the dependent variable.

The form of the function used is determined by the category of the dependent variable (*Figure 3*). For binary outcomes, linear probability models, logistic regressions or probit regressions can be employed for estimation (*Maddala 1983*). When the dependent variable has more than two potential outcomes, the probability of group membership is modelled within a multilevel probabilistic or

[5] The comprehensive competition statistics database, which illustrates the market structure of domestic sectors, was updated and jointly published by the Hungarian Competition Authority and the Magyar Nemzeti Bank at the end of 2023. Detailed data and accompanying methodological guide are available here: https://gvh.hu/en/gvh/competition_culture_development/gvhmnb-competition-statistics-database/gvhmnb-competition-statistics-database.

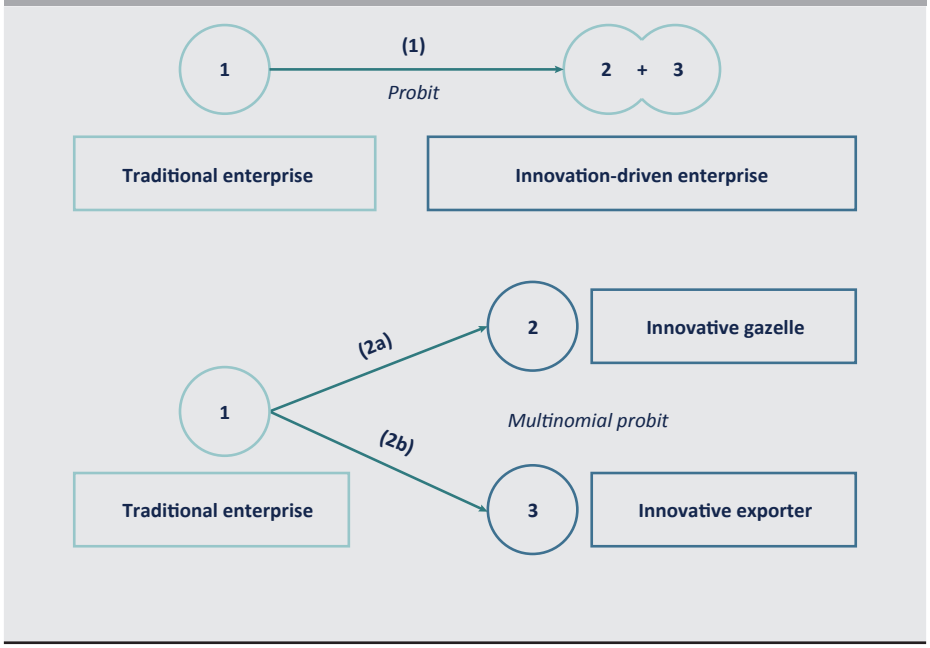
multinomial framework.[6] In the context of multinomial models, it is assumed that all relevant decision makers (in this case, Hungarian enterprises with a turnover of at least HUF 50 million in the specified sectors) select from the same set of observable outputs in the data set. The objective of the modelling is to stylise the occurrence of innovation-driven enterprises rather than to identify the factors that enable companies to become innovation-driven. This study does not aim to explore those facilitating factors. Instead, the research focuses on identifying the demographic characteristics of the entire group and two types of innovation-driven enterprises, with an emphasis on the territorial dimension.

In the first case (1), we model the probabilities of occurrence of innovation-driven enterprises relative to other businesses (*Figure 3, top panel*). The control group, to which IDEs are compared, comprises businesses that generated at least HUF 50 million in turnover in the sectors considered in the IDE identification (see *MNB 2023*: *Chapter 5*). In the probit specification (1), the innovation-driven pool is treated as a homogeneous group. Subsequently, by treating the two groups of innovation-driven enterprises separately while maintaining the same control group, we estimate the probabilities of belonging to the partial group within a multinomial framework (*Figure 3, bottom panel*). This approach allows us to determine whether innovative gazelles (2a) or innovative exporting firms (2b) are more or less likely to occur based on a specific criterion within the population by adjusting the predicted probabilities to 1. Innovative gazelles exporting in a slowing growth environment are defined as innovation-driven enterprises (innovative exporters) without any qualitative or ranking distinction.

The cross-sectional estimates the model situation as of 2016, as this represents the final year of observation during which gazelle growth can be anticipated. Consequently, this may imply that innovative exporters are the innovative gazelles of preceding years. Approximately 600 innovative gazelles satisfied the combined criteria of rapid growth and innovation activity in the period 2016–2019. Furthermore, the group of innovative exporters, which no longer qualifies as gazelles, augmented the pool of innovation-driven enterprises in Hungary by approximately 500 additional entities.

[6] It may be necessary to model the probabilities of occurrence separately by pairing the level values of the category variable (business enterprise | innovative gazelle | innovative exporter). In separate logistic regressions, the sum of the predicted probabilities does not necessarily equal 1, whereas in a multinomial framework, it does. In the former approach, each binary logistic regression model independently estimates the probability of its own output category, without considering the probability of falling into the other categories.

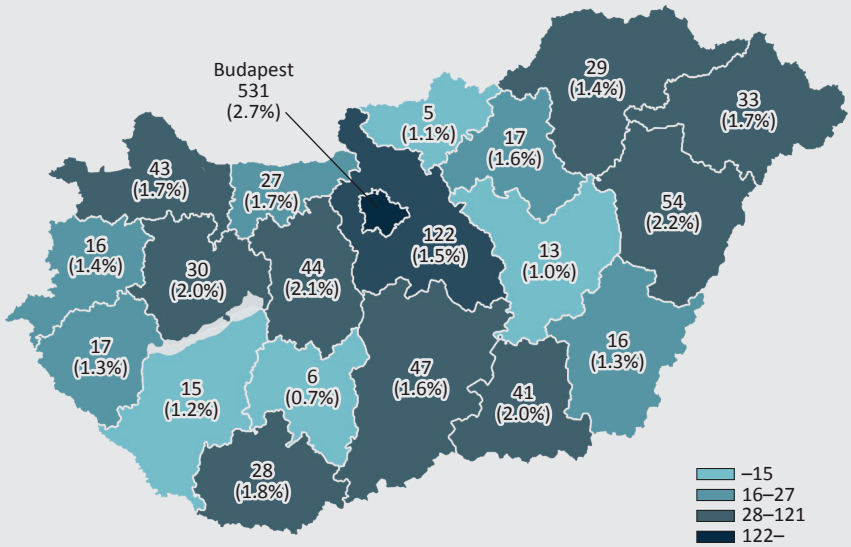
Figure 3
Flowcharts for probabilistic modelling



4. Findings

Consistent with the findings in the literature (e.g. *Budden-Murray 2017; Botelho et al. 2021*), Hungarian IDEs exhibit notable concentration in terms of location (*MNB 2023*). The observation that nearly half of innovation-driven enterprises are located in the capital city (*Figure 4*) may be misleading, as the probability of IDEs being present in an economic or spatial region is influenced by its 'immersion potential'. In 2019, 29 per cent of businesses operated in the capital, generating 43 per cent of national economic output, which provides a more nuanced understanding of the distribution. It is also crucial to consider sectoral, institutional and size-specific factors in defining innovation-driven enterprises. By definition, IDEs are drawn from enterprises in sectors engaged in foreign trade, excluding public, community, non-profit companies and special purpose entities (SPEs). The threshold for company size, for the reasons outlined above, was set an annual net turnover of at least HUF 50 million (*MNB 2023:52*).

Figure 4
Number and territorial distribution of innovation-driven enterprises (2016–2019) by county



Note: The figures in parentheses represent the percentage of innovation-driven enterprises within the county, specific to the relevant sector of activity, that have achieved a minimum turnover of HUF 50 million.

Source: Based on MNB (2023) and Szoboszlai (2023)

The estimation results are presented sequentially according to the models depicted in *Figure 3.* These results are utilised to filter out relationships among explanatory variables. Specifically, coefficients for the county categories in the specifications exclude the effect of the average sectoral, age, ownership and size characteristics of companies within a given region.

Demographic factors affecting the probability of becoming innovation-driven – model (1)

The explanatory variables are interpreted in the sequence presented in *Table 3.* Sector groups are categorised by technology and knowledge intensity: the coefficients for the various technology categories illustrate how the activities influence the likelihood of becoming an innovation-driven enterprise compared to the control group (traditional business enterprise). All coefficients are significantly positive and increase with technology intensity, indicating that, *ceteris paribus*, companies in all technology categories – primarily manufacturing – are more likely to become innovation-driven than those in less knowledge-intensive services (benchmark). This probability is higher in sectors with greater R&D expenditure as

a share of value added.[7] However, the coefficients associated with the high-tech and medium high-tech manufacturing categories and those associated with the medium low-tech and low-tech categories were not significantly different from each other in the post-estimation pairwise comparisons. This suggests that these categories have similar effects on the presence of innovation-driven firms, and that the finer statistical differences in technology level did not significantly impact the probability of becoming an innovation-driven enterprises. All else being equal, enterprises engaged in knowledge-intensive services as their primary activity are 2.4 per cent more likely to become innovation-driven compared to firms in less knowledge-intensive service sectors. *Ceteris paribus*, agriculture is slightly less likely (by 0.66 per cent) to have IDEs than less knowledge-intensive service providers. However, this does not necessarily mean lower production efficiency. *Fenyves et al.* (*2022*) demonstrated that Hungarian agricultural enterprises operated efficiently relative to their own technical standards between 2017 and 2019. If firms in a sector predominantly serve the domestic market, if external factors (e.g. weather, buyer-supplier relationships) have a strong impact on productivity, or if the typical firm size does not facilitate rapid growth, the estimated probability of an IDE occurrence may be lower compared to the benchmark group. Nonetheless, this does not inherently imply that the production processes are less productive.

The coefficient of variation for age indicates that, all other factors being equal, the probability of becoming innovation-driven increases by 0.3 thousandths per year of age. This marginal effect encompasses both the company's age and its square due to the quadratic relationship between these variables. Consequently, the marginal effect in *Table 3* is represented by the relationship $\partial y/\partial x = \beta_1 + 2\beta_2$. This implies that the marginal effect varies with the age of the company (x) and is not constant. The relationship between the age variable and its square thus jointly determines the marginal effect.

Ownership structure: The coefficient of the variable indicates that foreign-owned enterprises are somewhat less likely to become innovation-driven than domestically-owned ones with a difference of 6.4 percentage points. The result is noteworthy, despite the size of the impact.

Size category: The coefficients for different company size classes reveal that, when controlling for other variables, the probability of becoming innovation-driven increases with firm size. Compared to microenterprises, the probability of IDEs is 1.9 per cent higher in the small enterprise segment, 4.1 per cent higher in the medium enterprise segment and 6.2 per cent higher in the large enterprise segment.

[7] In its sectoral approach, Eurostat groups technology intensity by R&D expenditure as a share of value added. See: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:High-tech.

Table 3
Regression results – stylising the probability of occurrence of innovation-driven enterprises

P(y = group of innovation-driven enterprises)	(1)	(2a)	(2b)
Technology and knowledge intensity (base: less knowledge-intensive service sectors)			
High-tech manufacturing	0.0417***	0.0178*	0.0239***
	(4.41)	(2.47)	(3.60)
Mid-high tech manufacturing	0.0337***	0.017***	0.0167***
	(7.37)	(4.60)	(5.70)
Mid-low tech manufacturing	0.0099***	0.0032*	0.0067***
	(4.96)	(2.09)	(4.76)
Low-tech manufacturing	0.0065**	0.0023	0.0042**
	(3.03)	(1.24)	(3.06)
Knowledge-intensive services	0.0244***	0.0152***	0.0092***
	(11.82)	(9.49)	(6.82)
Agriculture	–0.0066***	–0.004***	–0.0026**
	(–4.47)	(–3.43)	(–2.81)
Age ([i])	0.0003**	–0.00004	0.0003***
	(3.13)	(–0.42)	(5.81)
Ownership structure (base: domestic)			
Foreign	–0.0064***	–0.005***	–0.0014
	(–4.10)	(–4.40)	(–1.69)
Size of enterprise (base: microenterprise)			
Small	0.0194***	0.009***	0.0104***
	(14.46)	(8.73)	(12.40)
Medium	0.0406***	0.0117***	0.0289***
	(11.84)	(5.07)	(10.75)
Large	0.0616***	0.0136**	0.048***
	(7.37)	(2.75)	(6.52)
County (base: capital)	*Figure 5*	*Figure 6*	*Figure 7*
Pseudo R^2	0.101	0.101	
Observation number	56,920	56,920	

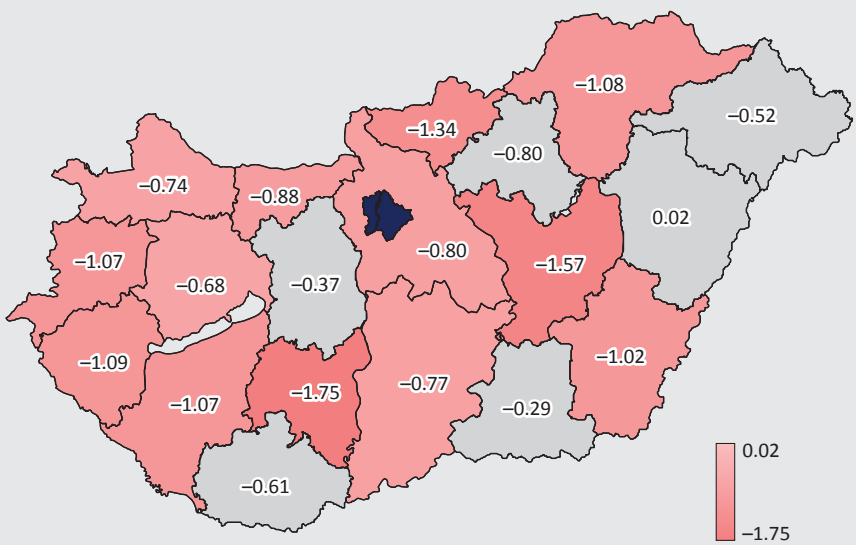
*Note: t-statistics in brackets, * p < 0.05; ** p < 0.01; *** p < 0.001. Marginal effects (dy/dx). ([i]) Marginal effect of company age and its square. The numbering of the models follows the numbering in Figure 3.*

Source: Calculated based on HCSO, MNB, NAV, NRDIO, NIPO, crunchbase

The county-level results are depicted in *Figure 5.* In addition to the aforementioned coefficients, the marginal coefficients in the majority of counties are, *ceteris paribus*, significantly lower than probabilities of occurrence in the capital city. However, the coefficients in six counties – namely, Baranya, Csongrád-Csanád, Fejér, Hajdú-Bihar, Heves and Szabolcs-Szatmár-Bereg – were not significant at the 5 per cent confidence level: This finding partially aligns with the knowledge regions identified in *Lengyel and Varga* (*2018*). Specifically, Baranya, Csongrád-Csanád and Hajdú-Bihar counties were classified as knowledge regions, Fejér and Heves as re-industrialising areas and Szabolcs-Szatmár-Bereg county as a rural region. It is also crucial to emphasise that the spatial distribution of the control group companies influences the estimated average marginal effects.

In summary, all firm demographic factors are associated with innovation-driven operation. However, while firm age and ownership exert a moderate (filtered) effect on the probability of occurrence of IDEs, a larger and increasing partial effect is observed by company size and scope of activity. In relation to these findings, *Szoboszlai et al.* (*2024*), through multivariate analysis of survey data from innovative enterprises, determined that the likelihood of rapid growth is enhanced by advanced technological infrastructure and a skilled workforce. There, even within such a robust (innovative) business segment, these factors remain critically important.

Figure 5
Probability of existence of innovation-driven enterprises in counties compared to Budapest



Note: Marginal effects (dy/dx). Counties with coefficients that are insignificant relative to the base value (Budapest) are depicted in grey. Due to rounding, the sum of the marginal effects presented in Figures 6 and 7 may slightly differ from the results shown in Figure 5.

Source: Based on HCSO, MNB, NAV, NRDIO, NIPO, crunchbase

In the next section, we examine how the decomposition of the innovation-driven pool within a multinomial framework refines the probabilistic picture presented above (model results (2a) and (2b)). This analysis highlights the observed differences.

Demographic factors affecting the probability of becoming an innovative gazelle and innovative exporter – models (2a) and (2b)

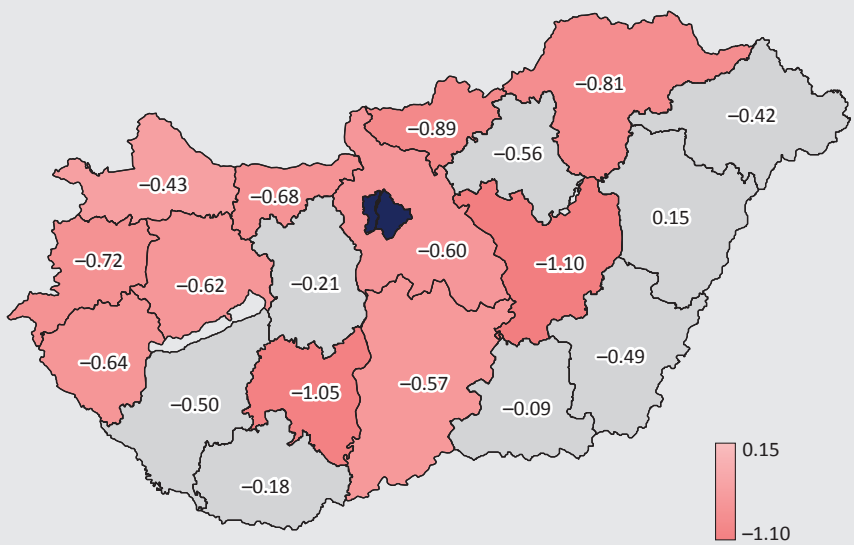
In regression models, the coefficients β describe the relationship between the explanatory variables and the dependent variable. When the combined output category is decomposed, the sum of the β coefficients equals the estimated coefficient of the combined case. The β coefficients for the different output categories are aggregated. This phenomenon is a fundamental property of linear regression models. This principle also applies to nonlinear models, such as dichotomous dependent variable probit models, where the shared output variable is explained with a single model framework rather than through multiple separate probit equations. Consequently, the multinomial probit can be viewed as an extension of the base case offering deeper insights into the company demographic characteristics (models (2a) and (2b)) of the innovation-driven enterprise types.

The 1,134 innovation-driven enterprises identified in the 2016–2019 period comprise two distinct groups (*Figure 2*)*:* 502 innovative gazelles and 632 innovative exporters. Analysis across sector groups reveals that the probability of occurrence of innovative gazelles is higher in the knowledge-intensive service sector, whereas low and medium-low manufacturing specialisation leads to a higher probability of innovative exporters. This pattern is consistent with the findings in models (2a) and (2b), where post-estimation coefficient tests indicated no significant differences between the pairwise coefficients for high-tech and medium high-tech categories versus medium low-tech and low-tech categories. However, it is noteworthy that while the coefficient on the medium low-tech manufacturing dummy variable is significant among innovative gazelles, the coefficient for the low-tech category is not. Similarly, the significance levels for the high-tech and medium high-tech category variables differed. Company age is an insignificant explanatory variable among innovative gazelles, suggesting that the effect identified in the previous combined specification was attributable to innovative exporters. By definition, innovative exporters are more mature (older) firms compared to innovative gazelles, as they remain within the IDE pattern beyond gazelle status (rapid growth period). Further analysis of the coefficients reveals that, for the innovative exporter, foreign ownership is an insignificant factor in explaining the probability of occurrence, but it is a significant negative coefficient in predicting the likelihood of becoming an IDE gazelle. An increase in company size is associated with a higher probability of being an innovative exporter. Specifically, medium firm size is associated with a 2.9 per cent higher probability of becoming an innovative gazelle, and large company size correlates with a 4.8 per cent higher probability among exporting IDEs. These respective marginal effects increase the probability of becoming an innovative

gazelle by 1.2 per cent and 1.4 per cent, respectively, which are statistically similar (*Table 3*).

The territorial dimension reveals distinct different between the two groups of enterprises. For innovative gazelles, the counties with significantly different (*ceteris paribus*) probabilities of occurrence compared to Budapest include Békés and Somogy. By contrast, for innovative exporters, only five counties – namely, Baranya, Békés, Jász-Nagykun-Szolnok, Somogy and Tolna – exhibit a significantly lower probability of occurrence than the capital. It is noteworthy that – according to *Lengyel and Varga* (*2018*) – these counties, with the exception of Baranya, are classified as rural regions based on their sectoral structure. This indicates that local characteristics, as defined by the concept of innovation-driven enterprises, strongly influence the frequency distribution of these enterprises and their subtypes when filtered by other company characteristics. Finally, the sum of the marginal effects in *Figures 6* and *7*, as presented *in Table 3*, corresponds the aggregate effects shown in *Figure 5*. The results demonstrate that the probability of occurrence of the entire pool is influenced by the probability of occurrence of innovative gazelles, after controlling to other factors. As innovative gazelles transition into innovative exporting companies, the probabilities depicted in *Figure 7* will adjust accordingly.

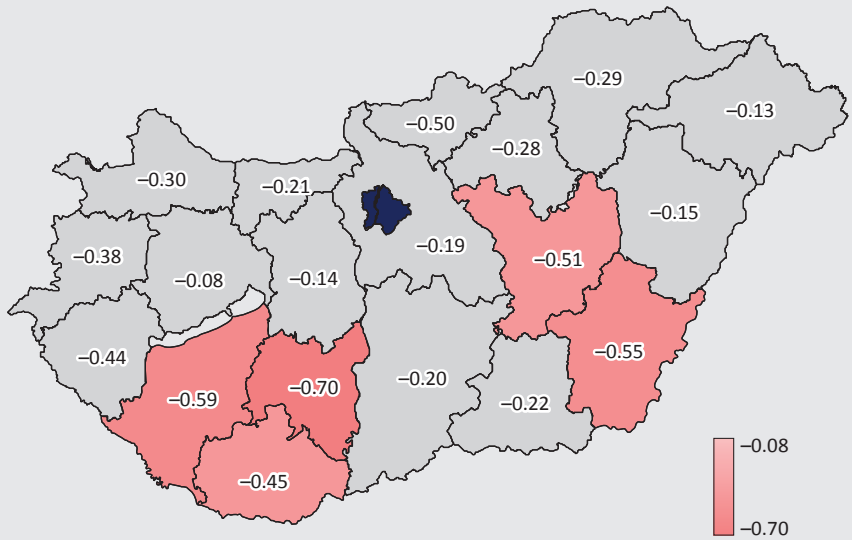
Figure 6
Probability of occurrence of innovative gazelles in the county relative to Budapest



Note: Marginal effects (dy/dx). Counties with coefficients that are insignificant relative to the base value (Budapest) are depicted in grey. Due to rounding, the sum of the marginal effects presented in Figures 6 and 7 may slightly differ from the results shown in Figure 5.

Source: Based on HCSO, MNB, NAV, NRDIO, NIPO, crunchbase

Figure 7
Probability of occurrence of innovative exporters in the county relative to Budapest



Note: Marginal effects (dy/dx). Counties with coefficients that are insignificant relative to the base value (Budapest) are depicted in grey. Due to rounding, the sum of the marginal effects presented in Figures 6 and 7 may slightly differ from the results shown in Figure 5.

Source: Based on HCSO, MNB, NAV, NRDIO, NIPO, crunchbase

5. Conclusions

The role of the innovation-driven enterprise is increasingly valued and dominant. This select group of approximately 1,100 companies is likely to attract heightened attention in the 2020s due to its significance to the national economy. This research examines the company demographic characteristics of innovation-driven enterprises within the context of the Hungarian economy, with a particular emphasis on the territorial dimension. Furthermore, the conceptualisation and application of innovation-drivenness have been tailored to Hungarian economic conditions, and this study is the first to develop these considerations at a scientific level and detail. Given the domestic context, including the terminology and the period of analysis, the data and methods employed in this research may be specific to the Hungarian economic environment. Consequently, similar studies conducted in other countries may yield different results.

The example of the world's leading industrial parks demonstrates that this prominent group of companies is characterised by a unique sectoral and geographical clustering. Previous domestic findings have also indicated that Hungarian innovation-driven enterprises operate in specialised markets such as engineering and natural sciences R&D, information technology, pharmaceuticals and biotechnology (*MNB 2023; Szoboszlai 2023*). This is reflected in the estimation coefficients for the groups categorised by knowledge intensity. The probability of becoming an innovation-driven enterprise within the analysed population of firms is increased by engaging in high-technology and knowledge-intensive activities and by expanding firm size, *ceteris paribus*, with higher coefficient values observed across subgroup. Additionally, company maturity (age) was identified as a factor that increases opportunities, albeit with a smaller estimated marginal effect. However, in terms of ownership structure, foreign control does not, *ceteris paribus*, significantly enhance the likelihood of innovation-driven operations.

In addition to activity-based concentration, spatial patterns emerged in the raw distribution of IDE firms. However, relying solely on the frequency distribution by county can lead to misleading conclusions. While the concentration of IDEs in the unfiltered data is dominated by the capital and counties with university towns, the relative probabilities of occurrence within a county are not necessarily prominent. The type of businesses operating within a county is also crucial, as it sets a specific condition for the local creation of innovation-driven businesses. From this perspective, six counties have asserted their own regional characteristics similarly to the capital region. Of these six counties, three – namely, Baranya, Csongrád-Csanád and Hajdú-Bihar – have been identified as knowledge regions in previous research. This partially confirms that, compared to other regions, the probability of IDEs is also significantly higher in counties that are home to universities with multiple faculties. However, it is important to emphasise that this is only one characteristic of the county-specific ecosystems, which are influenced by numerous other factors that play a decisive role in stimulating innovation and entrepreneurship. Furthermore, the balanced location of innovation-driven enterprises, which justifies Hungary's classification as a moderate innovator, may indicate that no county has yet reached the critical mass required to create regional local IDEs with a significantly higher probability. The innovative gazelles of the future will play a key role in this development, and according to the presented results and conceptualisation, they will have a profound impact on the development of the entire IDE pool.

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Innovation-Driven Enterprises in Hungary: Empirical Results at First Sight*

Stefan Kovács – András Nemeslaki

This study examines the issue of the middle-income trap in the Hungarian economy and the possibilities for escaping it, given the end of the period of extensive growth and the need for a new growth model. Innovative companies, especially SMEs, have a key role to play in this transformation, as they can differentiate themselves in the market and achieve international success. Our research analyses business capabilities that contribute to gazelle-like growth and export market competitiveness. Adapting the experience gained from the MIT REAP programme to the Hungarian context, we examine the importance and characteristics of Hungarian innovation-driven enterprises. The study highlights the importance of developing financial, technological and human resources, and the need to create a favourable market and regulatory environment. To increase the number of HIDE enterprises and promote sustainable economic growth in Hungary, it is crucial to understand their operation and impact in more depth, which necessitates further research.

Journal of Economic Literature (JEL) codes: O00, O30

Keywords: innovation, HIDE companies, skills, resources

1. The role of innovation-driven companies in the Hungarian economy

In this study, we contribute to the broader economic policy discourse that grapples with the challenges of the middle-income trap in the Hungarian economy and the urgent need to break free from it (*Havas et al. 2023; Győrffy 2022; Csath 2022; Kolozsi 2017; Bod 2015*). We also address the current issue of the period of extensive catching-up and growth for the Hungarian economy, primarily based on quantitative factors, which has reached its end. As our colleagues at the Magyar Nemzeti Bank (the Central Bank of Hungary, MNB) argued in the Growth Report 2023 (*MNB 2023*),

* 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.

Stefan Kovács: Budapest University of Technology and Economics, Senior Lecturer.
E-mail: kovacs.stefan@gtk.bme.hu
András Nemeslaki: Budapest University of Technology and Economics, University Professor.
E-mail: nemeslaki.andras@gtk.bme.hu

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the trends emerging at the end of the 2010s indicate that the old growth model in the previous structures is no longer sustainable. We align with the economic argument that seeks new growth model drivers in the economy to ensure Hungary's economic growth by enhancing productivity, value-added and competitiveness.

Innovation plays a crucial role in this intensive growth turnaround. Innovative companies can differentiate themselves in competition and, most notably in this respect, can enter international markets that allow them to grow and generate high revenues. Hungary has considerable reserves, especially in the related development of small and medium-sized enterprises (*Csath – Nagy 2023*), as this group has a particularly low level of accumulation of intellectual assets (so-called smart investment), which is also reflected in the low number of patents, trademarks and designs (*European Commission et al. 2023*).

The research questions, analyses and findings of this study, therefore, focus on expanding the empirical knowledge of the company capabilities that enable not only innovation, but also 'gazelle-like' growth or export market competitiveness. Enterprises with such capabilities are called Hungarian Innovation-Driven Enterprises (HIDEs). The characteristics of such firms and some initial findings are summarised in the MNB Growth Report 2023 (*MNB 2023*), the first result of a complex research programme conducted by a team of eleven experts at the Massachusetts Institute of Technology (MIT) Regional Entrepreneurship Acceleration Program (REAP), under the professional leadership of the MNB (*Gergely 2023*).

For more than 10 years, MIT has been intensively promoting the IDE (Innovation-Driven Enterprise) concept, including in the framework of REAP, which, according to its leading academics, is a major determinant of the economic growth potential of a region (*Guzman et al. 2023*; *Budden – Murray 2022; Budden et al. 2017*). In addition to being a market driver for innovation, IDEs also contribute significantly to employment growth through the spill-over effects of their activities. In essence, the MNB research adapted this concept to the domestic environment and examined the number of innovative and sustainable growth firms and whether the positive economic externalities on their environment can be justified.

In this study, we first briefly review the economic impact of innovation, then clarify the concept of HIDEs, i.e. Hungarian Innovation-Driven Enterprises, and show their importance for the national economy. We then review the innovation and entrepreneurship capabilities that characterise these companies, building in particular on the model used in the MIT Entrepreneurship Workshop. In the main part of the paper, we present the results of a survey of 182 Hungarian enterprises that we conducted to identify these capabilities, using a database of enterprises provided by the National Research, Development and Innovation Office (NRDIO),

which they consider to be innovative. This sample included 72 organisations that could be classified as HIDEs with the potential for rapid growth, and thus we were able to make an exploratory comparison with the 110 innovative but not HIDE firms. In this analysis, we show the differences between the two groups in terms of their perceptions of capabilities. We use these to arrive at the capabilities which need to be developed by an SME or fledgling start-up that is innovation-driven and wants to achieve rapid market growth and/or export sales.

2. Innovation and economic performance

The prominent role of innovation in raising productivity and improving economic performance is emphasised in the literature. *Schumpeter* (*1934*) drew attention to the concept of 'creative destruction' in his early work, describing the transformation of market structures through innovation, thereby promoting economic dynamism and growth. Other studies, e.g. *Poltarykhin et al.* (*2021*), *Khyareh and Rostami* (*2021*) and *OECD/Eurostat* (*2005*), also support the crucial role of innovation in promoting the competitiveness and economic progress of nations.

Pino et al. (*2016*) argue that innovation is essential to improve the international market performance of South American firms, while *Ghazinoory et al.* (*2020*) highlight the importance of harmonisation between innovative macro strategies and modern financial systems. *Nesterov et al.* (*2015*) focus on the cost effectiveness of innovation, while *Denkowska et al.* (*2020*) and *Siwek* (*2021*) examine the direct positive effects of innovation on economic growth and social welfare. *Terzić* (*2017*) analyses the innovation potential of developing economies, while *Zhu* (*2013*) discusses innovation management's theoretical and practical aspects. *Bashir and Akhtar (2016*) and *Kruja* (*2013*) analyse the effects of innovative entrepreneurship on economic dynamism and social development, while *Ziegler* (*2015*) emphasises the contribution of innovation to social justice.

In recent years, research in Central Europe has widely studied the importance and central role of innovation in the economy. These studies clearly confirm the importance of innovation in driving economic growth, business performance and socio-economic development. In studies ranging from exporting firms in South America to post-communist countries in Central Europe, researchers have used various methods and approaches to assess the impact of innovation activities and the strategies through which innovation contributes to improving international competitiveness.

Particular attention should be paid to Central Europe, where innovation is a critical factor for economic development and international competitiveness. *Dudukalov et al.* (*2016*) argue that global innovation networks are essential for knowledge transfer and technological development. *Dabic et al.* (*2014*) emphasise the need to improve the entrepreneurial environment in Central Europe, *Pełka* (*2018*) warns of differences in innovation performance across the European Union, *Olejnik and Żółtaszek* (*2020*) examine the impact of territorial innovation factors on economic performance, while *Ciocanel and Pavelescu* (*2015*) highlight the importance of boosting competitiveness through innovation.

Taken together, this research underlines the central role of innovation in economic and social development and the need to develop innovation strategies and policies at the regional and global level. Therefore, promoting and supporting innovation must be a key element of all economic policies for future sustainable development, improving international competitiveness and meeting global challenges.

2.1 Sources and drivers of innovation and other factors affecting innovation in Hungary

In 2023, Hungary spent 1.38 per cent of its gross domestic product (GDP) on research and development (R&D), below the previously set target of 1.8 per cent, indicating the need for further development in this area (*HCSO*[1] *2024*). This data suggests that while there is progress in the domestic R&D sector (the rate rose from 1.18 to 1.39 per cent between 2016 and 2022), the rate declined between 2021 and 2022, and the 2023 figure is not expected to show any significant change from 1.39 per cent, even at the forecast level. Hungary's gross R&D expenditure as a percentage of GDP remains below the EU average (2.24 per cent).

Hungary faces further challenges in innovation output. According to the *MNB* (*2022*), innovation is a key contributor to productivity growth, and R&D investment in the business sector directly impacts market competitiveness. However, the low innovation efficiency in international comparisons – 57 per cent compared to the EU average and 37 per cent compared to the EU TOP5 – suggests that while progress has been made in some areas, such as the number of top publications, significant improvements are needed in broader innovation outputs (*MNB 2023*). This reinforces the need for a three-pillar approach in Hungary, consisting of system, stakeholders and strategy (*MIT REAP 2023*), to refine the innovation ecosystem, stimulating knowledge-based economic growth and regional competitiveness.

[1] Hungarian Central Statistical Office

In the 2022 European Innovation Scoreboard (EIS) ranking, Hungary advanced one position to lead the group of emerging innovators, but its relative performance compared to the EU declined. However, it is important to highlight that the 2023 report shows that progress has been made: Hungary has moved into the category of moderate innovators, but is at the bottom of the list in this category (*European Commission 2022, 2023*).

3. Definition of Hungarian innovation-driven enterprises and presentation of their economic importance

An enterprise is generally considered innovative if it produces a new or improved product or process (or combination of products or processes) that differs significantly from its previous products or processes and is made available to potential users or is used by the enterprise (*OECD/Eurostat 2018*; *Galindo-Rueda – López-Bassols 2022*). In his often quoted lectures, Bill *Aulet* (*2013)*, Managing Director of the Martin Trust Center for MIT Entrepreneurship, defines innovation as the multiplication of *invention* and commercialisation *(innovation = invention x commercialisation*). The essential message on which the IDE concept is based is that an idea or a creative thought is not an innovation in itself, only if it leads to a business outcome or measurable success.

In its first edition, the Oslo Manual (*OECD/Eurostat 2018*) placed a strong emphasis on areas of innovation: product development, process organisation, marketing or the development of organisational structures. The first editions were then complemented by broadening the concept of innovation (e.g. to include government, non-profit or other public institutions), or by including social innovations that are much harder to measure than profit-driven expectations and long-term impacts that are harder to measure than direct quantifiable economic outcomes. To determine how innovative an enterprise is, we considered input and output variables, which can be found in *Horváth'*s (*2022*) summary in the first summary study of the research conducted for the NRDIO. As examples on the input side, Horváth cites corporate R&D expenditure, the number of R&D employees and the number of those with a scientific degree, and on the output side, the registered trademarks, patents and scientific publications, the technology export ratio and innovation-related turnover.

In addition to these characteristics, the MIT IDE model defines innovation-driven companies as those that receive early-stage investment early in their life cycle, essentially based on the idea, market plan and business model (*Budden et al. 2017*), and after successful market entry, they grow exponentially, which can mean significant returns for capital investors when the company is sold or goes public. This is particularly important in the case of technological developments, as large amounts of start-up capital are necessary primarily for companies where high-risk and high-value technical developments and investments are needed to bring the innovation to market.

In this research, we combined the two approaches to defining innovation-driven enterprises, defining Hungarian innovation-driven enterprises based on whether they have some innovation effort or innovation output that can be identified and linked to the company (R&D tax incentives, development grant, patent or trademark registration) and, on the other hand, if their turnover has grown exponentially, at least in one phase of their growth (by at least 20 per cent per year for three consecutive years).

The companies that met the above criteria were identified by processing data from around 400,000 businesses per year between 2009 and 2019, which involved linking several databases. In addition to the databases of the National Tax and Customs Administration (NAV), the database of the Hungarian Intellectual Property Office (with downloads of trademarks and patent registrations), the NRDIO's development funding database containing 1,700 firms per year and the market and venture capital funding databases containing around 100 firms were compared to identify Hungarian innovation-driven firms (*MNB 2023*).

The results identify 1,100 companies in Hungary that can be considered innovation-driven according to our definition. They account for 0.3 per cent of operating companies, so are barely visible in terms of volume – hence the apt name HIDE, which, along with the acronym Hungarian Innovation-Driven Enterprises, also refers to their hidden character. These companies are mature (9–12 years old) and predominantly Hungarian-owned. In terms of their activities, 43 per cent of them work in narrow industries requiring specialised skills, and they are more often found in knowledge-intensive activities such as scientific and technical research and development, computer programming, engineering, technical, business and IT consultancy, manufacturing and (wholesale) trade of specialised products, and creative sub-sectors (*MNB 2023*).

Their growth-generating effect is very promising for their numbers. The 1,100 HIDEs accounted for 13 per cent of total gross exports and 22.8 per cent of annual domestic GDP growth in the 10 years under review (*Szoboszlai et al. 2024*; *MNB 2023*). The economic potential of HIDEs is therefore significant, based on the first analyses. It certainly indicates that it is worthwhile to look deeper into their operation and examine their capabilities, which could be developed to increase their number and impact on the Hungarian economy.

4. The two defining capabilities of innovation-driven operations: innovation capabilities and entrepreneurship capabilities

To theoretically ground the research, we start from the MIT model that companies need two types of capabilities for IDE to be successful: Innovative Capabilities (I-CAP) on the one hand, and Business or Entrepreneurial Capabilities (E-CAP) on the other (*Budden – Murray 2019*).

The innovation capabilities of a business determine how successfully innovative solutions are created within the organisation (or, more broadly, within a region's ecosystem). These resources include creativity, research, technical development and the ability to introduce products, technologies and services that actually solve business or societal problems. Therefore, the I-CAP factors cover the whole chain from 'idea to exploitation', not only the R&D domain, but also the translation of results into economic benefits.

Entrepreneurship skills encompass the more general business development knowledge, attitudes, resources and conditions for starting a business. These skills support all types of entrepreneurial activity, including those needed to set up and run traditional SMEs, not just for IDE. These are relevant for our research because they are largely needed for market expansion, export market acquisition and exponential revenue growth.

Table 1
I-CAP and E-CAP elements and the MIT REAP team's initial assessment of the Hungarian situation

	I-CAP	Assessment	E-CAP	Assessment
Human Capital	Percentage of PhD graduates Percentage of STEM graduates Percentage of people employed in R&D Quality of STEM education	Partly a problem	People with a degree in tertiary education Entrepreneurial skills	Problem
Funding	Percentage of R&D expenditure Public R&D expenditure R&D expenditure of businesses	Partly a problem	Access to credit VC access Smart money	Problem
Infrastructure	ICT access Internet bandwidth Integration of ICT into business processes Availability of modern technologies	**OK**	Logistics Internet network Internet usage	**OK**
Demand and Market	Public investment in advanced technologies University-industry cooperation Market size, competition rules	Problem	Customer demand Domestic market size	Problem
Culture and Motivation	The quality of research institutes Quality of higher education STEM output	Problem	Entrepreneurial propensity Risk appetite Entrepreneurial diversity (e.g. proportion of women) Fear of failure Entrepreneurship status Business as a career Regulatory stability and security	Problem

Source: Budden – Murray (2019), Gergely (2023)

Table 1 presents the assessment template used by MIT-REAP participants to compile a comprehensive I-CAP and E-CAP map of the Hungarian innovation ecosystem and a subjective – expert perspective – assessment of the five characteristic capabilities each. The eleven participants represented five stakeholders in the Hungarian innovation ecosystem – four MNB staff, one government employee, two university employees, two company employees, one entrepreneur and one venture capitalist – who, prior to the assessment teamwork, provided a broad overview of Hungary's position in relation to the five I-CAP and E-CAP indicators based on secondary data. These resources are available in an organised format on the dedicated MIT open-

access portal.[2] Comparisons between countries and regions in terms of I-CAP skills can be made based on the European Innovation Scoreboard,[3] the Bloomberg Innovation Index,[4] the Global Innovation Index[5] and the Global Competitiveness Index[6] reports. Still, these are of course indicative, as they cover different time periods and use various statistical sources. Similarly, for E-CAP, data from the Global Entrepreneurship Monitor (GEM),[7] the Global Entrepreneurship Index (GEI),[8] and the Global Startup Ecosystem Report (GSER)[9] can be used to analyse and compare regional ecosystems.

The two types of capabilities determine the strengths and weaknesses of the organisation, i.e. its comparative advantages and disadvantages. For example, a company's I-CAP strength may be its good links with universities, strong research network or professional research capacity, while another company may have a comparative advantage because of a vibrant investor culture or simple management organisation, or perhaps because of its effectively exploited tax advantages.

The detailed background and empirical support for this resource-based approach among Hungarian SMEs is presented by *Szerb and Rideg* (*2003*), who also review a wealth of Hungarian research on the topic. The authors' summary highlights that technological development and increasing market competition make it essential for companies to recognise and effectively manage intellectual capital as a key resource. Companies in the domestic SME sector need to focus not on creating new knowledge and developing R&D capacities, but on absorbing innovation, collaborating and learning. The three main components of intellectual capital – human capital, structural capital, and social capital – contribute to increasing corporate innovation performance and competitiveness. And more important than physical resources are the skills of the people working in the company: the human capital.

Human capital, which encompasses workers' knowledge, creativity, health and skills, is essential for generating innovative ideas and driving technological improvements. The research of *Zhang et al.* (*2018*) highlights that intellectual capital directly improves product innovation performance and that the integration of supplier knowledge plays a mediating role in this process. The results show that the combination of intellectual capital and supplier knowledge integration contributes

[2] MIT Innovation Ecosystems: https://innovationecosystems.mit.edu/framework
[3] *European Commission et al.* (*2023*)
[4] Bloomberg Innovation Index 2021: https://ec.europa.eu/newsroom/rtd/items/713430/en
[5] Global Innovation Index 2023: https://www.wipo.int/global_innovation_index/en/2023/
[6] Global Competitiveness Index 2023: https://imd.cld.bz/IMD-World-Competitiveness-Booklet-2023
[7] GEM 2023/24: https://www.gemconsortium.org/reports/latest-global-report
[8] Global Entrepreneurship Index 2019: http://thegedi.org/global-entrepreneurship-and-development-index/
[9] Global Startup Ecosystem Report 2023: https://startupgenome.com/report/gser2023

significantly to the product innovation performance of companies, while *Madhar* (*2010*) stresses the critical importance of knowledge management for innovation and competitive advantage.

Structural capital, which includes corporate processes, organisational culture and knowledge management systems, enables the effective sharing and application of knowledge within the company. *Hsu'*s (*2011*) framework underlines the link between intellectual capital and organisational success, while *Subramaniam and Youndt* (*2005*) point out how intellectual capital influences different innovation capabilities.

Social capital, which refers to a company's external contacts and networks, is also important for gaining market insights and exploiting new business opportunities. According to *McDowell et al.* (*2018*), intellectual capital has a direct impact on companies' innovation ability.

Academic research consistently supports the role of intellectual capital in driving business success and innovation performance. Research by *Luthans et al.* (*2004*) and *Egbu* (*2004*) highlights the importance of psychological capital and knowledge management, while *Galeitzke et al.* (*2015*) and *McDowell et al.* (*2018*) emphasise the importance of strategic management of intellectual capital.

Overall, intellectual capital is a crucial element of business innovation and economic success. Companies must recognise the strategic importance of these resources and manage them in an integrated way to strengthen their competitive advantage and market position. The combined management of human, structural and social capital, as well as the use of knowledge-based HRM practices, can increase companies' innovative capacity, contributing to wider economic prosperity.

Continuous improvement and integrating a systems approach into innovation processes are key to improving business performance. *Terziovski* (*2002*) points out that a bottom-up continuous improvement strategy for Australian and New Zealand manufacturing companies significantly improves customer satisfaction and productivity. By contrast, the top-down strategy aims to increase technological competitiveness. Surprisingly, integrated strategies have been less effective, suggesting that companies have not yet achieved system integration and networking (*Terziovski 2002*).

Innovation 'leadership' is also a critical factor that directly improves business performance and increases strategic fit. According to *Carmeli et al.* (*2010*), innovation leadership enables firms to adapt to a changing environment, thereby achieving significant performance gains.

Knowledge management, particularly the management of human resources and the integration of information technology, is also essential to improve innovation performance. *Gloet and Terziovski* (*2004*) find that the simultaneous application of 'soft HRM practices' and 'hard IT practices' increases product and process innovation.

Extensive cooperation with external stakeholders, such as knowledge sharing and product innovation, also plays an important role in boosting innovation performance. *Markovic and Bagherzadeh* (*2018*) point out that this link is achieved through knowledge sharing and product innovation, which increases innovation performance.

5. Research questions and methodology

The data we used are the results of a primary survey that mapped the characteristics of Hungarian innovative and innovation-driven enterprises which are difficult to identify from existing statistical databases. The empirical study aimed to provide a comprehensive analysis of the characteristics and growth potential of the HIDE enterprises mentioned above. We set out to identify the characteristics that distinguish them from innovative firms in addition to their innovation performance. We focused on the five key assessment dimensions identified in the I-CAP and E-CAP competencies already described in the research.

The survey was conducted as part of the data collection by the National Research, Development and Innovation Office (NRDIO) from September to November 2022. The participating Hungarian companies were selected using a unique database compiled by the NRDIO. The sample consisted of 182 companies, of which 72 met the HIDE criteria, while 110 companies could not be classified as HIDE despite their innovation activity. This division provided an opportunity to conduct a comparative analysis between HIDE and innovative enterprises. The questionnaire did not ask about company size, activity and ownership, as we used a unique list of companies compiled by the NRDIO. In order to preserve anonymity and to increase the response rate, HIDE and innovative enterprises were identified based on additional information in the NRDIO database.

Our questionnaire included a total of 39 questions on a six-point Likert scale and 13 additional questions focusing on financing options (not included in our analysis).

The multi-item scale statements formulated during the literature research were checked by principal component analysis to examine whether the statements of the five selected main categories adequately describe the characteristics of the different

dimensions. Before presenting the research results, it is important to highlight that the factor analysis based on the statements in the questionnaire was designed to explore the structural relationships of the trends reported by the respondents.

5.1. Description of the variables tested

Our research framework was based on the 39 metric statements in our questionnaire, measured on a six-point Likert scale, and analysed according to five key dimensions: financial resources, infrastructure, human resources, market and demand, and culture and motivation. The non-metric variables in the questionnaire are not part of our analysis. In line with our aim, we wanted to use factor analysis to reduce the data's complexity and explore their structural relationships. This created a more manageable set of factors from the original wide range of variables, making data interpretation and further analysis easier. In our statistical analysis, we used the Kaiser-Meyer-Olkin (KMO) test, Bartlett's test of sphericity and Cronbach's alpha to confirm the suitability of the data for factor analysis and to ensure the reliability of the scales.

In the factor analysis, KMO and Bartlett's test were used to assess whether the correlation between variables was sufficient to perform the factor analysis. The results of the Bartlett test are shown in *Table 2*.

Table 2
Results of the KMO and Barlett test

Kaiser-Meyer-Olkin test		0.688
Bartlett's test	Approx. Chi-Square	2,627.956
	Degrees of freedom (df)	741
	Significance	0

The KMO test result was 0.688, which is above the accepted threshold of 0.6, indicating that the variables are suitable for factor analysis. The results of the Bartlett's test confirmed that the correlation between the variables is significant, i.e. the elements of the correlation matrix are not randomly different from zero.

Factor analysis was performed using principal component analysis to identify the factors that explain most of the variance between variables. To determine the number of factors, the Kaiser criterion was applied, according to which only factors with an eigenvalue greater than one were considered. The analysis using Varimax rotation identified 12 factors that together explained 67.73 per cent of the total variance, exceeding the generally accepted threshold of 60 per cent.

In determining the factors, we selected statements with a factor weight of 0.4 or more. The factors examined were grouped into the five main categories above, taking into account their characteristics and their impact on the innovation capacity of enterprises. The KMO test confirmed the appropriateness of our sample size (*Nkansah 2018*), while Cronbach's alpha (*Vaske et al. 2017*) and measures of composite reliability (CR), including average variance extracted (AVE), supported the internal consistency and convergent validity of our constructs (*Raykov – Grayson 2003; dos Santos – Cirillo 2021*). The AVE values measure the level of variance captured by the construct relative to the measurement error, and values above 0.7 are considered very good, while a level of 0.5 is acceptable. CR is a less biased estimate of reliability than Cronbach's alpha, and the acceptable CR value is 0.7 or higher. The AVE should be higher than 0.5, but a value of 0.4 is acceptable if the CR is higher than 0.6, so that the convergent validity of the construct is still acceptable (*Fornell – Larcker 1981*). These statistical methods reinforce the scale's applicability and increase our results' accuracy and relevance, allowing us to make robust interpretations of the complex relationships in our data.

Our scores for the factors Business Success and Market Position, Market Competition and Strategic Partnerships are outside the acceptable range. However, these factors have been retained by analytical choice to further refine the results between each main category and the two segments under analysis. It is likely that one of the main reasons behind the low Cronbach's alpha, CR and AVE values is the small sample size of the research sample. Thus, in order to test this, it would be useful to conduct further research and analysis on a larger sample.

Table 3 summarises each factor's classification into main categories, Cronbach's alpha, factor weights, CR and AVE values. This table clearly shows each factor's main categories and relevant statistical indicators, confirming their validity and reliability.

Table 3
Main categories examined and the factors assigned to them

	Factors	Claims*	Factor weight	CR & AVE values
Available resources and how they can be used	Financial support and access *Cronbach's alpha: 0.72*	My company has easy access to other (non-R&D) public funding.	*0.81*	*CR = 0.71*
		My company has easy access to public R&D funding.	*0.79*	*AVE = 0.48******
		My business can easily borrow money.	*0.40*	
	Risk capital network *Cronbach's alpha: –*	If my business needed it, I could easily contact business angels / venture capitalists.	*0.71*	*CR = 0.51**** *AVE = 0.51*
Business infrastructure situation	Technological development and human resources *Cronbach's alpha: 0.80*	In our company, the production/development process is sufficiently advanced.	*0.76*	*CR = 0.81*
		For our business, new technologies are readily available.	*0.74*	*AVE = 0.46******
		We are satisfied with the technological infrastructure needed to run our business.	*0.72*	
		Our employees are well trained.	*0.64*	
		Our employees have the entrepreneurial skills.	*0.50*	
The readiness, skills and education of human capital	Innovation excellence and intellectual capital *Cronbach's alpha: 0.73*	Continuous innovation in our products and services is the key to our market growth.	*0.74*	*CR = 0.77*
		We regularly spend on corporate research and development.	*0.73*	*AVE = 0.41******
		Our recognition is essentially due to our success in innovation.	*0.59*	
		We have a significant amount of intellectual property rights in various forms (patents, trademarks, copyrights).	*0.58*	
		Our employees are actively involved in the company's R&D activities.	*0.53*	
	Training quality and scientific competence *Cronbach's alpha: 0.57*	We have good experience of the quality and applicability of science education.	*0.84*	*CR = 0.78* *AVE = 0.55*
		We have good experience with the quality and applicability of business training.	*0.68*	
		We employ a high number of people with a degree in STEM (Science, Technology, Engineering, Mathematics).	*0.49*	
		We employ a high number of PhD graduates.	*0.40*	
Demand and market absorption	Market environment and government support *Cronbach's alpha: 0.50*	The Hungarian market demand is sufficient to sustain the long-term growth of the business.	*0.76*	*CR = 0.74*
		The majority of our company's turnover comes from import markets.	*0.67*	*AVE = 0.49******
		Our innovative products/services are also used by government/local governments.	*0.66*	
	Business success and market position *Cronbach's alpha: 0.33***	Our recognition is based solely on our business success.	*0.68*	*CR = 0.52****
		The market size is appropriate, my business has a well known and segmented customer base.	*0.50*	*AVE = 0.35*****

	Factors	Claims*	Factor weight	CR & AVE values
Cultural and motivational factors	Entrepreneurial motivation and commitment *Cronbach's alpha: 0.52*	I am happy with the freedom that entrepreneurship gives me.	*0.81*	*CR = 0.87*
		The main driving force for starting an entrepreneurial activity was the desire for independence.	*0.76*	*AVE = 0.45******
		At the beginning of my entrepreneurial activity, the motivation and knowledge for entrepreneurship came mainly from family, friends and acquaintances.	*0.71*	
		Financial reasons and incentives were the main driving forces for starting an entrepreneurial activity.	*0.70*	
		I am satisfied with the entrepreneurial skills of our company.	*0.67*	
		I chose the sector/industry of entrepreneurial activity based on previous professional activity/knowledge.	*0.64*	
		The main driving force for starting an entrepreneurial activity was the loss of a previous job or other life changes or career changes.	*0.54*	
		I have a high social esteem as an entrepreneur.	*0.48*	
	Entrepreneurial risk-taking attitude *Cronbach's alpha: 0.74*	I like working with women entrepreneurs because their attitudes towards entrepreneurial risk are positive.	*0.90*	*CR = 0.88* *AVE = 0.78*
		I like co-operating with male entrepreneurs because their attitudes towards entrepreneurial risk are positive.	*0.88*	
	Gender balance *Cronbach's alpha: –*	Our enterprise is gender balanced.	*0.81*	*CR = 0.65* *AVE = 0.65*
	Error and risk-taking *Cronbach's alpha: 0.78*	Within the enterprise, making mistakes is not accepted and is not seen as a learning opportunity.	*0.69*	*CR = 0.60****
		In my environment, I fear the failure of our ideas because it means a loss of reputation.	*0.62*	*AVE = 0.43******
	Market competition and strategic partnerships *Cronbach's alpha: 0.1***	Competition in the industry is strong.	*0.72*	*CR = 0.54****
		The risks of our business are scary.	*0.46*	*AVE = 0.30*****
		My enterprise works with Hungarian universities to promote strategic innovation and/or entrepreneurship.	*0.41*	

Note:
**measured on a 6-point Likert scale (1 = Strongly disagree, 6 = Strongly agree); after filtering out "I don't know" responses.*
*** Cronbach's alpha < 0.50 – rejected internal consistency*
**** CR < 0.70 – reliability below the acceptable range*
***** AVE < 0.50 – level of variance below the acceptable range compared to measurement error*
****** AVE < 0.50 but the CR value => 0.60 so the convergent validity of the construct is acceptable*

6. Findings

Based on the principal component analysis of the research, we examined how HIDE and innovative firms differ in five key categories: funding resources, infrastructure, human capital, market demand and absorptive capacity, as well as cultural and motivational factors. Factors in each category were determined by averages of statements rated on a six-point scale to provide a comprehensive assessment of the factors under study. A two-sample t-test was used to examine the differences between HIDE and innovative firms, and an ANOVA analysis of variance was performed between the means of each segment.

6.1. Available resources and how they can be used

The analysis of the main category of funding resources highlighted the crucial role of financial resources, including state aid, access to credit and venture capital, in financing enterprises' growth and innovation activities. For the comparison between HIDE and innovative firms, we took into account the averages of the statements on venture capital relationships and financial support and access. *Table 4* presents the results for the HIDE and innovative subsamples.

Table 4
Analysis of the main category 'Funding resources' and its dimensions

Main category	Factors	HIDE average (standard deviation)	Innovative average (standard deviation)	t-value	Degrees of freedom (df)	p-value
Available resources and how they can be used	Venture capital relationships	3.90 (1.42)	3.51 (1.49)	–1.62	153	0.10
	Financial support and access	3.36* (1.10)	3.50 (1.10)	0.83	178	0.41
	Total resources	*3.48 (1.05)*	*3.52 (1.04)*	*0.24*	*178*	*0.81*

*Note: * Significantly lower (95%) than the most important dimension of the sub-sample (based on ANOVA analysis)*

The results show that among the two factors in this category, the 'Venture capital relationships' factor group scored the highest (3.90) for HIDE companies. The difference between the factors of venture capital relationships as well as funding and access is significant (3.90 versus 3.36) (at the 95-per cent probability level). For HIDEs, venture capital relationships are the most important factor, while for innovative firms, there is no significant difference between the two groups of factors. It can be said that HIDEs have a higher average score (3.90) in the venture capital relationships factor compared to innovative enterprises (3.51).

In addition, we also compared the average 'total resources' of the two subsamples. Based on the analysis, no significant difference between the two groups was found.

This is likely to be influenced by the fact that our control group also had access to NRDIO sources, regardless of their purpose.

The analysis shows that HIDE enterprises rely more strongly on venture capital relationships, which profoundly impacts their ability to grow and innovate. The strategic use of funding and the wide availability of financial instruments are key to the success of businesses, especially in sustaining innovation activities. The results suggest that diversifying financing strategies and strengthening relationships with venture capitalists can help businesses grow and strengthen their market position.

6.2. Infrastructure situation of the company

The main category 'Infrastructure situation' includes technological development and human resources as critical factors affecting enterprises' productivity and innovation capacity. The availability of infrastructure, including modern technology and a skilled workforce, is a key determinant of a company's competitiveness and innovation potential. *Table 5* presents the results for the HIDE and innovative subsamples.

Table 5
Analysis of the main category 'Infrastructure'

Main category	Factors	HIDE average (standard deviation)	Innovative average (standard deviation)	t-value	Degrees of freedom (df)	p-value
Business infrastructure situation	Technological development and human resources	4.42 (0.71)	4.04 (0.88)	–3.20	173	0.002

The comparison results show that HIDE companies place significantly higher value on the technological and human resources available. This confirms that HIDEs perform better on average in integrating these resources, which contributes to the development of their production and development processes. The easier accessibility of new technologies and the possession of the tools to operate efficiently underline the advantage of HIDE enterprises over innovative organisations.

The outstanding performance of HIDEs in the main category 'Infrastructure' highlights the key role of technological development and human resources in increasing innovation capacity. Businesses should prioritise the modernisation of technological infrastructure and the continuous training of their workforce to facilitate innovative activities and improve their market competitiveness.

In addition, innovative businesses may need to rethink their technological and human resource development strategies, which can help increase operational efficiency and create new innovation opportunities. Investing in infrastructure

improvements can not only boost productivity and innovation but also lay the foundations for the long-term sustainability of businesses.

6.3. The readiness, skills and education of human capital

The main category 'Human capital' focuses on the quality of training programmes and the scientific and technological knowledge of the workforce, highlighting their importance for enterprises' competitiveness and innovation capacity. The level of skills and knowledge of the workforce directly affects firms' innovation potential and market adaptability. *Table 6* presents the results for the HIDE and innovative subsamples.

Table 6
Analysis of the main category 'Human capital' and its dimensions

Main category	Factors	HIDE average (standard deviation)	Innovative average (standard deviation)	t-value	Degrees of freedom (df)	p-value
Readiness, skills and education of human capital	Innovation excellence and intellectual capital	4.84 (0.79)	4.35 (0.90)	–3.74	180	0.00
	Training quality and scientific competence	3.57* (0.96)	3.17* (1.05)	–2.59	180	0.01
	Total innovation excellence and human resources	*4.30 (0.68)*	*3.87 (0.76)*	*–3.93*	*180*	*0.00*

*Note: * Significantly lower (95%) than the most important dimension of the sub-sample (based on ANOVA analysis)*

The results show that of the two factors in this category, innovation excellence and intellectual capital (4.84 and 4.35) scored higher for both HIDE enterprises and innovative companies. The difference between the average value of the two factors per group of companies is significant (at the 95-per cent probability level). This confirms that businesses rely heavily on their innovation and intellectual capital for their innovation activities.

The analysis also shows that, on average, HIDE enterprises associate a higher value with the main category and its sub-dimensions. These companies are more supportive of corporate R&D activities and rigorous in protecting their innovation results. Their employees actively participate in the enterprise's R&D activities and contribute to innovation through entrepreneurial skills. Furthermore, being more satisfied with the technological infrastructure needed to run a business suggests that they are prepared to support creative processes.

The study shows that human capital development is key for HIDEs, as it allows them to gain an advantage in the innovation race. This draws attention to the need for innovative businesses to train and develop their workforce to improve their innovation capabilities and competitiveness.

Businesses are encouraged to invest in their workforce's continuous training and development, with a particular focus on STEM areas and programmes to promote creative thinking. It is also important to share knowledge and actively involve employees in innovation activities, which can help to strengthen the company culture and generate new ideas.

6.4. Demand and market absorption

In our research, we examined the dimensions under the main categories of demand and market absorptive power, which focus on understanding market demand, leveraging government support, and strengthening business success and market position. These factors are key to achieving the long-term growth and stability objectives of businesses. *Table 7* presents the results for the HIDE and innovative subsamples.

Table 7
Analysis of the main category 'Demand and market absorptive power' and its dimensions

Main category	Factors	HIDE average (standard deviation)	Innovative average (standard deviation)	t-value	Degrees of freedom (df)	p-value
Demand and market absorptive power	Business success and market position	4.03 (0.93)	4.11 (0.96)	0.54	179	0.59
	Market environment and government support	2.91* (0.87)	2.85* (0.87)	–0.49	180	0.63
	Total demand and market	*3.46 (0.69)*	*3.47 (0.71)*	*0.03*	*180*	*0.98*

*Note: * Significantly lower (95%) than the most important dimension of the sub-sample (based on ANOVA analysis)*

The results show that of the two factors in this category, of business success and market position (4.03 and 4.11) scored higher for both HIDE and innovative companies. The average value of the dimensions 'market environment' and 'government support' (2.91 and 2.85) is significantly lower (at the 95 per cent probability level). This result shows that companies belonging to both subsamples see their business success in terms of demand and market as their primary source of recognition, and that they value their knowledge of the different market indicators and their understanding of their customers, and on this basis, their segmentability.

An analysis of the main category shows that business success is not only about increasing revenue, but also about the recognition of the business in the market.

The analysis suggests that it is strategically important for businesses to strengthen their market position and accurately segment their customer base. For the innovative companies included in the study, it is important to invest continuously in market research and analysis of customer behaviour and to make the most of government support programmes and export opportunities. Businesses need to adapt to market changes and proactively respond to demand trends to maintain and increase their market share and business success.

6.5. Culture and motivation

The main category 'Culture and motivation' focuses on the importance of entrepreneurial culture, motivation, gender balance, learning from mistakes and the role of strategic partnerships. These factors make a crucial contribution to enterprises' innovative capacity and market adaptability, which are essential to gaining and maintaining a competitive advantage. *Table 8* presents the results for the HIDE and innovative subsamples.

Table 8
Analysis of the main category 'Culture and motivation' and its dimensions

Main category	Factors	HIDE average (standard deviation)	Innovative average (standard deviation)	t-value	Degrees of freedom (df)	p-value
Cultural and motivational factors	Market competition and strategic partnerships	4.10 (0.86)	3.99 (0.89)	–0.79	180	0.43
	Entrepreneurial motivation and commitment	3.99 (0.86)	3.96 (0.75)	–0.24	173	0.81
	Gender balance	3.65* (1.53)	3.66* (1.53)	0.07	179	0.94
	Error and risk-taking	3.53* (0.79)	3.50 (0.76)	–0.238	177	0.81
	Entrepreneurial risk-taking attitude	2.72* (1.12)	2.49* (1.31)	–1.17	140	0.26
	Total cultural and motivational factors	*3.62 (0.58)*	*3.59 (0.56)*	*–0.40*	*180*	*0.69*

*Note: * Significantly lower (95%) than the most important dimension of the sub-sample (based on ANOVA analysis)*

The results show that the most important factors for both HIDE and innovative firms are market competition and strategic partnerships, with the highest average scores (4.10 and 3.99, respectively). Entrepreneurial motivation and commitment, the second factor on average, scored slightly lower than the first dimension (3.99 and 3.96), although not significantly so.

In examining the main category 'Culture and motivation' the least important factor was found to be entrepreneurial risk-taking attitude. This set of factors describes the importance of risk-taking and positive attitudes for both female and male entrepreneurs in entrepreneurial cooperation. This seems to be the least important for both sub-samples tested.

A comparison of the means of the two subsamples showed no significant difference. For the main category 'Culture and motivation' both HIDE and innovative companies score the same in each dimension.

The analysis shows that strategic partnerships and the ability to compete in the market are key for businesses. This underlines the importance of constantly monitoring market dynamics and building strategic alliances for business success. In addition, entrepreneurial motivation and commitment, as well as gender balance and learning from mistakes, are also important factors that support business innovation and adaptability.

Building strategic partnerships and thoroughly understanding competitive market factors can increase companies' market responsiveness and innovation capacity. Strengthening cultural and motivational factors is important for companies, as they directly contribute to business resilience and long-term success.

7. Summary

The research results highlight the differences between HIDE and innovative enterprises in terms of access to finance, the availability of infrastructure, and the quality and use of human capital. HIDEs benefit from significant advantages in terms of venture capital and financial support, which have a profound impact on their ability to innovate and succeed in the market. By contrast, innovative firms, while having similar infrastructure and human resources levels, are less likely to use these resources efficiently.

The benefits of infrastructure and human capital revealed by the factor analysis are paramount for HIDE enterprises, which better integrate and exploit these resources, thereby increasing the development of their production and development processes. The dimensions of culture and motivation are also important for firms'

innovative capacity and adaptability, although there are no significant differences between the two groups of companies.

Future research should look at internal communication strategies and information flows within individual companies, which could contribute to improving corporate resilience and crisis management capabilities. A deeper analysis of the links between innovation processes and corporate culture can help to understand how internal organisational factors influence innovation capabilities. In addition, the speed and efficiency of technological adaptation, including digitalisation processes and their impact on the competitiveness of companies, should be examined. The accelerating pace of technological development and the challenges of digital transformation can offer new perspectives on the adaptation strategies of HIDE and innovative businesses.

Finally, as research expands, the study of the relationship between corporate management styles and decision-making processes may also become a key issue. This can help to clarify how different management practices affect the ability of companies to innovate and adapt to the market. This analysis can help companies better understand and manage internal and external challenges in the innovation process.

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Main Impacts of the Introduction of IFRS 17 on the Hungarian Insurance Sector*

Zsófia Szikráné Lindner – Beatrix Dénes – Gabriella Kosztik – Gabriella Merész – Mária Somogyvári Sándorné

The analysis presents the effects and supervisory experience of the transition to IFRS 17 applicable to the insurance sector from 1 January 2023. The new standard is significant as it sets out a harmonised methodology for insurance contracts based on fair value, which is also the greatest challenge. It is estimated that the sector spent HUF 13.5 billion between 2018 and 2023 to prepare for IFRS 17. Three insurers report under IFRS: the accounting policies of these companies have changed significantly, and the transition has resulted in an overall increase in their equity. Twelve other insurers belonging to international groups prepare IFRS calculations for the group accounts. The application of IFRS 17 mainly affects these entities in terms of business plans and performance measurement. For these institutions, the analysis of IFRS calculations showed that the impact on equity varies in direction and magnitude, but that overall the application of IFRS would result in an increase in equity.

Journal of Economic Literature (JEL) codes: G22, M41, M48

Keywords: IFRS 17, accounting, insurance, capital position, supervision

1. Introduction

One of the newest elements of the International Financial Reporting Standards (IFRS), the international accounting system based on uniform principles, is IFRS 17 'Insurance Contracts', which applies to insurance contracts. IFRS 17 was published by the International Accounting Standards Board (IASB) on 18 May 2017 and amended on 25 June 2020. The date of entry into force was amended several times, and applies from 1 January 2023. It supersedes IFRS 4 and related interpretations. The new standard is a significant step forward as it sets out uniform valuation

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Zsófia Szikráné Lindner: Magyar Nemzeti Bank, Actuary. Email: szikranelizs@mnb.hu
Beatrix Dénes: Magyar Nemzeti Bank, Chief Supervisor. Email: denesb@mnb.hu
Gabriella Kosztik: Magyar Nemzeti Bank, Actuary. Email: kosztikg@mnb.hu
Gabriella Merész: Magyar Nemzeti Bank, Head of Department. Email: mereszg@mnb.hu
Mária Somogyvári Sándorné: Magyar Nemzeti Bank, Supervisory Advisor. Email: somogyvarisne@mnb.hu

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principles for the measurement of insurance contracts (and reinsurance contracts held), unlike its predecessor IFRS 4, which allowed insurance contracts to be measured under previous accounting rules. In line with IFRS principles, the main objective of IFRS 17 is to ensure that companies present insurance contracts fairly in their financial statements on the basis of relevant information.[1]

The question arises as to how the Hungarian insurance sector is affected by the application of IFRS 17. The applicability of IFRS is mainly determined by the accounting rules in force in the European Union and in Hungary. Under EU legislation, the application of International Accounting Standards (IAS) is mandatory for the consolidated financial statements of listed (public) companies from the 2005 financial year. EU legislation has also left it up to member states to permit or require companies to prepare their (individual) annual financial statements in accordance with international accounting standards. In Hungary, this is governed by Act C of 2000 on Accounting,[2] which regulates the scope of entities to which IFRS can be applied (or are applicable) for the purpose of individual reporting. According to the regulation on insurance companies, as of the 2018 financial year, listed insurance companies are required to prepare annual (individual) accounts in accordance with IFRS[3] (there is currently one listed insurer on the Hungarian market). In other cases, the use of IFRS instead of Hungarian accounting is optional but not mandatory for insurers. The use of IFRS is not allowed for mutual associations.

In this regulatory environment, three of the 22 insurers in the Hungarian insurance sector (under the scope of Solvency II[4]) currently prepare their financial statements under IFRS. Since 2018, IFRS have been applied by the insurance companies belonging to the CIG Pannónia Group (CIG Group), the Group's parent (listed) insurer CIG Pannónia Életbiztosító Nyrt. (CIG Life Insurance Company) and its subsidiary CIG Pannónia Első Magyar Általános Biztosító Zrt. (CIG EMABIT). Gránit Biztosító Zrt. (until 15 February 2024 Wáberer Hungária Biztosító Zrt., hereinafter referred to as Gránit Insurance) has been preparing its financial statements in accordance with IFRS since 2022. These institutions measure their insurance contracts in

[1] Regulation (EU) 2023/1803, Preamble (4): *Commission Regulation (EU) 2023/1803 of 13 August 2023 adopting certain international accounting standards in accordance with Regulation (EC) No 1606/2002 of the European Parliament and of the Council* (europa.eu): https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32023R1803

[2] https://net.jogtar.hu/jogszabaly?docid=a0000100.tv

[3] Pursuant to Section 9/A (2) of Act C of 2000 on Accounting: "The annual financial statements shall be prepared in accordance with IFRS (*a*) by an undertaking whose securities are traded on a regulated market of any Member State of the European Economic Area".

[4] Solvency II framework: a harmonised prudential framework in the European Union based on Directive 2009/138/EC. The Solvency II framework lays down uniform requirements for the assessment of the solvency position of insurers, corporate governance, and data reporting and disclosure across the European Union (*Bora et al. 2016b:89*). Currently, 22 Hungarian insurers are covered, except for small insurers covered by Part 6 of Act LXXXVIII of 2014 on Insurance Activities (Insurance Act) (the latter category mainly includes small agricultural insurance associations).

accordance with IFRS 17 from 1 January 2023. The gross written premium of the three institutions accounts for around 5 per cent of the total gross written premium of the sector.

In the case of Hungary, a further specific feature is that most of the 22 insurers belong to listed European insurance groups, which are required by EU regulations to prepare their consolidated financial statements in accordance with IFRS. To do so, they request inputs, i.e. IFRS-compliant calculations, from their subsidiaries. Smaller subsidiaries, whose weight within the group is not material, are not affected, and accordingly in total twelve insurers prepare IFRS calculations for group reporting purposes. The first application of IFRS 17 also had an impact on the activities of these institutions. These twelve insurers account for 88 per cent of the sector's gross written premium. For the other part of the sector, the introduction and application of the new standard has had less impact on daily operations (two of these are insurance associations and therefore cannot apply IFRS).

The Hungarian insurance sector is thus affected by the introduction of the new standard, and so it is no coincidence that a number of domestic and international analyses and papers have recently dealt with the preparation and methodological issues related to IFRS 17, as well as the expected implications of using the new standard. Before the introduction of the standard, *Hanák* (*2017*) summarised the main steps in the preparation of IFRS 17, the challenges to be addressed and the most important methodological novelties in IFRS 17. *Árendás et al.* (*2018*) addressed the impact of the introduction of the standard on the business operations and financial performance of insurers. In their analysis, they distinguished whether insurers perform IFRS calculations for individual reporting purposes or for reporting to the group, which may lead to different methodological choices (rational simplifications). Most of the studies have highlighted the impact of the transition on, among other things, insurers' strategic planning, the Key Performance Indicators (KPIs) used to measure performance, resource allocation, IT systems, and processes and calculations. *Szepesváry* (*2019*) focused on the main actuarial and IT challenges posed by IFRS 17, in particular on the identification and impact of onerous contracts. *Palmborg et al.* (*2021*) dealt with the measurement of financial performance of insurers under IFRS and the challenges of calculations in their article. *Lakatos* (*2023*) summarised the main ideas of the closing panel discussion of the conference 'Information on the insurance market for lawyers and on insurance law for economists', also focusing on the impact of IFRS 17 on daily business and financial reporting.

In addition to the above, it should be mentioned that the various audit firms have played a significant role in supporting the preparation. A number of studies have been carried out by these companies to assess the preparedness for IFRS 17 and

present the results. Documents on the illustration and interpretation of IFRS 17 financial statements, as well as details on the expected key performance indicators, have also been prepared and used in the writing of this article (*Deloitte 2023*; *KPMG 2020*; *PwC 2019*).

In this analysis, we primarily seek to answer the question as to how the transition to IFRS 17 affects the actors in the insurance sector, looking specifically at the main qualitative and quantitative impacts on the three institutions applying IFRS 17 and preparing their financial statements in accordance with IFRS, on the one hand, and on the twelve institutions indirectly affected by the application of IFRS through the group reporting, on the other.

The quantitative analysis focused on the overall impact on the financial situation of insurers. Thus, we focused on the changes in assets, liabilities and equity reported in each system (IFRS, Solvency II and Hungarian accounting). We considered it of particular importance to compare IFRS calculations with those under Solvency II (SII), the European harmonised prudential framework, for the following reasons.

On the one hand, the performance of SII calculations is an important common point between the two sets of institutions (insurers using IFRS for individual reporting and those reporting IFRS data only to the group), so a comparison with this helps to compare results.

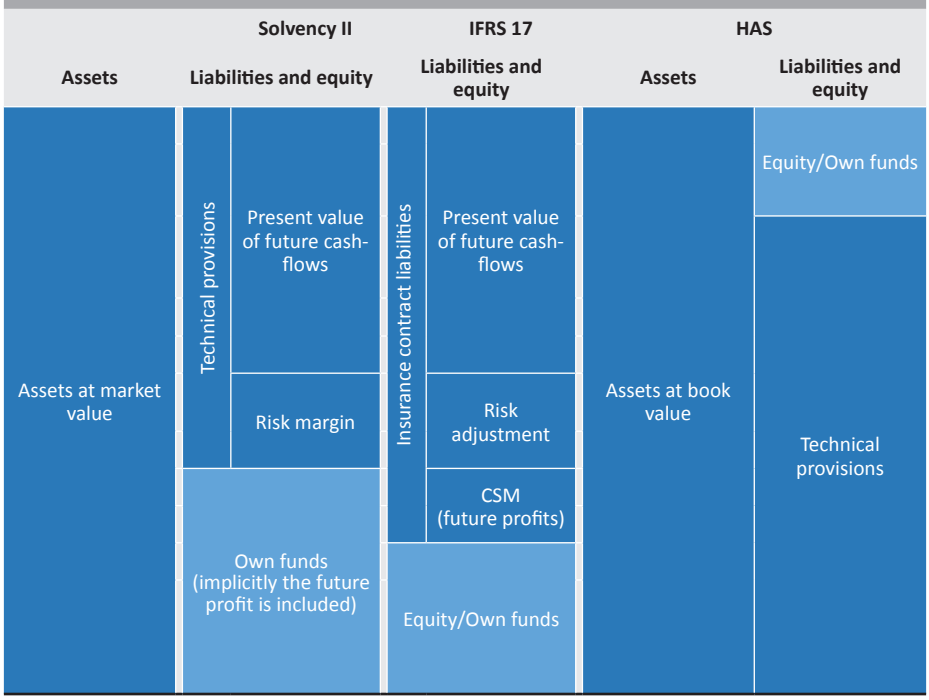
The inclusion of equity under SII is also justified by the fact that the change in accounting equity resulting from the impact of the transition to IFRS 17 is important but is not expected to have a significant impact on the dividend payments of insurers, which will continue to be determined by their solvency level under SII to the extent that the volatility capital buffer[5] is met.

In addition, it was important to note that IFRS 17 and SII have many similarities in valuation principles and methodology, both based on the fair market valuation of insurance contracts. Similar methodological components are used in the calculation of technical provisions, such as best estimates of future cash flows, discounting and risk margins/adjustments. However, there are also important differences in principle, for example, the IFRS 17 technical provisions – in case of the GMM (General Measurement Model) and VFA (Variable Fee Approach) valuation methods[6] – is increased by the accrual of expected future profits, the so-called

[5] According to MNB Recommendation 6/2016, it is recommended that individual insurers maintain a volatility capital buffer of at least 90 per cent over a one-year period to protect against unexpected capital losses.
[6] The General Measurement Model (GMM) is the basis for measuring insurance contracts under IFRS 17, with certain exceptions. In many cases, the VFA measurement model is applied to life contracts with direct profit-participating, which is mandatory under certain conditions. In the non-life sector, the most common method for valuing insurance contracts is the Premium Allocation Approach (PAA).

CSM (Contractual Service Margin), while in SII future profits of existing contracts are part of equity.[7] Compared to the Hungarian Accounting Standard (HAS), this is a significant difference for both systems, as future profits are not shown in the HAS accounting balance sheet (*Table 1*).

Table 1
Schematic balance sheet according to Solvency II, IFRS 17 and HAS (illustration)



The significantly simplified, schematic balance sheet presented in *Table 1* illustrates the material difference between the technical provisions under SII and IFRS 17, the inclusion of CSM as introduced by IFRS 17. It is important to point out, however, that the methodologies for calculating the present value of future cash flows and the risk margin in the two systems are different. Hence, their values may differ significantly (which is not illustrated in the table). At the time of writing, information on these differences was available in a report published by the European Insurance and Occupational Pensions Authority (EIOPA) on 15 April 2024. According to *EIOPA* (*2024*) survey,[8] the value of the IFRS 17 technical provisions (present value of future

[7] *Hanák* (*2017*) describes the expected impact of the new standard, the transition issues and the relationship between IFRS 17 and Solvency II.
[8] The survey covered listed European insurance groups and the reference date for the figures is 30 June 2023.

cash flows and risk adjustment) without CSM is on average 2.5 per cent lower than the value of the SII technical provisions (present value of future cash flows and risk margin). However, there may be differences at the level of individual institutions.

2. Impact of IFRS 17 on insurers applying IFRS

For the three Hungarian insurers that prepare their individual financial statements in accordance with IFRS, the transition to IFRS 17 had a direct impact. We first describe the methodology used to assess the impact of the transition to IFRS 17, followed by the qualitative and quantitative impacts that are more important from a supervisory perspective.

2.1. Impact assessment for institutions applying IFRS

The Magyar Nemzeti Bank (the Central Bank of Hungary, MNB) started to monitor more closely the preparation process for the transition to IFRS 17 at the institutions concerned in 2022. The beginning of the annual reporting period before the date of first-time application of IFRS 17 was 1 January 2022, the reference date for the opening balance sheet prepared by insurers applying IFRS using IFRS 17. The impact of the adoption of IFRS 17 was therefore first analysed and assessed for the opening financial data at the beginning of 2022 (i.e. year-end 2021). These analyses were mainly for internal purposes, and the impacts were not yet published back then.

The impact of the first-time adoption of IFRS 17 is presented in this analysis for the three Hungarian insurers applying IFRS on the basis of publicly available data (due to the small number of insurers involved and data protection considerations). The first publicly disclosed information on the impact of the transition from IFRS 4 to IFRS 17 on the financial position and profitability was included in the financial statements for 2022. However, they mainly focused on the methodological implications of the presentation and application of the new standard and the significant change in accounting policies. In developing their accounting policies, insurers applying IFRS had to perform an analysis of the specific accounting and disclosure differences and then develop their accounting policies to implement IFRS 17. The financial statements for 2022 presented only limited quantitative impacts. One important milestone in this respect was that by 31 May 2024 the audited accounts for 2023 were completed by the insurers concerned, which show the impact of the transition to IFRS 17 in detail.

In the analysis, the main qualitative impacts are highlighted, and the main numerical impacts are presented, taking advantage of the availability of audited data. For 2021 and 2022, we present the impact of IFRS 17 adoption on equity and profit for 2022. We do not attempt to analyse and explain the data in more detail, as this is done by the insurers themselves in their publicly available financial statements.

Finally, the equity under IFRS was compared with the value of equity calculated under SII (excess of assets over liabilities) to examine the consistency between the two valuation methods. In this respect, insurers also conducted their own assessment in the disclosure reports to be prepared under the Solvency II framework. In fact, in Chapter D of the Solvency and Financial Conditions Report (SFCR), they are legally obliged to describe the main differences between the valuation for financial reporting purposes and the valuation under the SII.[9]

2.2. Reporting and disclosure rules under IFRS 17

In general, IFRS financial statements differ substantially from the formal-statutory financial statements prepared in accordance with Hungarian accounting standards. When IFRS are applied, the regulations provide greater freedom in terms of the form of the financial statements and the items to be reported. The statements of financial position and comprehensive income should include material and relevant information and items. One positive outcome of the adoption of IFRS 17 is that the scope of explanations and disclosures on insurance contracts and related accounting is significantly expanded, including explanations of the amounts recognised, significant judgements made in applying IFRS 17 and the nature and extent of risks arising from contracts within the scope of IFRS 17.

Under the previous standard, IFRS 4, the main items under HAS were still included in the accounts of the institutions applying IFRS, due to the identical valuation of technical provisions, but the insurers only presented the items that were relevant to them in a freer, more informal manner. However, when IFRS 17 is applied, the measurement and therefore the scope of the information presented in the financial statements is significantly different, especially with regard to the profit and loss account. The profit and loss account under HAS is based on gross written premium, with the main expenses being claims paid and changes in provisions. However, according to IFRS 17, insurance revenue is the amount that the insurer expects to receive in return for bearing the risk of a group of contracts or for other services provided to the group of contracts (*Hanák 2017*). The insurance revenue is based on the release of the insurance obligation. Expected future profits are released in

[9] *Commission Delegated Regulation (EU) 2015/35 of 10 October 2014 supplementing Directive 2009/138/EC of the European Parliament and of the Council on the taking-up and pursuit of the business of Insurance and Reinsurance (Solvency II)* Article 296: https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32015R0035

proportion to the insurance service over the life of the contract, while expected losses are recognised immediately. This means that the overall profit on the insurance contract is the same, but its realisation over time can differ significantly. The interpretation of insurance income and expense under IFRS 17 was presented in detail by *Hanák* (*2017*), while *Mottura's* (*2021*) study examined the timing of the recognition of income and expense in the three systems – SII, national accounting, IFRS 17 – through a simple example.

One important consequence of the transition to new reporting principles, new reporting formats and new disclosure requirements is that the insurers concerned are setting new KPIs to better inform investors and owners (*Kozma 2023:108*). In terms of their composition, there are unchanged indicators (e.g. number of contracts, gross written premiums), variables in terms of content (e.g. combined ratio[10]) and new indicators such as CSM, which is an indicator of the future profit potential of the insurer. The new type of performance indicators are expected to be applied not only by the institutions applying IFRS, but may also affect the operations of insurers belonging to groups that report to their parent company under IFRS.

2.3. Supervisory and statistical aspects with entry into force of the new standard

The main purpose of IFRS is to measure the performance of business entities according to the same principles, based on current financial data, allowing comparisons between entities operating in different sectors in different countries, especially for investors. The use of financial reporting for other purposes is pushed to the background, making it difficult to treat the insurance sector as a whole from both a supervisory and statistical perspective.

For insurance companies that do not apply IFRS, Government Decree 192/2000[11] determines the structure of the financial statements, balance sheet and profit and loss account and the content of the individual items. For institutions applying IFRS, the structure of the accounts is left to the discretion of the institutions, while taking into account the relevant IFRS rules. From a supervisory point of view, it is important that, as in the sector as a whole, statements of financial position and income are available for institutions applying IFRS and that information on these is available during the year (in the form of quarterly reports). Annexes 6 and 7 of MNB Decree 59/2023 (XI. 24.)[12] contain the supervisory reporting requirements for insurers other than small insurers, with new tables for those applying IFRS. The new reporting

[10] An indicator, mainly used for non-life insurance, comparing claims incurred and expenses incurred in a given year with premiums earned. In simple terms, if the value is below 100 per cent, the business is considered profitable.
[11] https://net.jogtar.hu/jogszabaly?docid=a0000192.kor
[12] https://njt.hu/jogszabaly/2023-59-20-2C

tables include the most important items on the financial position and the statement of comprehensive income. On the supervisory side, the risk indicators of insurers applying IFRS have already used this input data starting from 2023 Q1.

In addition, it is important to stress that we also use the data we receive for statistical purposes. The insurance time series published on the MNB's website[13] also contain information on profitability, where data reported by insurers applying IFRS are also included.

2.4. Impact on equity and profitability (IFRS 17 vs IFRS 4, SII)

For insurance companies that apply IFRS, the most relevant standards are, due to the nature of their activities, those for insurance contracts (IFRS 4, then IFRS 17) and for financial instruments that determine the valuation of their investments (IAS 39, then IFRS 9).

IFRS 17 applies to the valuation of insurance contracts from 1 January 2023. Its predecessor, IFRS 4, established the definition of an insurance contract and set out disclosure requirements,[14] but allowed contracts to be valued under previous accounting rules; accordingly, institutions applying IFRS continued to value their insurance contracts under Hungarian accounting rules. By comparison, IFRS 17 resulted in a significant change, setting out a single set of valuation principles and methodology for the valuation of insurance contracts (and reinsurance contracts held), based on fair value,[15] but which was significantly different from the previous ones (according to HAS).

Investments are measured in accordance with IAS 39 'Financial Instruments: Recognition and Measurement' at fair value in line with IFRS principles (similar to economic measurement under SII[16]). Insurers were allowed to continue applying IAS 39 after the entry into force of IFRS 9 'Financial Instruments', which replaced IAS 39. As IFRS 4 did not introduce 'fair value measurement' of insurance contracts on the liability side, insurers were granted a temporary exemption from IFRS 9 until the first application of IFRS 17. Compared to IAS 39, the measurement principle, 'fair value', has not changed as a result of applying IFRS 9.

[13] https://statisztika.mnb.hu/statistical-topics/supervisory-statistics/iii_-insurance-sector/time-series-of-insurance-companies

[14] By requiring the Liability Adequacy Test (LAT), it has taken the first step towards valuing insurance contracts based on an estimate of the actual cash flow (*Hanák 2017:35*).

[15] Paragraph 9 of IFRS 13 (Fair Value Measurement) defines fair value as the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date.

[16] Under Article 75 of the Solvency II Directive, assets are to be measured at the amount at which they could be exchanged between knowledgeable, willing parties in an arm's length transaction. Liabilities are to be measured at the amount at which they could be transferred or settled between knowledgeable, willing parties in an arm's length transaction.

Hungarian insurers have applied IFRS 9 since 1 January 2022 (the year before the mandatory application of IFRS 17). CIG insurers had previously measured their investments according to IAS 39. The impact of IFRS 9 on their accounting policies was significant, but the impact of the transition on equity was not significant due to the same measurement principle (no comparative figures were required). Gránit Insurance has applied IFRS 9 since its transition to IFRS since 1 January 2022, which meant a significant change for the company compared to HAS. It started to measure its securities, which were previously measured at amortised cost, at fair value (the fair value difference in investments was HUF 636 million on 1 January 2021 and HUF –1.7 billion on 31 December 2021). In total, the transition from HAS to IFRS resulted in an increase in equity of HUF 324 million at the beginning of 2021 and a decrease in equity of HUF 1.3 billion at the end of 2021.

IFRS 9 introduced significant changes compared to IAS 39 in the categorisation of investments, the rules for classification and the items to be accounted for (e.g. impairment). It is therefore important to apply the two standards – IFRS 17 and IFRS 9 – together to ensure consistency in the measurement of assets and liabilities.

Insurers already applied IFRS 9 on the asset side before the first application of IFRS 17, and therefore we present the impact directly linked to the application of the new standard, IFRS 17, for the period 2021–2022. Based on the 2022 and 2023 annual financial statements, the main data are summarised *in Table 2.*

Equity in 2021 reflected a significant increase for two out of three institutions due to the transition from IFRS 4 to IFRS 17. For the two institutions, the increase in equity was due to the fact that the value of liabilities decreased more than the value of assets. The change on the liability side was of course driven by the different valuation of insurance contracts.

Table 2
Impact of IFRS 17 on equity and profit for the year, based on the accounts of the institutions applying IFRS

	IFRS 17 (HUF million)	Change compared to IFRS 4		Change compared to SII	
		HUF million	%	HUF million	%
Equity/Own funds – 31 Dec 2021					
CIG Life Insurance	19,350	7,128	58	232	1
CIG EMABIT	3,689	–430	–10	–594	–14
Gránit Insurance	27,587	12,107	78	–202	–1
Profit for the year – 2022					
CIG Life Insurance	1,886	429	29	n.a.	n.a.
CIG EMABIT	–473	357	43	n.a.	n.a.
Gránit Insurance	6,220	1,222	24	n.a.	n.a.
Other comprehensive income – 2022					
CIG Life Insurance	–1,421	2,311	62	n.a.	n.a.
CIG EMABIT	24	102	131	n.a.	n.a.
Gránit Insurance	–916	800	47	n.a.	n.a.
Equity/Own funds – 31 Dec 2022					
CIG Life Insurance	18,115	9,867	120	446	3
CIG EMABIT	4,239	27	1	193	5
Gránit Insurance	32,891	14,130	75	1,362	4

Note: n.a. – not applicable

Source: SII data based on SFCR reports for 2021 and 2022 published on the Insurers' website (downloaded on 27 May 2024), Financial Statements data based on reports for 2022 and 2023 downloaded from the Company Information and Electronic Company Registration Service (E-reporting) website of the Department of Justice (downloaded on 4 June 2024)

For 2022, equity under IFRS 17 increased further compared to IFRS 4, mainly due to higher profit and other comprehensive income under IFRS 17 in 2022. The latter item was typically negative in 2022, presumably due to a decrease in the value of investments measured at fair value through other comprehensive income (high yield environment). When IFRS 17 is applied, this is somewhat offset by the effect of the decrease in technical provisions due to changes in interest rates in the context of discounting of provisions, recognised in other comprehensive income, if the OCI option[17] is applied.

[17] Other comprehensive income (OCI) comprises items of income and expense (including reclassification adjustments) that are not recognised in profit or loss as required or permitted by other IFRS. Under IFRS 17, insurers may choose to recognise the effects of changes in financial assumptions (for example, assumptions about rates of return) in other comprehensive income.

The 2022 financial result was higher for all three insurers under IFRS 17, but the return on equity (ROE) decreased for two institutions compared to IFRS 4. The financial reports also show the advantage of applying the new standard in that the performance of each portfolio group is presented in detail (segment by segment). This significantly increases transparency and better understanding of the source of the result.

Table 2 shows the Solvency II value of equity (excess of assets over liabilities). Overall, due to the similarities between the SII and IFRS 17 measurements, we expect that for institutions using IFRS, the consistency between their calculations to comply with the quantitative requirements of the Solvency II framework (economic balance sheet, capital adequacy calculations) and their calculations for financial reporting purposes will be strengthened (SII equity is similar to IFRS 17 equity).

3. Impact of IFRS 17 on insurers using IFRS for reporting to their group

The impact of the transition to IFRS 17 for the twelve insurers that prepare their individual financial statements in accordance with Hungarian accounting standards, but prepare IFRS accounts for the group is mixed. For this group of institutions, we firstly describe the methodology used to examine the effects. We then look at the main qualitative and then quantitative impacts. As only eleven institutions were able to provide reliable data, only their data are presented in the quantitative analysis.

3.1. Assessing the impact on insurers reporting IFRS data to the group

For the twelve insurers concerned, the fact of belonging to the group is the reason for the IFRS calculations. In this case, we first conducted an international outlook to better understand the IFRS-related regulations in the country of the parent company, as this may indirectly affect the depth of IFRS accounting expected of the subsidiaries.

Based on supervisory experience, the first application of IFRS 17 to these institutions also required extensive preparation. They prepared their opening balance sheet for 2022 with the application of IFRS 17 and assessed the impact of the new standard in varying degrees of depth.

In order to assess the impact of the transition to IFRS 17, the MNB performed a questionnaire survey in the spring of 2023 among the most affected (medium and large insurers belonging to groups) insurers, collecting information from twelve affected insurers. This survey also included a request for quantitative data, the main balance sheet and profit and loss data under IFRS accounting for the reference period 2022 year-end. In practice, this meant requesting the main rows of the reporting tables for institutions using IFRS, which are part of the MNB national

reporting, as already mentioned in *Section 2.3.* Eleven insurers were able provide sufficiently reliable data on this.

In presenting the quantitative impacts, we typically rely on aggregate data. Although we analyse similar data as for the institutions applying IFRS, two important differences are worth pointing out here.

On the one hand, for these institutions the base of the comparison is the balance sheet and profit and loss data according to national accounting standards, against which the impact of IFRS is assessed. In this case, therefore, we cannot consider the impact of the application of IFRS 17 in a pure way, because both the asset side (investments, reinsurance contracts held) and the liability side (insurance contracts) are subject to a significantly different valuation compared to the HAS valuation.

On the other hand, during the data analysis, it arose several times that the institutions did not have verified, audited data, and thus the data were provided for information purposes only (in one case, we did not use the data from the institution due to data quality problems). For this reason, this analysis was prepared for information purposes only, which should be taken into account in its possible future use.

It is also worth noting that the reference date of the analysis was the end of 2022, when the hectic macroeconomic environment (unfavourable capital market returns, high yield environment) had a significant impact on the economic valuation (IFRS, SII calculations).

For this group of institutions, we also compared the IFRS data with the Solvency II calculations and examined the results from this perspective as well.

3.2. Belonging to a group – an international perspective

Hungarian insurers are members of German, Dutch, Austrian, Belgian and French (listed) insurance groups, and thus the regulatory environment in these countries has an indirect impact on the detail and depth of IFRS calculations applied by Hungarian insurers.

According to European legislation on the applicability of international accounting systems, Regulation (EC) No 1606/2002[18] requires listed companies to prepare their consolidated accounts in accordance with IFRS. It is the discretion of the Member State to determine whether

[18] *Regulation (EC) No 1606/2002 of the European Parliament and of the Council of 19 July 2002 on the application of international accounting standards* (https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32002R1606)

i. the consolidated accounts of unlisted groups,

ii. the individual accounts of listed insurers,

iii. the individual accounts of unlisted insurers can be prepared under IFRS.

Therefore, different rules and requirements have been and are in place in different European countries. The application of IFRS is mandatory in some countries, optional in others or subject to certain exceptions. In 2022, the International Association of Insurance Supervisors (IAIS) published a data table (*IAIS 2022*) showing the existing arrangements for European countries in applying international standards (*Table 3*). The table should be read with the caveat that regulations may have changed in the meantime in different countries.

Table 3
IFRS regulation (EU27)

		Consolidated financial statements – non-listed companies Whether using IFRS is allowed			Total
		Required	**Permitted**	**No provision**	
Annual financial statements – publicly listed companies Whether using IFRS is allowed	**Required**	Cyprus, Croatia, Estonia, Greece, Latvia, Lithuania, Malta, Slovenia	Czech Republic, **Hungary**	–	**10**
	Permitted	Slovakia	Bulgaria, Germany, Ireland, Luxembourg, Netherlands, Poland	–	**7**
	No provision	Belgium, Italy	Austria, Denmark, Finland, France, Romania, Spain, Sweden	Portugal	**10**
Total		**11**	**15**	**1**	**27**

Note: The table does not show the exceptions and concessions. For example, for the individual accounts of unlisted insurance companies in Hungary, the 'Permitted' category is basically the applicable one. Insurers can choose to apply IFRS, but mutual associations are an exception, which cannot be reflected in the table. The rules for the individual reports of unlisted insurers (category iii) are colour-coded: blue for 'Required', black for 'Permitted' and green for 'No provision'.

Source: Edited by the authors based on IAIS (2022)

Table 3 shows that the regulation regarding unlisted insurers is also significantly influenced by the country's regulation on group reporting and the extent to which IFRS are allowed for individual reporting.

The diversity of the European regulatory environment is clearly visible. In the regulation of individual accounts, the use of IFRS is less of an expectation or option

for unlisted insurers than for listed insurers. The table shows the overall picture at the moment, but it should also be noted that the new standard – IFRS 17 – sets out a common methodology for accounting for the main activities of insurers. This is a significant improvement in the comparability of insurers' results and financial position. This may also mean that in the near future, many countries may review their regulation on the applicability of IFRS, or open up to wider use of international standards.

3.3. Results of the qualitative questionnaire survey

Based on the results of the qualitative questionnaires, the parent-country regulations applicable for the groups have an indirect impact and the governance of the group have a significant impact on local corporate governance, planning and reporting obligations, with significant cost implications, i.e. the effects can be measured and quantified.

The qualitative questionnaire survey covered four main topics:

1. Plans for transition to IFRS and current involvement (e.g. disclosure requirements).
2. Participation in IFRS 17 calculations and use of the results in the operation of the insurer.
3. The resource and cost requirements to prepare for IFRS 17, broken down by cost type, and the workforce capacity requirements. (This issue was also relevant for insurers that apply IFRS; the cost requirement of the transition to IFRS 17 is summarised in *Part 4*).
4. Methodologies used in IFRS 17 calculations.

Based on the results of the questionnaires, a possible transition to IFRS is not yet a goal of either parent companies or local entities, but is an issue that is under continuous consideration.

Out of the twelve insurers surveyed, ten provide quantitative and qualitative data to the parent company, mostly on a quarterly basis, but some also provide data on a monthly basis. None of the institutions has a separate unit for fulfilling IFRS 17 reporting obligations, but there are designated persons at each of the main competence levels, and responsibilities have been established. During the preparation and application process, the increase in staffing levels varies from institution to institution, with the highest increase in actuarial, followed by accounting and IT, as these are the main professional areas preparing the IFRS 17 reporting.

Insurers providing data to their parent companies are also actively involved in the calculation of technical provisions under IFRS 17, to varying degrees of depth. Half

of the institutions are less involved in the IFRS 17 calculations, only transmitting the necessary basic data to the parent company, or transmitting IFRS technical provisions calculated with significant simplifications. Three insurers perform detailed IFRS 17 calculations locally, but they also rely heavily on parent company systems.

In terms of dividend payments, only two institutions indicated that IFRS profitability was taken into account, but the impact was considered negligible. A larger impact can be identified in terms of the use of KPIs. Most of the institutions (nine) already use IFRS-based – newly developed – KPIs and four found the impact on their operations to be significant.

According to the survey, the new regulation will significantly change business planning. New planning processes will have to be introduced, and financial plans will be prepared by institutions in line with the new standard. Nine out of twelve insurers use IFRS 17 data in their business planning, with three institutions considering the impact on their business to be material and five considering it to be significant.

The institutions participating in the survey received professional support from the parent company. Mainly, the group is responsible for developing and managing the data collection and the data repository. The dominant role of the parent company is also clearly visible in terms of methodological issues and choices, so the methods used (such as the method of calculating the risk margin) show a mixed picture.

In terms of the measurement methods used in IFRS 17 calculations, the most common method for the measurement of non-life insurance contracts is the premium allocation approach (PAA), which can be used optionally if conditions are met. In many cases, the VFA measurement model is applied to life contracts with direct profit-participating, which is mandatory if certain conditions are met. The GMM measurement model is only used for 0–10 per cent of the portfolio by the majority of insurers (10), and the other insurers use GMM for a part that is well below 50 per cent.

3.4. Impact on equity and profitability (IFRS vs HAS, SII)

As mentioned in *Section 3.1*, eleven insurers submitted IFRS calculations in the MNB's spring 2023 quantitative survey. The results of this survey are analysed in more detail below. The figures presented refer to the end of 2022 and are for information purposes only.

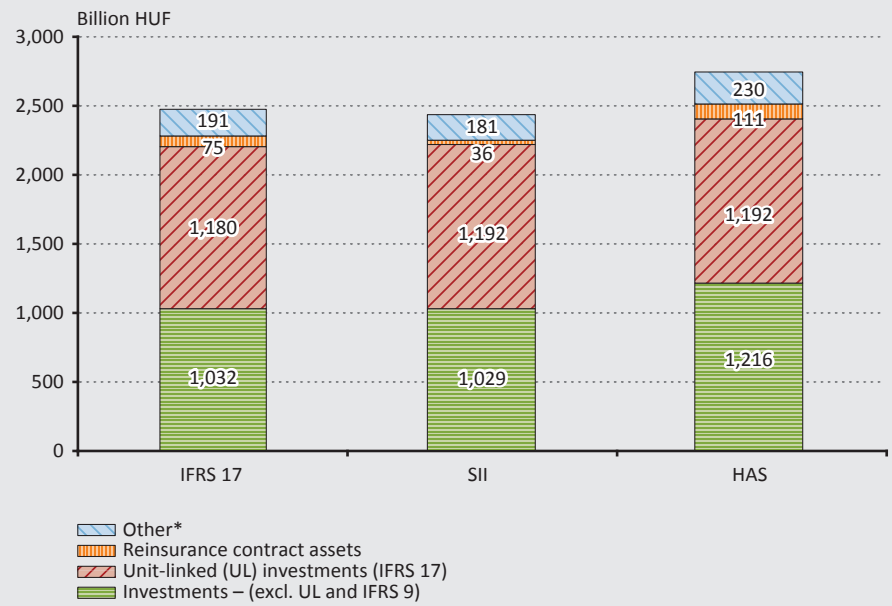
3.4.1. Differences on the assets side

Under IFRS, the value of total assets (HUF 2,477 billion) is 10 per cent lower than the value of total assets under Hungarian accounting as a result of a significantly different valuation methodology. For investments, IFRS require predominantly market valuation, using (where possible) observable and current market prices

and other parameters, as opposed to HAS valuation, which typically requires book valuation, except for investments linked to unit-linked life insurance. Accordingly, the largest difference is in the financial assets of non-unit-linked investments,[19] as can be seen in Figure 1: the IFRS value (HUF 1,032 billion) is 15 per cent lower than the HAS value. Not surprisingly, there is no significant difference in the value of investments linked to unit-linked insurance.

A much smaller item than investments (3 per cent of assets under IFRS) is the reinsurers' recoverables (reinsurers' share of technical provisions), where the valuation differences under IFRS 17 and HAS are significant (this item is shown as "reinsurance contract assets" in *Figure 1* and it is also used as "reinsurance contract held"). The impact of this could be significant, especially at the institutional level, for non-life insurers with larger reinsurance exposures. The value of reinsurance recoverables calculated according to IFRS 17 is typically lower or close to the value calculated according to HAS.

Figure 1
Total assets at the end of 2022 by different valuation methods



*Note: The data refer to the eleven insurers in the sample; * Additional lines on the asset side (e.g. cash and cash equivalents, receivables, property for own use, plant and equipment, intangible assets and goodwill, other assets) are included in the Other category.*

Source: MNB survey, 2023

[19] A significant portion of non-unit-linked investments is directly invested in government bonds (*G. Szabó – Nagy 2021:179*).

Figure 1 also shows the value of all assets by SII. The two types of valuation are based on a similar methodology for the investments that are dominant regarding the asset side of the balance sheet, and therefore the asset side of the IFRS balance sheet does not differ significantly from the SII balance sheet, as confirmed by the data examined (2 per cent difference). In terms of total asset value, the main difference is in the value of reinsurance contracts held and other assets. Based on the analysis, the value of reinsurance contracts held under IFRS 17 is overall higher than their value under SII.

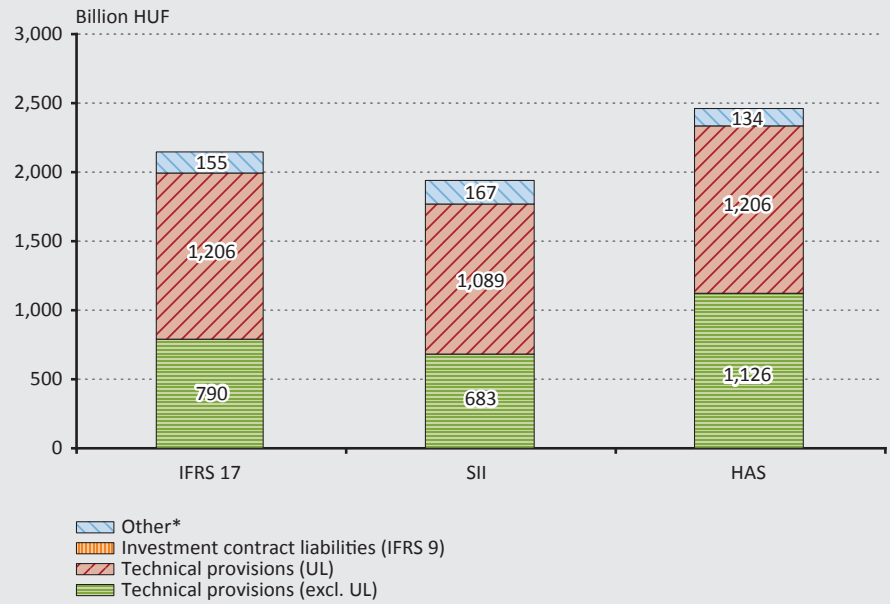
3.4.2. Differences on the liability side

Based on the aggregate data submitted by eleven insurers, the value of liabilities under IFRS 17 (HUF 2,151 billion) is 13 per cent lower than the value under Hungarian accounting, as shown in *Figure 2.* Technical provisions, which are the most significant item, are typically lower under IFRS 17 compared to a HAS valuation. The primary reason for this is that IFRS 17, like SII calculations, forms provisions on the basis of a discounted best estimate. Overall, for the eleven insurers surveyed, the IFRS 17 technical provisions were lower than the HAS technical provisions, and only one institution had higher IFRS 17 provisions. It is also worth looking at technical provisions separately for life and non-life insurances.

In terms of life insurances, if the current discount rate used in the IFRS 17 calculation is higher than the technical interest rate used in the calculation of the mathematical provisions in national accounting, the value of the best estimate of the future cash flows that form the main part of the IFRS 17 technical provisions is expected to be lower than the value of the mathematical provisions in national accounting.

For non-life technical provisions, the main reason for the discrepancy is the discounting applied to the Liability for incurred claims (LIC), which typically results in lower IFRS 17 claim provisions than the HAS claim provisions (especially in a high yield environment). In addition, the technical provisions under the HAS often include a prudence (safety margin), while IFRS 17 is based on the best estimate (expected value) principle, complemented by a risk adjustment (RA).

Figure 2
Total liabilities at the end of 2022 by different valuation methods



*Note: The data refer to the eleven insurers in the sample; * The Other category includes additional lines on the liability side (e.g. portfolios of reinsurance contracts held that are liabilities, financial liabilities – loans and financial reinsurance, forward contracts, lease liabilities, trade and other payables, deferred tax liabilities, subordinated liabilities, other liabilities and provisions).*

Source: MNB survey, 2023

Figure 2 also provides an opportunity to compare IFRS 17 calculations with SII data. Based on aggregated data, the value of liabilities under IFRS 17 is 11 per cent higher than the value of liabilities under SII (HUF 1,939 billion). The methodological basis for the establishment of technical provisions is similar in both systems. The discounted best estimate and the risk margin are used in both systems, but the detailed regulation also contains important differences (e.g. contract boundaries, discount rate used, different grouping of contracts, immediate loss recognition for onerous contracts, methodology for the calculation of the risk margin). The survey found that for the eleven insurers surveyed, the technical provisions under IFRS 17 were higher than the provisions under SII.

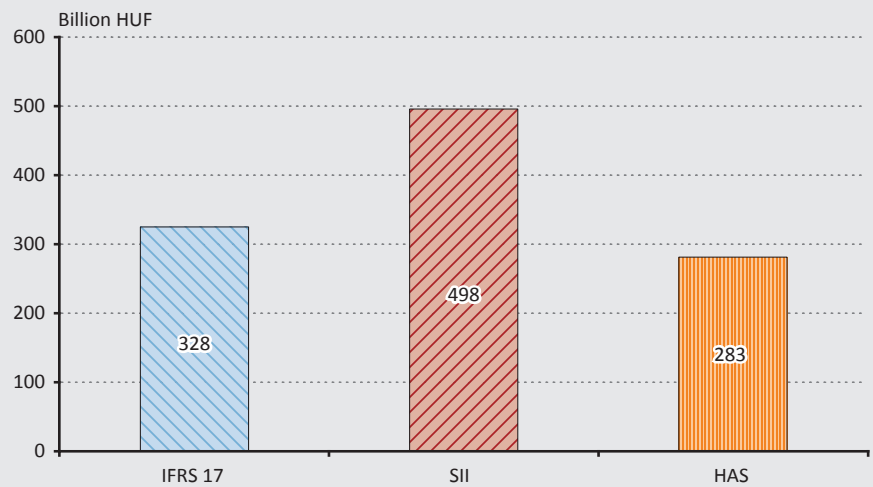
The similarities and differences between IFRS 17 and the SII methodology have been explored in several recent studies (*Deloitte 2020*; *PwC 2017*). *EIOPA*'s (*2024*) report on the impact of IFRS 17 analyses the similarities, differences and quantitative impact of the two calculation methodologies on European insurance groups using data with the reference date 30 June 2023. The results of the report also showed

that IFRS 17 technical provisions are typically higher than SII technical provisions for both life and non-life. According to the EIOPA survey, IFRS 17 life technical provisions were 5 per cent higher due to the CSM than SII technical provisions. Apart from that, the SII technical provisions (present value of future cash flows and risk margin) are typically higher than the technical provisions without CSM (present value of future cash flows and risk adjustment) according to IFRS 17. In terms of non-life insurance contracts, the survey showed that the IFRS 17 technical provisions are typically higher than the SII technical provisions. In case of non-life business, the typical technical provisions calculation method for IFRS 17 is the PAA method, and according to the EIOPA survey results, the technical provisions measured in this way are 10.2 per cent higher than SII technical provisions.

3.4.3. Differences in equity

At the aggregate level, the equity resulting from the application of IFRS was higher than the HAS equity for the institutions under review (as a result of the effect of economic valuation), but lower than the SII equity (the SII equity, available own funds by SII terminology, in this analysis is the excess of assets over liabilities, to which the IFRS net asset value is compared). The comparison is shown in *Figure 3.*

Figure 3
Equity at the end of 2022 according to different valuation methods

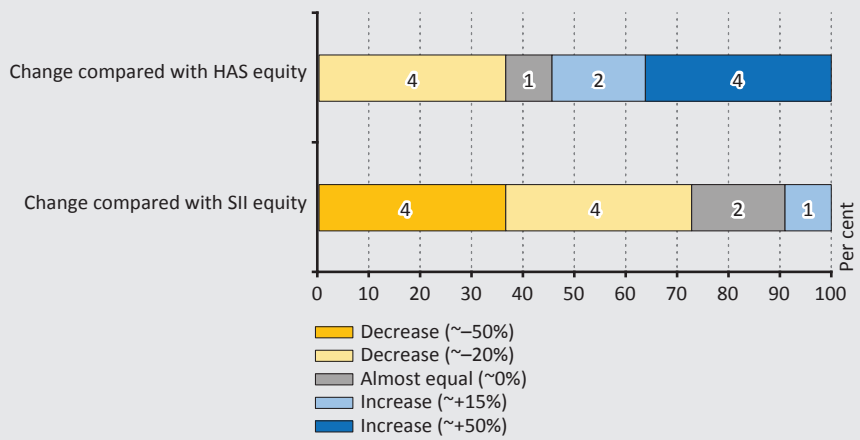


Note: The data refer to the eleven insurers in the sample.
Source: MNB survey, 2023

As regards the analysis of equity, it should be stressed that for 2022, the value of equity is analysed according to different valuation methodologies (prudential and two types of accounting valuation). This year was characterised by a high yield environment and negative capital market returns, which had a major impact on valuations based primarily on economic valuation. Overall, as the change in equity is the result of several effects – externalities and institutional characteristics – it is not clear whether the use of IFRS will cause an increase or decrease for institutions in any given year.

Bar 1 in *Figure 4* shows the change in equity compared with equity under HAS, and compared to *Figure 3,* which contains aggregated data, it provides a more accurate picture of the change in equity for the eleven insurers. It can be seen that the significantly different valuation methodologies (involving both the asset and liability sides) make the direction of the equity change clear to a lesser extent in this comparison. In six cases, there is an increase in equity (to a lesser or greater extent), while in four cases there is a decrease. The fact that, according to IFRS, the total value of liabilities (mainly technical provisions) decreases more than the value of assets typically leads to an increase in equity. In addition, the decrease in equity for the other part of the institutions may be due to a more significant decrease in the value of assets under IFRS compared to the value of assets under HAS. Due to the evolution of the economic environment in 2022, the unrealised loss on investments recognised in equity could result in equity that is significantly lower than under HAS.

Figure 4
Changes in equity at the end of 2022



Note: The data refer to the eleven insurers in the sample.
Source: MNB survey, 2023

Compared to SII equity, the direct impact of the application of IFRS 17 is more identifiable in the evolution of equity under IFRS, as the valuation of investments is similar in the two regimes. Compared to SII equity, IFRS equity tends to decrease (*Figure 4*, *bar 2*) in the case of eight out of eleven insurers, while in three cases the IFRS equity is close to the same or slightly higher.

The lower IFRS 17 equity than SII equity experienced by the majority of institutions was mainly attributed to the differences in principle between SII and IFRS 17 valuations. Of these, we would like to highlight the following three differences, which increase IFRS 17 technical provisions (and thus reduce equity).

The IFRS 17 technical provisions are increased compared to the SII technical provisions because in the SII valuation, future profits on existing insurance contracts are included in the technical provisions as a negative item (thus increasing equity). Under IFRS 17, however, future profits are accrued in the technical provisions as part of the liability for remaining coverage (LRC) in the form of CSM, thus increasing the technical provisions. The CSM will not be released immediately, but gradually over the life of the insurance contract.

For the short non-life technical provisions (within the year), insurers applying IFRS 17 use the simplified PAA method in most cases. In this case, the LRC (premium provision) is calculated according to a method similar to HAS for the unearned premium provision (*EIOPA 2024:13*), which typically results in a higher premium provision than the SII one. This is because the SII premium provision includes the (future) expected profit margin for the period from the reference date to the contract end date. This profit brought forward (as a negative technical provision component) reduces the technical provision under SII (*Bora et al. 2016a:22*).

In addition, for IFRS 17, the grouping of insurance contracts during their measurement (GIC, Group of Insurance Contracts) is more granular, it is based on different principles than in the SII measurement that may increase the technical provisions. In grouping, onerous contracts should be valued separately (*Szepesváry 2019:20*) and the loss should be recognised immediately, while future profits are spread over the life of the contract, which also increases the amount of the technical provision to be formed.

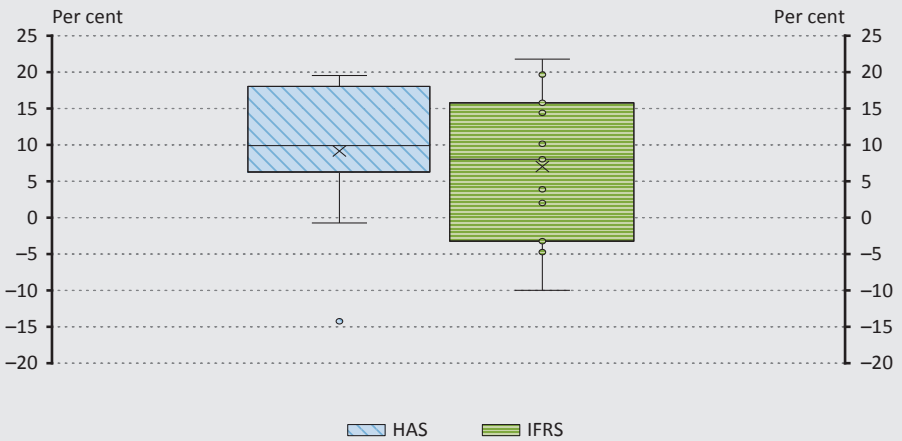
3.4.4. Profit or loss

With the application of IFRS 17, the profit and loss account of insurance companies differs significantly from the national accounting statements (a comparison with the SII methodology is not relevant in this case as it is static in nature and does not include income statement recognition).

For profit after tax, a comparison was made between the performance of insurers under IFRS and under national accounting. The ROE indicator for 2022 was used to compare the results calculated using different methodologies. The application of IFRS would have a significant impact on the profit or loss of all institutions, but the impact on financial results varies significantly from one institution to another.

As shown in *Figure 5*, the volatility of ROE increased with the application of IFRS, and overall the survey showed lower average profits when using IFRS.

Figure 5
ROE indicators of the eleven insurers for 2022 under the two accounting regimes



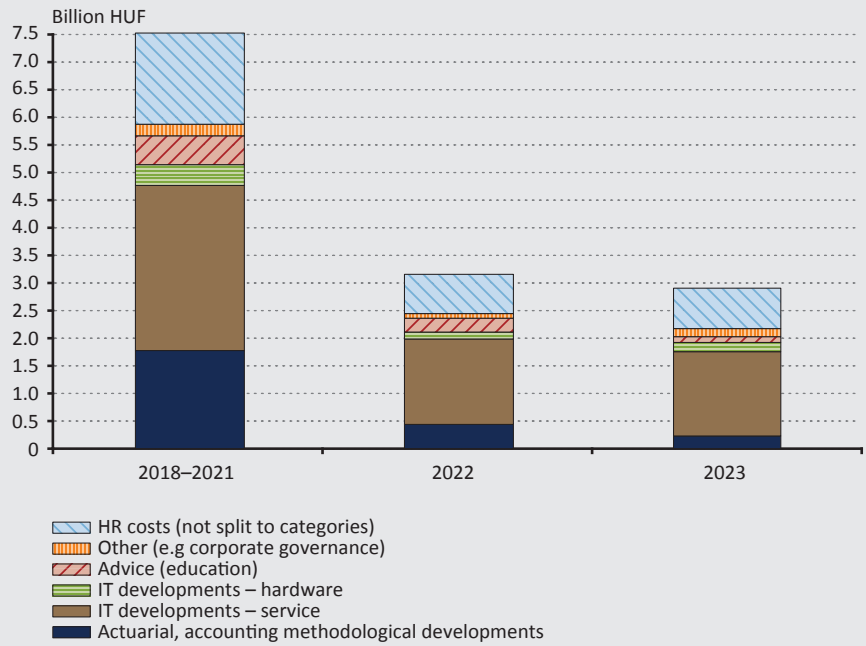
Source: MNB survey, 2023

In terms of profit after tax, seven institutions would have a worse financial result in 2022 under IFRS than their current financial result under national accounting, and two of them would even be loss-making. By contrast, other insurers would see a significant improvement in profitability. From a corporate governance perspective, the higher volatility and significant differences in profitability compared to the HAS financial result is one of the most important impacts.

4. Cost of transition to IFRS 17 (total sector)

The cost of the transition to IFRS 17 for the whole insurance sector was assessed in the spring 2023 data collection, the results of which are illustrated in *Figure 6.*

Figure 6
Costs incurred by the insurance sector for transition to IFRS 17 (the 15 most affected insurers provided data)



Source: MNB survey, 2023

The cost of implementing IFRS 17 varied from institution to institution, ranging from HUF 38 million to HUF 3.6 billion. Based on *Figure 6*, the responding insurers estimated the total related costs at HUF 13.5 billion (based on 2018–2022 actual and 2023 projected data). The largest cost was for IT developments, which accounted for 50 per cent of the costs incurred (a small proportion for hardware provision and a larger one for services). 18 per cent of the costs were for actuarial, accounting methodological developments and 6 per cent for advice (responding insurers could not provide a breakdown of 21 per cent of the costs, which we mainly considered as the cost of human resource incurred). The most significant costs were incurred in the 2018–2021 period, accounting for 55 per cent of the total cost. In 2022 and 2023, similar costs of around HUF 3 billion were incurred.

5. Conclusions

The quantitative impact of IFRS 17 transition was presented for the three insurers applying IFRS and the eleven insurers reporting under HAS but performing IFRS calculations for consolidated reports. The main results are summarised in *Table 4*.

Table 4
Main impacts of IFRS 17 on insurers applying IFRS to their individual accounts and preparing IFRS calculations for the group

		Insurers using IFRS for their individual financial statements	Insurers using IFRS for reporting to their parent institution consolidated financial statements
Qualitative aspects			
Number of insurers		**3**	**12**
Market share (on the basis of gross written premium, GWP)		5%	88%
Documentation of IFRS calculations and methods		Documented in accounting policy	Documented in internal regulation (strong impact of the group policies)
Explanation and analysis of results		Detailed, (compulsory disclosures)	Different depth of analysis
Quality		Audited	Different depth of analysis, mixed, differs from institution to institution
Quantitative impacts			
Number of insurers (respondents)		**3**	**11**
Reference date		Year-end 2022	
Macroeconomic environment		Upward of risk-free interest rate term structure, low returns on capital market	
Comparison (accounting) (main items that differ)		**IFRS 17 value compared to IFRS 4 (different valuation of insurance and reinsurance contracts)**	**IFRS 17 value compared to HAS (different valuation of investments and insurance, reinsurance contracts)**
Equity/ Own fund	**at aggregate level: at institution level:**	**77% increase 3 institutions where increase**	**15% increase 6 institutions where increase**
Profit/ result of the year	**at aggregate level: at institution level:**	**36% increase 3 institutions where increase**	**66% decrease 7 institutions where decrease**
ROE	**at aggregate level: at institution level:**	**4 ppt decrease 2 institutions where decrease**	**7 ppt decrease 6 institutions where decrease**
Comparison (prudential)		**IFRS17 value compared to Solvency II**	
Equity	at aggregate level: at institution level:	NO SIGNIFICANT DIFFERENCE 4% increase 3 institutions where increase	53% decrease 8 institutions where decrease

In terms of the quantitative impact, the application of IFRS 17 increased accounting equity for 2022 for the three institutions applying IFRS. Due to similar principles, IFRS 17 and SII calculations result in almost identical equity (last row in *Table 4*).

For the eleven insurers that report IFRS data to their parent company, the picture is more varied. In this case, we were not able to assess the impact of IFRS 17 alone (providing comparative data would have been a significant additional burden for the insurers concerned). Here, we compared the IFRS calculations with the HAS values. The results of the survey suggest that there may be significant differences between the balance sheet and profit and loss accounts of these insurers under IFRS and under Hungarian accounting, affecting both the asset side (valuation of investments) and the liability side (valuation of technical provisions). According to *Table 4*, for the eleven insurers concerned, the IFRS equity for 2022 would be higher than the HAS equity in most cases (six cases). The impact on profitability is also highly variable.

The possibility of transition exists for insurers and is currently affecting their operations. The transition should be considered primarily for the medium and large insurers belonging to a group, and is carried out periodically by the institutions. It is therefore worth monitoring the evolution of the balance sheet and profit and loss data of institutions under IFRS 17 and their intention to transition, so that their business decisions are transparent and their market position can be assessed.

Prudential supervision will not be fundamentally changed by the entry into force of IFRS 17. Institutions will still have to comply with the capital requirements calculated under the Solvency II framework, while maintaining an appropriate level of SII own funds (equity). However, from a supervisory perspective, it is also important to monitor and assess the information contained in the accounts of institutions that are applying IFRS and, where appropriate, compare it with the accounting financial position and performance of institutions that apply HAS.

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Payment Habits and Instant Payment Systems in the V4 Countries*

Péter Antal – Cserne Panka Póta – Patrícia Becsky-Nagy

The study examines payment habits and instant payment systems in the Visegrád Four (V4) countries using a comparative analysis of secondary data. The authors identify the factors that influence household payment habits and the operational parameters of the instant payment systems in the V4. Based on the information thus identified, the similarities and differences between these countries and the reasons behind such are explored. Both quantitative and qualitative data are examined for the purposes of the summative evaluation, which concludes that the main reasons for cash payments are the lack of electronic payment options in certain payment situations, as well as the power of personal preferences and habits. Below a certain limit, the transfer is automatically instant in Hungary and does not entail any extra costs, while in the other three countries, instant transfer is optional and subject to a surcharge. Financial institutions and regulators play a key role in shaping household payment habits and enhancing instant payment systems.

Journal of Economic Literature (JEL) codes: E42, F30, G28, G40, O33

Keywords: payment habits, electronic payment, instant payment system, V4 countries

1. Introduction

The existence of instant payment systems (IPS) is becoming increasingly important in today's fast-paced world, as these payment systems not only process transactions in a matter of seconds, but also at a lower cost than the existing real-time gross settlement systems. The possibilities offered by instant payment systems can encourage consumers to make transactions electronically (in the form of credit transfers) instead of using cash. However, many other factors (e.g. technical conditions and personal preferences) can influence household payment habits,

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Péter Antal: University of Debrecen, Master's Student. Email: 4ntal.p@gmail.com
Cserne Panka Póta: University of Debrecen, PhD Student. Email: pota.cserne.panka@econ.unideb.hu
Patrícia Becsky-Nagy: University of Debrecen, Associate Professor, Head of Department. Email: becsky.nagy.patricia@econ.unideb.hu

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and financial institutions and regulators play a key role in shaping these factors; this study does not cover the latter aspect.

The research focuses on the Visegrád Four (V4) countries, i.e. the Czech Republic, Poland, Hungary and Slovakia. These countries in Central and Eastern Europe have a similar level of economic development and geography, and are linked by numerous historical and cultural ties. This also influences the evolution of their economic institutions, policies and preferences.

The primary objective is to provide a comparative analysis of payment habits and instant payment systems in the V4 countries, using the results of previous research. First, we attempt to identify the factors that influence household payment habits in each country and the operational aspects of their instant payment systems. In answering the research questions, we explore the similarities and differences between the countries and the reasons behind them. When analysing the differences between individual countries of the V4, certain distortion effects (e.g. different payment system and taxation backgrounds, levels of economic development) may arise, which are not discussed in this study. However, in our view, the low level of individual distortions is still acceptable for the purposes of our findings.

In our summative evaluation research, we review the major national and international literature, examining both quantitative and qualitative data. Payment habits in the V4 countries were primarily analysed based on a representative survey by EVO Group member eService and REVO – MMB Platební Služby, which covered, among others, Central European countries and conducted a separate survey for each individual country in 2022 (*eService 2022a, 2022b, 2022c*; *REVO 2022*). The primary objective of this international research was to investigate the population's attitude towards different payment methods in certain payment situations. Reports published by the respective central banks of the V4 countries constituted the primary source for the analysis of instant payment systems. We also used information from the websites of the companies operating or providing the technical background for payment systems in each country, as well as relevant communications from the European Central Bank (ECB) and the European Payments Council (EPC).

By understanding cash payment preferences and the state of electronic payment options, targeted measures can be taken to discourage cash payments and encourage electronic payment options, which may assist in reducing the shadow economy. The aggregation of operational parameters related to instant payment systems also highlights the opportunities to improve customer experience. This may increase the use of the system and hence speed up economic processes.

2. Literature review

2.1. Factors influencing payment habits among companies and households

Market behaviour and trading practices are influenced by regulations intended to facilitate market safety and transparency (*Friesz – Váradi 2019*). The compelling impact of the pandemic and the response to central and government measures have led society to make a significant step towards the greater use of digital payment systems (*Farkas et al. 2022*). The benefits of technological innovation were first perceived in the banking sector. Financial institutions using online banking or e-banking have a competitive advantage over those offering only traditional banking services, as their customers can carry out certain banking transactions without the cost of visiting the bank in person (*Tömöri – Hamad 2022*).

However, the payment habits of companies and households are shaped by several factors. In business circles, a distinction is basically made between retailers and corporations. The difference is that while retailers prefer cash-intensive and card payment solutions, corporations prefer other electronic payment methods (e.g. credit transfers). According to *Leinonen* (*2008*), the most important consideration for retailers when choosing a payment method is the speed (real-time) and simplicity of the technology chosen. Based on a study by *Gresvik and Haare* (*2008*), the share of cash payments in Nordic countries has been below 50 per cent for many years. In fact, the *Danish Payments Council* (*2019*), which analyses Danish companies from a business-to-business (B2B) perspective, does not even include cash transactions, so negligible is their share.

The two main drivers of card acceptance by Hungarian enterprises are the size of the companies (*Ilyés and Varga 2018*) and the diverging levels of development in different parts of the country (*Kajdi – Nemecskó 2020*). The majority of B2B transactions still take the form of credit transfers, but cash payments are also present, reflecting initial mistrust (*Bódi-Schubert 2014*) and adherence to well-established habits (*Belházyné Illés et al. 2018*). *Deák et al.* (*2021a*) analysed the online cash register (OCR) database provided by the National Tax and Customs Administration of Hungary (NTCA) and data from a questionnaire survey conducted by Kutatópont Kft. Based on the data, only 3 per cent of retailers have more than 2 sales units, while the corresponding value is around 9 per cent for corporations. The study also found that 71 per cent of retailers and 40 per cent of companies provided an option for card payment. When asked why they did not offer a card payment option, the most common answer from non-retail companies was that customers did not demand that option. This confirms the claim that the most common payment method among corporations is bank transfer.

Costs associated with banking and POS[1] terminals are also an important factor for companies and retailers. Some retailers also cited the low speed of card payments. According to *Deák et al.* (*2021a*), there is a significant correlation between firm size and card acquiring propensity, and – as is the case with firm size – the likelihood of card acquiring increases with the number of sales units. The method of wage payment also influences the prevalence of card acquiring: where wages are paid by bank transfer, the card payment option is more likely to be offered than in the case of companies where wages are paid in cash. Although *Deák et al.* (*2021a*) conducted their survey before the introduction of the Hungarian IPS, the authors also formulated questions regarding the above in their questionnaire survey. These questions revealed that while retailers valued real-time payments, 68 per cent of them reported that the cost of implementing and applying IPS was the most important aspect, while only 18 per cent of retailers prioritised instant execution.

Many factors, such as age, income, employment status and education, play a role in the evolution of household payment patterns (*Deák et al. 2022b*). The influence of other sociodemographic dimensions is beyond the scope of this research, and thus we do not intend to explore these in depth. Such factors include different personal and technical conditions related to payment methods (*Szobonya 2021*) or preferences resulting from intergenerational gaps (*Agárdi – Alt 2021*). The technical requirements are banking and internet coverage in the country concerned and access to digital tools. In Hungary, all three indicators are considered adequate: 89 per cent of the country has internet access, 83.5 per cent of the population reported owning a smart device and payment systems are available even in smaller settlements through the digital services of banks (*Szobonya 2021*). The rise of BigTech and FinTech companies has also affected consumers' expectations when choosing a payment method: customer experience has become the main criterion for decision-making (*Póta – Becsky-Nagy 2022; Deák et al. 2021b*).

Financial inclusion is also influenced by personal conditions such as the existence of digital skills or financial literacy. *Szobonya* (*2021*) compared the level of financial literacy to the corresponding data of the 2010 OECD survey, which indicated that Hungarians had the level of financial literacy expected by the OECD (69 per cent); however, according to the 2015 survey – also conducted by the OECD – only 40 per cent of Hungarians reached the expected lower threshold (71 per cent). The values measured distinguished between skills in different financial areas. While the Hungarian population scored a high 77.09 and 75.97 per cent in the areas of lending and digital finance, respectively, it scored only 56.31 per cent for savings. This is not surprising, as according to recent statistics, in 2023 only 20 per cent of the total population has at least HUF 0.5 million in savings (*OTP Bank 2023*).

[1] Point of sale

Agárdi and Alt (*2021*) pointed out that preference differences arising from generational gaps had a major impact on the acceptance of FinTech tools. The research shows that for generation X (those born between 1965 and 1979), the simplicity of mobile wallets is far more important than their usefulness. The potential risks associated with mobile wallets also have a greater impact on this generation. According to *Agárdi and Alt* (*2021*), for generation Z (those born between 1995 and 2010), the perceived experience is less significant than for generation X. Instead, perceived compatibility is more important for generation Z as indeed, this age group sees mobile phones as "problem-solving devices".

2.2. The role of instant payment systems

As demonstrated in the previous subsection, with the spread of digitalisation cash payments are increasingly taking a back seat to other payment methods, such as debit cards, instant payment systems, various mobile wallets and central bank digital currency. The Covid-19 pandemic also made a significant contribution to the declining share of cash payments: during that period, one of the most obvious solutions to the problems that the sector faced and that needed to be avoided was the application of contactless, electronic financial services, which led to a sharp increase in the volume of online sales (*Deák et al. 2021c*).

Instant payment systems are modern, digital financial clearing systems that take advantage of 21st century technology to complete electronic (cashless) transactions in the shortest possible time, 365 days a year, 24 hours a day. In the March 2024 issue of the BIS Quarterly Review, *Frost et al.* (*2024: p. 44*) used the following wording: "real-time or near real-time transfers of funds between accounts of end users (private individuals, businesses, public institutions) are as close to a 24 hour per day and seven days per week basis as possible", making the operation of the economy easier and faster in an increasingly fast-paced world. This is why all countries strive to implement a well-functioning instant payment system, because without it the national economy may come to a standstill or may even be excluded from future innovations, in short: it will become less competitive.

Within instant payment systems, we distinguish between interbank, B2B and P2P (peer-to-peer) systems (*Hyman 2023*). A typical interbank instant payment system is the Hungarian RTGS[2] (Hungarian abbreviation: VIBER). As its name implies, an IPS basically completes transactions in seconds for B2B, P2P and interbank transactions. The exception to this is when the transaction is carried out by an automated clearing house connected to the VIBER system, where the funds transferred may take several days to be made available. VIBER is typically used for large interbank credit transfers[3] (*Daugherty 2024*) and is thus mainly used by larger companies

[2] Real-time Gross Settlement
[3] Large-value payment system – LVPS

and public authorities. P2P instant payment systems are more widespread among the general public.

In Hungary, with the introduction of the IPS, electronic credit transfers under a given limit are also settled within a few seconds at any time of the day, on any day of the year (*MNB 2023a*). Besides the IPS, the other big competitor to cash payments remains card payments. While the share of cash payments has declined from 77 per cent to just under 70 per cent over the past 10 years, the share of bank card transactions has increased from 4.7 per cent to nearly 19 per cent, rising by almost 15 percentage points (*Deák et al. 2022a*). Accordingly, cash transactions still account for the bulk of Hungarian payment transactions and, despite exhibiting a declining trend, are still very substantial.

3. Data and methodology

As indicated above, in the context of our summative evaluation research we conduct a comparative analysis of the payment habits and instant payment systems of the V4 countries, and evaluate their payment habits and instant payment systems based on the results of previous research. We analyse the payment habits of the countries under review from the perspective of households only.

Payment habits in the V4 countries were primarily analysed based on the 2022 research conducted by EVO Group member eService and REVO – MMB Platební Služby. The primary objective of this international survey was to explore the population's attitude towards different payment methods in certain payment situations. The survey was conducted using the Computer Assisted Web Interview (CAWI) method, which means that participants completed the questionnaire online using a computer. For Poland and Hungary, we also used the representative studies *Payment habits in Poland in 2020* and *Payment habits of Hungarian households in 2020* (*NBP 2022; Deák et al. 2021b*), which are available on the respective central bank websites, to provide a more comprehensive view of payment habits among households in those two countries. The study in Poland was based on the Computer Assisted Personal Interview (CAPI) method, i.e. the questionnaires were completed by computer with personal assistance. In the case of Hungary, the questionnaire for the payment habits survey was completed by personal interview. An important part of the research conducted by the central banks of Poland and Hungary is the so-called payment diary kept by the participants. Participants were required to record all transactions concluded, detailing the value of the transaction and the method of payment.

The reports prepared and published by the central banks of the V4 countries also served as primary sources for the analysis of instant payment systems; however, we also researched the websites of a number of other companies that typically operate or provide the technical background for the payment systems in the country concerned. For Slovakia, we also used the ECB and EPC websites, as the systems applied in Slovakia as a euro area member state are, in some cases, developments of the ECB or the EPC and therefore, more information was available on these websites.

The influence of distorting factors is also discussed in our study. In our view, the level of distortion is not so high as to render our findings irrelevant.

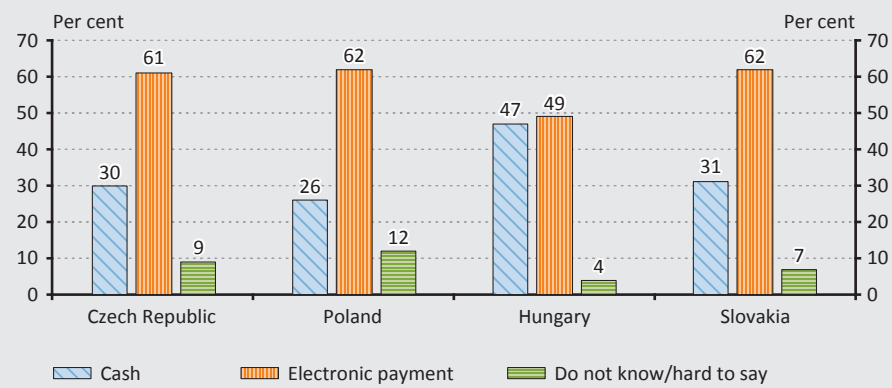
4. Analysis and results

4.1. Comparative analysis of payment habits in V4 countries

In the comparative analysis of payment habits, we examine which payment methods were most preferred by households in V4 countries, and in which cases they preferred to pay electronically or in cash. The factors influencing cash or electronic payments are distinguished and presented in terms of physical factors (availability of infrastructure) and personal perceptions.

Figure 1 summarises the results of the 2022 representative survey of eService 2022 by country. The survey was designed to determine whether the individual countries preferred cash or electronic payment for offline purchases.

Figure 1
Is cash or electronic payment more common among V4 households when shopping offline?



Source: Based on eService (2022a, 2022b, 2022c) and REVO – MMB Platební Služby (2022)

Consumers in the Czech Republic, Poland and Slovakia prefer electronic payments by far, while in Hungary the two payment methods are almost equally popular for offline payments.

Across the V4 countries, no significant differences were observed as to the situations in which individuals were more likely to use electronic or cash payments. In all four countries, online shopping, paying at pharmacies and petrol stations, and travelling abroad were the most often cited situations in which electronic payment was preferred.

It can be said that the Covid-19 pandemic had a compelling effect on the spread of electronic payment options. In this context, the majority of people in all four countries agreed that the number of places where electronic payments were accepted had increased compared to the pre-pandemic period.

By contrast, consumers are most likely to pay in cash when shopping at the market, paying a hairdresser or a doctor, paying for taxi trips/public transport, paying builders or paying for home repairs. The results of the survey show that the cases in which consumers are most likely to pay in cash coincide with the cases in which electronic payment is not available. It is also common in the V4 countries that giving money as a gift usually occurs in the form of cash. However, this certainly cannot be attributed to the lack of electronic payment options, but rather to habits.

Inadequate availability of electronic payment solutions may hinder the reduction of cash payments. This also suggests that the widespread provision and modernisation of electronic payment solutions would contribute to reducing cash payments. Besides physical conditions, individual preferences behind the choice of cash and electronic payment methods should also be highlighted. However, in all four countries, the reason for using cash was overwhelmingly based on the lack of other options. In addition, being used to handling money and liking it were also cited as arguments for the preference for using cash.

Convenience and comfort were the most frequently cited reasons for countries' preference for electronic payment, but speed (saving time) and ease of use were also arguments in favour.

One form of electronic payment is credit transfer. The customer experience associated with it is strongly influenced by the operational characteristics of the instant payment system available. The faster, more convenient and cheaper the instant payment system is, the better the customer experience, which may encourage consumers to perform their transactions electronically (in the form of a credit transfer), instead of in cash. However, the fees associated with instant payment systems may be influenced not only by the system operator but also by the bank's pricing. This is explained in detail in the subsection below.

4.2. Comparative analysis of the instant payment system of V4 countries

In our study, we conduct a comparative analysis of the instant payment systems of V4 countries, focusing on operational characteristics, transaction limits and fees, and transaction numbers. However, we do not address the distortions arising from market forces and different levels of regulation and development.

Table 1 shows a comparison of the instant payment systems in each country according to their operational parameters. Poland introduced two systems in 2012 (Express Elixir and BlueCash), which have been running in parallel ever since, but Express Elixir handles significantly more transactions. Slovakia was the last of the four countries to introduce an IPS, with a lag of 10 years. The Polish systems are the slowest in terms of the speed of credit transfers (120 and 15 seconds, respectively). The processing speed of instant payment systems in the rest of the countries ranges between 3 and 5 seconds.

Table 1
Operational parameters of the V4 instant payment systems

	Czech Republic	Poland		Hungary	Slovakia
	CERTIS	Express Elixir	BlueCash	Hungarian IPS/ GIROInstant	TIPS/ SCT Inst
Year of introduction	2018	2012	2012	2020	2022
Speed of transfers (sec)	<3	<120	<15	<5	<5
Obligation for banks to join	No	No	No	Yes	No
Instant execution of transactions	Optional under limit	Optional under limit		Automatic under limit	Optional under limit
Limit (thousand HUF) *	≈ 39,250 (2,500k CZK)	≈ 9,210/23,033 (100/250k PLN)	≈1,823 (20k PLN)	20,000	≈ 39,698 (100k EUR)
System usage fees	1.59 HUF/ transaction (CZK 0.10)	Typically a few PLN/ transaction		<11 HUF/ transaction	0.79 HUF/ transaction (0.002 EUR)
Payer of system usage fees	Banks, per transaction (there are discounts)	Banks when joining, then client per transaction (there are discounts)		Banks (clients cannot be charged)	Banks (sender and receiver, 50% each)
Number of transactions per capita (2022)	16.86	6.19	0.39	19.27	5.28

*Note: CERTIS: Czech Express Real Time Interbank Settlement system, SCT Inst: SEPA Instant Credit Transfer. * Currencies were converted into forint at the MNB mid-rate quoted on 25 March 2024.*

Source: Edited based on CNB (2022, 2023a, 2023b); KIR (2023a, 2023b, 2024); Citi Handlowy (2023); Autopay S.A. (2023); Łodyga (2021); MNB (2023a, 2023b, 2024); NBS (2022, 2023a, 2023b); Gand (2022); ECB (2024); EPC (2023); GIRO (2024); HCSO (2023); Statista (2024)

For banks, it is optional to join the instant payment system in all countries. In Hungary, all commercial banks are required to enable instant payments. The immediacy of the transaction is subject to a limit in all four countries. The limit is the lowest for BlueCash in Poland and the highest for TIPS used in Slovakia. In Hungary, transactions below the limit are automatically instant (accordingly, a significant proportion of credit transfers are processed instantly), while in other countries this is optional.

Instant execution is typically subject to surcharges; therefore, higher limits do not always contribute to higher instant transaction numbers. These charges are typically borne by the banks. In the Czech Republic, there is a per-transaction fee (CZK 0.10), but there is a discount depending on the number of transactions. In Poland, banks pay a fee to join the IPS system and then set the price of the instant service for their customers individually, which usually costs only a few zlotys (some banks offer free instant credit transfers for this every month). It should also be noted that the instant mobile payments of the Polish BLIK P2P are free of charge. In Hungary, banks are not permitted to charge their customers a surcharge for instant payments, but they have to pay a fee for using the instant payment system in function of the value of the transaction. As regards Slovakia, the transaction fee for instant payments is split equally between the sender and the receiver bank.

Table 2
Comparison of the instant payment systems of the V4 countries

	Czech Republic	Poland	Hungary	Slovakia
Earliest introduction		X		
Fastest transfer	X			
Obligation to join			X	
Instant execution is automatic below limit			X	
Cheapest for bank client			X	
Highest number of transactions per capita (2022)			X	

Note: Based on Table 1

As summarised in *Table 2*, Poland was the first country to introduce an instant payment system in 2012, while the fastest transfer speed (3 seconds) was observed in the Czech Republic. The speed of the system contributes to a better customer experience, as well as speeding up payments and making settlements more convenient. It also contributes to improving the liquidity of businesses, as payments received can be used almost immediately (subject to a limit).

Banks' access to instant payment systems is mandatory only in Hungary, and is optional in the other countries under review. Competition between Hungarian banks is levelling out in this respect, as all commercial banks are required to provide an instant credit transfer facility to their customers. However, in the other three countries, joining the IPS may give banks a competitive advantage. In Hungary, transactions below the instant payment limit are automatically executed immediately, while in the other three countries this is optional and subject to a surcharge. Because of the fees associated with instant execution, a higher limit does not always contribute to a higher number of transactions. This has a very negative impact on the customer experience related to the IPS. It is also important to underline that it is only in Hungary that the payment of the fee for instant processing cannot be passed on to the customer; consequently, domestic bank customers do not perceive any difference between the cost of instant and traditional credit transfers. In the other three V4 countries, the customer typically pays the extra cost of instant payment per transaction. It should be noted that in the Czech Republic and Poland there are discounts depending on the bank account package, while in Slovakia the cost of an instant transfer is split 50/50 between the payer and the beneficiary. Probably due to the mandatory bank connection, automatic instant credit transfers under the limit, the free nature of instant access and the compelling effect of the Covid-19 pandemic, Hungary had the highest number of transactions per capita in 2022. In addition, a number of other factors can influence the number of transactions per capita, such as digital financial preferences, the availability of mobile apps for making transfers, and the availability of instant payment options at retailers and utility companies. The influence of these factors is not examined in this study. In addition to the above, we have not taken into account certain distortion effects – such as different monetary and fiscal backgrounds, level of economic development, etc. – when analysing the similarities and differences of V4 countries. However, in our view, the low level of individual distortions is still acceptable for the purposes of our findings.

4.3. Factors affecting the payment habits of households

The distortion due to differences in the populations of the countries was eliminated by determining the per capita number of transactions. The indicator is the highest in Hungary, which may indicate the widespread use of the system, but may be distorted by the impact of the Covid-19 pandemic that coincided with the introduction of the Hungarian IPS, which encouraged electronic payments. Another distortion effect may be due to the fact that it is only in Hungary that bank customers do not incur a surcharge for instant credit transfers, as the fee for instant transactions cannot be charged to the customer in Hungary. In the other three countries, the option of instant payment and the surcharges associated with it may not always make the use of instant payments more popular than traditional transfers.

Table 3 summarises the factors influencing household payment patterns based on the literature reviewed and the results of our secondary research. In addition, we summarise the countries that stand out in terms of each operational parameter.

Table 3
Factors affecting the payment habits of households

Based on the literature review	Based on secondary research
Personal conditions (financial and digital competences)	*Not covered by secondary research*
Technical conditions (bank and internet coverage)	Technical conditions (option of electronic payment)
Generational preferences (risk vs. compatibility)	Personal preferences (payment situation, individual perception)

Source: Based on Szobonya (2021); Agárdi – Alt (2021); eService (2022a, 2022b, 2022c); REVO – MMB Platební Služby (2022)

In terms of the influencing factors discussed in the literature review, financial and digital literacy and technical conditions are the most important factors in the choice of payment method among the general public. The influence of generational gaps should be highlighted, with generation X focusing on the convenience and security of payment methods, while generation Z focuses on their usefulness and perceived compatibility. The personal conditions defined in the literature are not addressed in this study. Based on the results of the 2022 representative surveys of eService for each country, the physical possibility of electronic payment emerged as a technical condition shaping the payment habits of the population, while personal preferences were more strongly influenced by payment situation and individual perception.

Regional and local regulations play a key role in discouraging cash payments and encouraging electronic payments. Several actions have already been taken in this area. For example, under the EU cash limit in the countries surveyed, cash payments are only permitted up to a certain amount (*ECCG 2024*). A Hungarian example is the obligation for retailers to provide electronic payment options in relation to online cash registers,[4] and in the area of bank card payments, the impact of the regulation of interchange fees (*Kajdi – Kiss 2021*) should be highlighted.

5. Summary and conclusions

The relevance of the research is that in an increasingly fast-paced world, the introduction of instant payment systems is of paramount importance for national economies to speed up economic transactions. At the same time, there has been

[4] NGM Decree No. *48/2013 (XI. 15.) of the Minister for National Economy on the technical requirements of cash registers, the marketing, use and servicing of cash registers used for issuing receipts, and the reporting of data recorded by cash registers to the tax authority*

a shift towards prioritising electronic payments, i.e. the targeted development of consumer payment preferences.

In our study, we reviewed key national and international literature. In answering the research questions, we explored the similarities and differences between the countries under review and their reasons, as well as the emerging distortion effects. In our view, the level of individual distortions is still acceptable for the purposes of our findings.

Our primary objective was to compare and analyse payment habits and instant payment systems in the V4 countries and to identify the factors that influence payment habits among households and the operational aspects at work in the countries under review.

The study examined both quantitative and qualitative data. We explored preferences for cash payments and the state of electronic payment options. We found that in three of the V4 countries – Poland, the Czech Republic and Slovakia – electronic payments were highly preferred, while in Hungary, cash and electronic payments were both preferred, in almost equal proportions, for offline payments. We also pointed out that the main reason for cash transactions in the V4 countries is the lack of electronic payment options in certain payment situations. In addition, personal preferences and habits are also important determinants. A notable example of the latter is giving money as gift, which is common in all four countries under review even though this could probably be done electronically.

In an increasingly fast-paced world, the introduction of instant payment systems for national economies is of paramount importance for the settlement of economic transactions. It can be seen that all four countries under review have an instant payment system in place. The customer experience associated with it is strongly influenced by the characteristics of the system's operation. In our research, we summarised and evaluated the operational parameters of each IPS system. Poland has the longest history of instant payments, while the Czech Republic has the fastest transfer speed. Hungary's instant payment system stands out because it is mandatory for banks to join, payments are automatically instant below a limit, it is the cheapest system for the customer and the Hungarian IPS features the highest number of per capita transactions. Below a certain limit, the instant execution of credit transfers is automatic in Hungary and does not involve any additional costs for bank customers compared to traditional transfers. By contrast, in the other three countries, the instant execution of the transaction is optional and subject to the payment of certain surcharges.

We found that the lack of availability of electronic payment solutions could be a barrier to reducing cash payments, and for instant payment systems, the faster, more convenient and cheaper the system was, the better the customer experience,

which may encourage consumers to conduct transactions electronically rather than in cash. Regional and national regulations have a key role to play in improving the system, and targeted action by financial institutions and regulators can discourage cash use and encourage electronic payments, which may assist in reducing the shadow economy.

Our conclusion is that, in view of the above, financial institutions and regulators may take targeted measures to discourage cash payments and encourage electronic payments and hence facilitate reducing the shadow economy. Aggregation of the operational parameters related to instant payment systems (fees, limits, optionality, etc.) highlights the potential for enhancing the customer experience, thereby increasing the use of the system and accelerating economic processes.

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The Effect of Seasonal Depression on Stock Market Returns*

Virág Kégl – Dóra Gréta Petróczy

The study analyses the statistical relationship between the degree of seasonal depression and stock index returns. For this analysis, we examine the daily returns of two US and five European stock indices using OLS regression. The analysis found a statistically significant relationship between seasonal depression and the change in returns. However, due to the limited use of the reduced form, this only confirms the link between seasonal depression and returns, and further observations would be required to confirm a causal relationship.

Journal of Economic Literature (JEL) codes: C10, G14, G20, G40

Keywords: investor sentiment, seasonal depression, stock indices, stock market returns

1. Introduction

Our study focuses on a subset of behavioural finance, namely, seasonality and investor sentiment, and the impact of the latter on stock markets. Relying on applied psychology, behavioural finance takes a new and previously overlooked perspective from classical finance, and is able to draw conclusions from certain cognitive biases that can explain specific financial and economic anomalies and phenomena better than classical financial models.

Price analyses of different financial markets may serve both explanatory and predictive purposes. The seasonal depression examined in this study is presumed to reduce the risk-taking propensity of investors. *Kamstra et al.* (*2003*) attempt to show this effect by analysing the returns on stock indices. On the one hand, this also has explanatory power, as the authors seek to provide information on part of the variation in stock market returns. In addition, if the effect of seasonal depression does have a statistically detectable impact on stock market returns, taking into

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Virág Kégl: Budapest University of Economics and Technology, Student; Rajk College for Advanced Studies, Senior Member. Email: virag.kegl@gmail.com
Dóra Gréta Petróczy: Budapest Metropolitan University, Assistant Professor; Magyar Nemzeti Bank, Education and Research Expert. Email: petroczyd@mnb.hu

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consideration the degree of seasonal depression may become part of a successful trading strategy for specific stock exchanges.

The relevance of the topic stems from several factors. While providing an academic narrative accepted by the finance literature, behavioural finance still has many unexplored areas. Part of this is a series of studies on investor sentiment and mood, as well as on different seasonal effects. In their paper, *Kamstra et al.* (*2003*) identified several studies that derived seasonal depression in the same way, from the length of nights; it is therefore worth examining in detail the methodology and theoretical considerations applied by the authors.

The link between climate change and public sentiment as well as stock markets underlines the relevance of our research. Warming weather increases the risk of mental health problems and depression (*Palinkas – Wong 2020*). *Peillex et al.* (*2021*), for example, found that heat waves reduced trading volume on the Paris stock exchange significantly by 4–10 per cent, and *Lanfear et al.* (*2019*) pointed out a link between extreme weather events and market anomalies.

The purpose of this study is twofold: it is intended (1) to examine methodological considerations, and (2) to be a partial reproduction with some methodological changes. In the reproduction, the original regression model is adjusted in accordance with various causal aspects, and among the selected stock indices, a special focus is placed on the Central European market through the returns of the Czech and Polish stock exchanges. Regardless of the causal deficiencies of the original study, it is reasonable to assume that the results of this paper will take values that are approaching those of that study and will be statistically significant.

The analysis of the risk-reducing effect of the Seasonal Affective Disorder (SAD) – i.e. seasonal depression – and the reproduction of *Kamstra et al.* (*2003*) on some level remains an exciting area of research. More recently, *Škrinjarić* (*2018*) examined eleven countries in Central and South East Europe, and found that Croatia, Hungary, Romania, Serbia, Slovakia and Ukraine exhibited significant SAD effects. *Škrinjarić et al.* (*2021*) focused specifically on the Croatian stock market, while *Škrinjarić* (*2022*) constructed a profitable trading strategy based on seasonal depression.

In three out of the seven stock markets examined here (NASDAQ, FTSE 10, DAX), we obtained significant results pointing to the impact of SAD on the stock markets.

In *Section 2* we present the literature on behavioural finance. *Section 3* then details the method of *Kamstra et al.* (*2003*) and the conditions for using the instrumental variable. *Section 4* includes the stock indices selected for analysis and the causal map that underpins the analysis presented in the study, which clarifies the control and explanatory variables required for the OLS regression applied in the analysis.

Finally, the results obtained are compared with those of the original study. We conclude our study with a summary.

2. Literature review

As a result of the approach and toolkit of behavioural finance, the literature has developed a new, methodologically sound perspective on the impact of emotions in various decision-making situations, demonstrating, for example, how empirical analysis is able to show a relationship between sentiment and stock market volatility or risk-taking propensity. Research in the field of behavioural finance suggests that emotions and mood, as well as certain human cognitive characteristics, can be considered as informative variables in financial analysis (see, for example, *Tversky – Kahnemann 1974; Johnson – Tversky 1983; De Bondt – Thaler 1985; Thaler 1999; Barberis – Thaler 2003; Barberis 2013*).

The relevance of the topic is demonstrated by the fact that the number of investor sentiment surveys more than doubled between 2016 and 2020 compared to the previous five-year period. The research of *Kamstra et al.* (*2003*) belongs to the early part of the literature linking seasonality and emotions to financial market movements. Subsequently, *Dowling – Lucey* (*2008*) and *Joëts* (*2012*), for example, also relied on their study, as suggested in the literature review by *Goodell et al.* (*2023*). Hungarian literature is also linked to the research on behavioural finance, for example, via articles by *Golovics* (*2015*) or *Neszveda* (*2018*), where the field of behavioural finance is outlined in the light of Thaler's work, introducing key concepts of behavioural finance.

2.1. The role of sentiment and emotions in investor decision-making

In the following, we briefly review the theoretical framework of behavioural finance, including studies on seasonal effects on financial market returns and the literature on individual investor emotions and sentiment. Investor and consumer sentiment and the influence of such on their decisions is a crucial issue. This notwithstanding, some research directions have yet to receive sufficient attention, despite the fact that the results of the articles written on the subject are not always consistent with each other. This suggests that the exact methodology for the analysis of this issue has yet to be developed (*Goodell et al. 2023*).

2.1.1. Behavioural finance

Modern financial models are based on economic models whose dominant paradigm is neoclassical economics. The main assumptions of neoclassical economics are that individuals and firms are self-interested and try to optimise limited resources to the best of their ability. People have rational preferences between possible outcomes or states of nature. Preferences are described by utility functions (see, for example,

Fama 1970; *Markowitz 1952*; *Miller – Modigliani 1961*). Obviously, even scholars who rely on modern financial theories based on neoclassical economic models do not consider human behaviour and decision-making to be perfectly rational (*Thaler 1999*); however, these financial models have proved inadequate, overall, to explain certain market phenomena correctly. The behavioural finance narrative has criticised modern financial theories since the 1970s (*Tversky – Kahnemann 1974*).

Behavioural finance combines psychological and financial insights. Based on *De Bondt – Thaler* (*1985*) and *Barberis – Thaler* (*2003*), we can detect systematic biases and better understand financial market movements by assuming a specific form of irrationality using experimental results from cognitive psychology. As pointed out by *Barberis – Thaler* (*2003*), our understanding of bounded rationality is largely due to the work of cognitive psychologists such as the already cited *Tversky – Kahneman* (*1974*). Thanks to their initial work and the work of other researchers, the field of behavioural finance has produced concrete empirical results. Building on this, it is possible to catalogue the systematic set of biases and beliefs on the basis of which people form expectations and make decisions.

There have also been publications in Hungarian on behavioural finance and capital market anomalies. *Molnár* (*2006*) provides a comprehensive summary of the criticisms of the efficient markets theory. Among seasonalities, the author mentions the January and weekend effects, and among the value-based anomalies, the P/E and small company effects, as well as the Value Line Investment Survey puzzle, where investments included in the investment advisor's newsletter realise unusually high, abnormal returns.

In their empirical research on the most liquid, large cap stocks on the Budapest Stock Exchange, *Nagy – Ulbert* (*2007*) analysed irrational decision inconsistencies in addition to the aforementioned seasonal and value-based anomalies. Examining the dataset between 1996 and 2007, they found that the reversal phenomenon identified by *De Bondt – Thaler* (*1985*) also held true for the BSE, i.e. stocks that performed well (poorly) in the past became the poorly (well) performing stocks in the period that followed. In a similar study, *Naffa* (*2009*) pointed out that investors were willing to forgo part of their expected return in exchange for investments that are more resilient to market turmoil.

The reversal phenomenon on the BSE was studied by *Lakatos* (*2016*), as well. The author identified the reversal phenomenon in a larger database from 1996 to 2015; however, he found that the phenomenon disappeared towards the end of the period. *Fömötör et al.* (*2017*) summarised the factors limiting consumer rationality in loan contracts. *Kutasi et al.* (*2018*) investigated factors determining the behavioural biases of retail investors in Hungarian government bonds.

2.1.2. The role of sentiment and emotions in investor decision-making

A subset of the phenomenon of bounded rationality used in behavioural finance is the observation of the role of emotions in the decision-making of investors. Drawing on the literature, we find that emotions influence both the perception of future prospects; see *Johnson – Tversky* (*1983*) and *Arkes et al.* (*1988*), and the assessment of risks, as pointed out by *Loewenstein et al.* (*2001*) and *Slovic et al.* (*2004*).

Several studies have demonstrated the impact of positive and negative emotions on investors' decision-making: positive (negative) emotions motivate (demotivate) investors' risk-taking (see, for example, *Kuhnen – Knutson 2011*). Following the outbreak of the Covid-19 pandemic, several researchers observed a significant relationship between the emotional effects of Covid-19 and financial market movements. *Subramaniam – Chakraborty* (*2021*) analysed the correlation between fear of the pandemic and exchange rates. According to *Chundakkadan – Nedumparambil* (*2022*), this emotional effect is directly related to the volatility observed in financial markets.

Hirshleifer – Shumway (*2003*) found a high correlation between sunshine and the returns on stock indices, which is inconsistent with the notion of rational investors. *Cao – Wei* (*2005*) detected an inverse relationship between temperature and returns, with yields being lower on very hot days. According to research by *Shanaev et al.* (*2022*), there is a consistent and irrational optimism in investor behaviour around Groundhog Day in the USA.

Building on the work of *Kamstra et al.* (*2003*), studies by *Dowling – Lucey* (*2008*) and *Joëts* (*2012*) identified a significant relationship between seasonal depression and stock market price movements.

Jacobsen – Marquering (*2008*) partially refuted the findings of *Kamstra et al.* (*2003*) and *Cao – Wei* (*2005*). Although they reviewed a longer period and worked with monthly rather than daily data, they were able to reproduce the findings of both studies, but pointed out that it was difficult to single out possible explanations. According to their results, there is no evidence that SAD, higher temperatures or the old market adage 'Sell in May and go away' are the reasons for lower returns in summer. It was pointed out that the proximity of a country to the equator does not affect the phenomenon, and a simple winter/summer dummy has better explanatory power than SAD or temperature.

In their response, *Kamstra et al.* (*2009*) were only partially able to reproduce the results of *Jacobsen – Marquering* (*2008*). In the authors' view, they used inappropriate data and it was a mistake to include countries where the length of days and nights does not vary, or where it is not the intensity of seasonal depression

in an investor's life that matters, but the number of new people who reallocate their portfolio because of the onset of depression. However, *Jacobsen – Marquering* (*2009*) argued in their response that *Kamstra et al.*'s *(2009*) justification for omitting certain countries was arbitrary and that if the full picture were examined, it would not be clear whether SAD or other seasonality was causing the rise in returns.

Kelly – Meschke (*2010*) contested the study of *Kamstra et al.* (*2003*) mainly from the perspective of psychological impact. The length of the nights used in the original article varies, and it does not show a strong correlation with the actual seasonal depression experienced, i.e. the months when the nights are longest were not the months when people felt the worst. The variable applied by *Kamstra et al.* (*2003*) was, in this case, split into two separate periods, autumn and winter SAD. After re-running the analysis they found that only the winter effect holds and accordingly, the authors believe that the original SAD variable measures the 'turn of the year' effect instead. Responding to the criticism, *Kamstra et al.* (*2012*) stressed that the original model also included a dummy variable for the end of the tax year. They re-ran their models on more sophisticated panel and time-series models, with seasonal depression measured on actual clinical data. Their results further confirmed the original article.

Although the original article has been broadly criticised, recent research appears to support their original findings. *Ruan et al.* (*2018*) found that SAD was the Granger cause of the higher returns on the Chinese stock market. *Škrinjarić* (*2022*) constructed a successful trading strategy on the Zagreb Stock Exchange based on this phenomenon.

Goodell et al. (*2023*) emphasise in their literature review that although the impact of emotions on financial markets is an extensively researched topic, there is a gap in the literature in some respects: it is not clear which emotions will be important for decision-making, nor in what context they occur. In addition, investors may react consciously to certain financial market phenomena: for example, according to some research, the calendar effect (a fall in stock prices in December followed by a rise in January, or lower returns at the beginning of the trading week) is priced in on the market, and emotions have less influence on the decision-making processes of sophisticated investors (*Duxbury et al. 2020*).

2.2. Seasonal depression and risk-taking propensity

The relationship between different weather factors and investor decision-making has been the subject of psychological research for decades (*Goodell et al. 2023*). In a study by *Kamstra et al.* (*2003*), the length of nights is used as an explanatory variable to measure seasonal depression and, through that, the variation in financial

market returns. In the following, we present the above study and its findings, including the validity of the methodology.

Research in experimental psychology has shown a direct link between depression and higher-than-average risk aversion (*Zuckerman 1984*, *2007*). Seasonal depression is classified as a specific type of clinical depression by *Leonhardt et al.* (*1994*), i.e. the decline detected by *Zuckerman* (*1984, 2007*) in risk-taking propensity is presumed to apply to people with seasonal depression as well. Depression is a mental illness associated with disturbed levels of serotonin in the brain, and studies have shown depressive changes in certain brain areas when the body is exposed to less sunlight (*Cohen et al. 1992*). According to a study by *Kamstra et al.* (*2003*), seasonal depression may affect about one tenth of the population.

The results of the experiments conducted by *Zuckerman* (*1984*) using the Sensation Seeking Scale developed by the author can be applied to financial decision-making based on *Kamstra et al.* (*2003*). Experiments using the Sensation Seeking Scale find that people with depressive or anxiety disorders have a significantly lower-than-average risk-taking propensity, and the severity of the disorders is directly proportional to the degree of risk aversion (*Kamstra et al. 2003*).

2.2.1. A possible measure of the effect of seasonal depression

Drawing on research on behavioural finance, in their study, *Kamstra et al.* (*2003*) attempted to explore seasonal depression as a prolonged altered emotional state and its impact on the financial market. In their research, they estimated the value of the SAD_t variable based on the length of nights, as subsequently was done by *Joëts* (*2012*) and *Dowling – Lucey* (2008). Both studies found that the model constructed using SAD_t performed the best relative to the use of all sentiment variables.

Kamstra et al. (*2003*) used the length of nights and daily returns as a starting point for the stock indices reviewed by them. In order to properly measure the impact of seasonal depression, the summer months were taken into consideration for stock markets in the Southern Hemisphere. In their study, the authors selected stock market indices from twelve countries for further analysis. The selection took into account the different geographical locations, both in terms of latitude and Northern and Southern Hemispheres. According to the authors, the selected indices are diversified geographically and include stocks with high market capitalisation.

Kamstra et al. (*2003*) applied a first-order autoregressive (AR(1)) model and included several different non-time series variables. For the purposes of the analysis, the most important variable among those was SAD_t, calculated by the authors to capture the level of seasonal depression.

The SAD_t variable was calculated as the length of night normalised by 12 hours. Only two values are needed to determine the length of night: the latitude of the location (σ) and the day of the year ($julian_t$). Spherical trigonometry formulae can then be used to first determine the sun's declination angle (λ_t), using formula (1).

$$\lambda_t = 0.4102 \cdot \sin\left[\frac{2\pi}{365} \cdot (julian_t - 80.25)\right] \quad (1)$$

$$H_t = 24 - 7.72 \cdot \arccos\left[-\tan\left(\frac{2\pi\sigma}{365}\right) \cdot \tan(\lambda_t)\right] \quad (2)$$

Using λ_t, the time between sunset and sunrise at a given latitude for a given trading day, i.e. the length of the night, can be obtained from H_t. In addition to formula (2) for the Northern Hemisphere, an H_t value was also calculated for the Southern Hemisphere, where the second half of the formula is not subtracted from 24. The next step after the calculation of the given H_t is normalisation by 12, which produces the SAD_t variable calculated by *Kamstra et al.* (*2003*)*:*

$$SAD_t = \begin{cases} H_t - 12: for\ trading\ days\ in\ winter\ and\ autumn \\ 0: otherwise \end{cases} \quad (3)$$

In addition to SAD_t, the authors relied on additional binary variables: D_t^A, which controls for asymmetry between autumn and winter, the binary variables D_t^M, which pertains to the effect of Mondays, and D_t^T, which pertains to sales for the purpose of tax cuts; moreover, they controlled for weather-related variables on specific trading days: precipitation (I_t^P), cloud cover(I_t^C) and temperature (I_t^T).

Accordingly, the regression model presented in the study by *Kamstra et al.* (*2003*) applies the following variables: the SAD_t variable, which is estimated from the length of nights, the lagged variable of stock index returns, i.e. $\rho_1 r_{t-1}$, as well as the three D_t binary variables and the weather-related I_t variable. The variables take their values according to the geographic location of the twelve stock exchanges reviewed by the authors.

$$r_t = SAD_t + \rho_1 r_{t-1} + D_t^M + D_t^A + D_t^T + I_t^P + I_t^C + I_t^T + \epsilon_t \quad (4)$$

Next, the authors ran regression (4) for each of the twelve index countries selected in their paper. Their results show that the coefficients of the SAD_t variable and the lagged variable are significant for most indices, and for several indices the coefficients of the binary variables are significant, while the weather-related coefficients are typically not. To calculate the seasonal depression returns of the respective indices, *Kamstra et al.* (*2003*) assigned a SAD value to each trading day. The value of SAD_t is obtained by multiplying the coefficient of the SAD_t variable

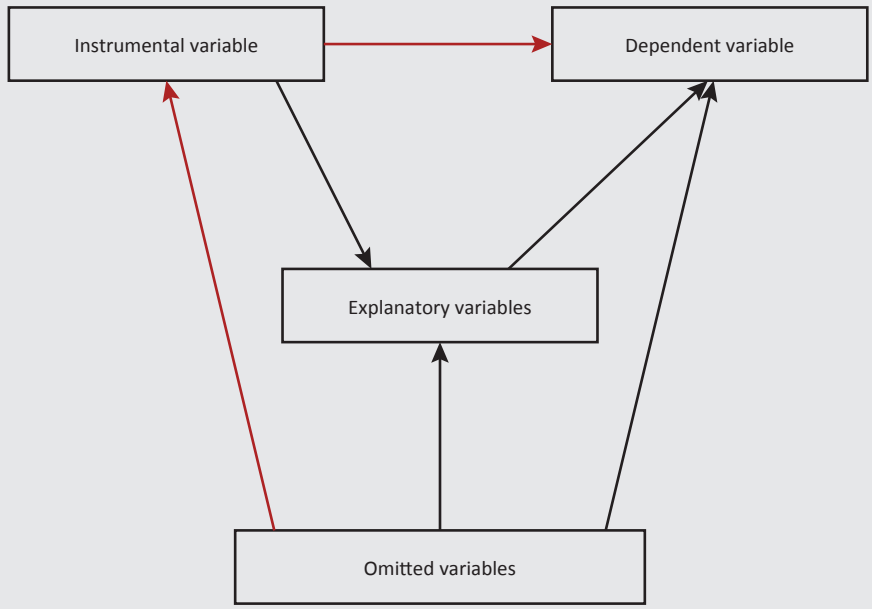
from the regression (4) with the SAD_t variable itself calculated from the length of nights, and averaging it over the year, i.e. assigning a value to each index to reflect the return from seasonal depression. This average annualised return is positive in all countries, ranging from 5.7 to 17.5 per cent, and significant for all indices except for the Australian stock market. Furthermore, it can be stated that countries closer to the equator tend to have a lower average value, with less significant returns attributed to seasonal depression than countries further away from the equator.

From the above, *Kamstra et al.* (*2003*) conclude that the pattern associated with seasonal depression is reflected in the returns on the stock indices under review as expected by the authors. In other words, due to the effect of seasonal depression, risk-averse investors are more likely to avoid risky assets in autumn on average and more likely to invest in riskier assets in winter on average, resulting in lower-than-average stock index returns in autumn and higher-than-average returns after the longest night of the year. It can also be observed that there is a correlation between the significance and magnitude of the effect of seasonal depression and the latitude of the stock exchange. Countries at higher latitudes (where the seasonal variation in the length of nights and days is more extreme) have higher returns and the SAD value is explanatory at a higher significance level on average (*Kamstra et al. 2003*).

2.2.2. The instrumental variable and its conditions of use

Although not discussed specifically in *Kamstra et al.* (*2003*), the methodology they apply corresponds to the use of the instrumental variable's reduced form. The instrumental variable is used for the construction of models in cases where the exogeneity condition for the OLS regression is violated due to an unobserved confounding variable that is not causally related, i.e. there is no independence between the error term and the explanatory variable (*Pearl – Mackenzie 2018*). An instrumental variable is a variable for which the conditions shown in *Figure 1* pertain: (1) the instrumental variable has an effect on the explanatory variable (there is a high correlation between the two, possibly a causal relationship based on specialised knowledge); (2) the instrumental variable has an effect on the dependent variable only indirectly through the explanatory variable; and (3) there is no unobserved confounding variable between the instrumental variable and the dependent variable (*Pearl – Mackenzie 2018*). Accordingly, in *Figure 1*, the existence of the relationships marked in black and the exclusion of the existence of the relationships marked in red describe, in a simple manner, the fulfilment of the instrumental variable's conditions of use.

Figure 1
Causal map with instrumental variable



Source: Based on Pearl – Mackenzie (2018)

If an instrumental variable satisfying the conditions shown in *Figure 1* is available in an analysis, a causal relationship between two variables can be estimated using the two-stage least squares method. In order to do this, we first need to estimate the biased explanatory variable of our hypothesis using the instrumental variable in an OLS regression where the explanatory variable is explained by the inclusion of the instrumental variable, as we assume that the instrumental variable gives a more accurate value for the original explanatory variable. The resulting estimated coefficients are then substituted into the original model in place of the original explanatory variable to run the second OLS regression, which no longer violates the exogeneity assumption and captures a causal relationship (*Pearl – Mackenzie 2018*).

However, in their paper *Kamstra et al.* (*2003*) do not use a two-stage least squares method to estimate the effect of seasonal depression on returns; instead, they apply a reduced form as they estimate the returns on stock indices directly from the instrumental variable (SAD_t). The reduced form of the model that includes the instrumental variable can be used primarily as a model diagnostic tool to test the relevance of the use of the instrumental variable (*Pesaran – Taylor 1999*).

3. Measuring the effect of seasonal depression

3.1. Data applied in the analysis

As the research of *Kamstra et al.* (*2003*) is an important part of the literature and investigates an easy-to-describe cognitive bias, it is worth examining in more detail. Moreover, as *Goodell et al.* (*2023*) pointed out, articles focusing on Europe account for roughly 12 per cent of all studies on investor sentiment and finance; therefore, later in our paper we will examine the way in which the explanatory power of seasonal depression can be applied to the European financial market in particular.

Our analysis is focused on the stock market indices of seven countries. These include the stock indices applied by *Kamstra et al.* (*2003*) and two indices from the Central European markets, namely, the Polish WIG and the Czech PX stock indices. For the latter two countries, *Škrinjarić* (*2018*) found no significant relationship between SAD and returns.

For the selection, we considered the volume of trading on the specific stock exchange and its location; consequently, a total of two US and five European stock indices are included in the analysis. All indices are weighted by capital value. The US indices are included in the analysis in order to verify the effect described by *Kamstra et al.* (*2003*) in a reproduction attempt, and the rest of the indices are used to examine the effect of seasonal depression in Europe, in particular in Central Europe.

Table 1 summarises the cities and corresponding latitudes for the selected indices. Latitudes were taken from the simplemaps database,[1] and values are rounded up as in the case of *Kamstra et al.* (*2003*). Daily returns for each index were obtained using the quantmod package constructed by *Ryan – Ulrich* (*2022*) for the RStudio software.

Table 1
Indices selected for the analysis

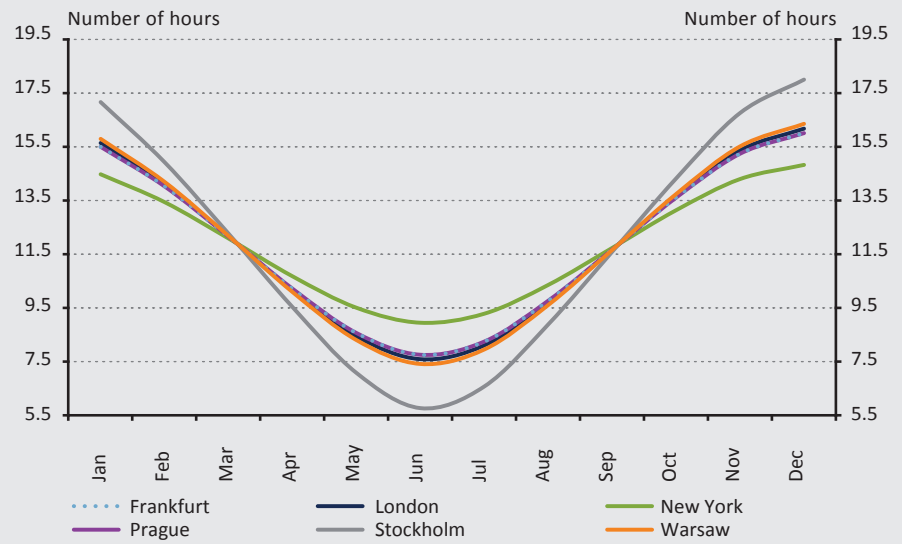
Country	Index	City	Latitude	Review period
United States	S&P 500	New York	41°N	01.12.1983–14.04.2023
United States	NASDAQ	New York	41°N	31.01.1985–14.04.2023
United Kingdom	FTSE 100	London	51°N	03.01.1989–14.04.2023
Germany	DAX	Frankfurt	50°N	04.01.1988–14.04.2023
Sweden	OMX	Stockholm	59°N	20.11.2008–14.04.2023
Poland	WIG	Warsaw	52°N	30.04.2013–01.10.2021
Czech Republic	PX	Prague	50°N	30.04.2013–01.10.2021

Source: Based on simplemaps

[1] https://simplemaps.com/data/world-cities. Downloaded: 28 February 2023.

In consideration of the latitude and the trading days, the length of the nights associated with specific trading days was determined using the spherical trigonometry formulae [(1) and (2)] described above. *Figure 2* displays the variation in the length of night by city, broken down by month, as determined by spherical trigonometry. The values displayed are smoothed, but for the purposes of subsequent calculations, the discrete values associated with specific trading days are applied. As demonstrated by the Figure, there is no significant difference for stock exchanges that are geographically close to each other (Prague, Frankfurt, Warsaw).

Figure 2
Length of nights for each stock exchange



Note: Calculated using the spherical trigonometry formula

Table 2 shows simple descriptive statistics for the stock market indices selected for analysis. The number of observations for the Swedish OMX, Polish WIG and Czech PX indices is significantly lower than the number of observations for the rest of the indices, but does not differ significantly from the index with the lowest number of observations used by *Kamstra et al.* (*2003*).

Table 2
Descriptive statistics with returns expressed in percentages

Indices	Sample size	Mean	Standard deviation	Min	Max	Skewness	Kurtosis
S&P500	9,923	0.04	1.15	–20.47	11.58	–0.76	22.88
NASDAQ	9,628	0.05	1.41	–12.32	14.17	–0.12	11.08
FTSE 100	8,659	0.02	1.10	–10.87	9.84	–0.14	10.32
DAX	8,919	0.04	1.40	–13.14	11.40	–0.11	9.44
OMX	3,612	0.05	1.29	–10.57	10.37	–0.04	8.63
WIG	2,024	0.03	1.09	–12.65	5.80	–1.05	15.67
PX	2,027	0.02	0.94	–7.84	7.65	–0.76	12.80

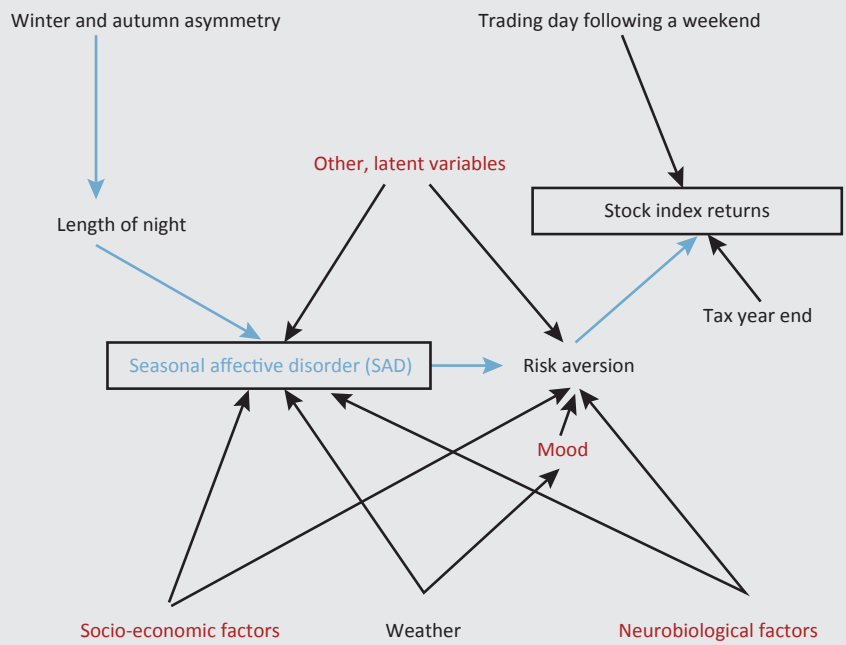
Source: Based on data from the Quantmod package (Ryan – Ulrich 2022)

We did not use completely overlapping trading periods partly because of the specificities of the quantmod package constructed by *Ryan – Ulrich* (*2022*), and partly because the data are much more recent than those observed in *Kamstra et al.* (*2003*). However, as expected, the descriptive statistics take similar values for each index; for example, returns are negatively skewed for all indices.

3.2. Methodology applied for the analysis

In order to construct the model required for estimating the effect of seasonal depression on the returns of the selected indices, we relied on the causal map shown in *Figure 3*, which can be used to plot different causal and non-causal paths, and also provides a clear summary of the variables associated with the phenomenon to be analysed as described by *Pearl – Mackenzie* (*2018*). In *Figure 3*, the causal path (i.e. the relationship whose effect we wish to estimate with the model) is indicated by blue arrows, and unobservable variables are presented in red. Some of the variables in the causal path are primarily based on the variables used in *Kamstra et al.* (*2003*); however, when placed on the causal map, it appears that their study controls for some variables redundantly.

Figure 3
Causal map associated with the model used for the analysis



Note: Unobservable variables in red, instrumental variables and causal path in blue.
Source: Based on Kamstra et al. (2003) and Pearl – Mackenzie (2018)

For example, one such variable is the asymmetry around the winter solstice, for which the D_t^A binary variable was included in the regression model. In fact, this variable has no indirect effect on stock index returns in itself; instead, it acts through the length of the night; consequently, controlling for it will yield a biased result. For seasonal depression and risk-taking propensity, we can see variables that affect both but cannot be observed. These are the variables that we should control for if they were observable; however, either the data are insufficient or the variables cannot be adequately quantified, such as neurobiological characteristics which, based on the literature, have a clear effect on the onset and magnitude of seasonal depression and also on the level of individual risk-taking propensity (*Zuckerman 1984*).

However, for lack of that option, we estimate the effect of seasonal depression using the instrumental variables method mentioned above, as indeed, the causal map demonstrates that all three conditions for doing so are present. Namely, (1) the length of nights affects the explanatory variable, i.e. seasonal depression;

(2) the length of nights affects stock index returns only indirectly through seasonal depression; and (3) there is no unobserved confounding variable between the length of nights and stock index returns. The causal map will thus enable us to verify the use of the SAD_t variable calculated from the length of nights by *Kamstra et al.* (*2003*) as an explanation of stock index returns, as in this case the length of nights means the instrumental variable used to estimate the size of the seasonal depression.

However, it is necessary to control for the D_t^T variable related to the close of the fiscal year and for the D_t^M variable implying the first trading day of the week, as presumably they affect returns directly rather than through risk-taking propensity. The causal map therefore enables us to estimate the effect of seasonal depression on returns more accurately, without endogeneity, by way of regression (5) below through influencing risk-taking propensity:

$$r_t = SAD_t + \rho_1 r_{t-1} + D_t^M + D_t^T + \epsilon_t \quad (5)$$

where SAD_t is the instrumental variable calculated from the length of nights, $\rho_1 r_{t-1}$ is the return lagged by one day, D_t^M is the first trading day of the week, and D_t^T is the variable associated with the close of the fiscal year.

4. Analysis of the effect of seasonal depression on financial markets

In this Section, in our analysis of the effect of seasonal depression on financial markets, we present the results of an estimation with a modified model compared to the one applied by *Kamstra et al.* (*2003*). Similar to the authors, we found a statistically significant relationship for three of the seven stock indices in our analysis. The findings also confirm that the issue is worthy of deeper analysis, and that even a causal relationship may well be observed with additional observations.

4.1. Findings and comparison

Although the causal map and the results obtained by *Kamstra et al.* (*2003*) both suggest that the inclusion of the variable related to the end of the fiscal year should be important to obtain a better estimate of stock market returns, this variable was not included in the final model because we did not have the resources required for calculating the values included in the variable. Consequently, the final model is the following:

$$r_t = SAD_t + \rho_1 r_{t-1} + D_t^M + \epsilon_t \quad (6)$$

Table 3 is obtained after regressing equation (6) on stock returns by country and includes all the coefficients for the stock indices included in the analysis except for the two Central European indices. The coefficient of the SAD_t variable is significant for all indices except for the returns on the S&P 500 and the OMX index.

Robust standard errors are estimated both in *Tables 3* and *4.* Comparing *Table 3* with the results obtained by *Kamstra et al.* (*2003*), there is a clear difference in the magnitude and significance of the coefficient associated with the SAD_t variable. The coefficient will be significant for NASDAQ, FTSE 100 and DAX with a p-value of at least 10 per cent. The coefficient associated with the D_t^M variable, which represents the start of the trading week, is negative for all indices except one, but will only be significant for NASDAQ (at a p-value of 1 per cent). The F-statistics will be significant at a p-value of at least 10 per cent in all cases except FTSE 100.

However, it should be noted that for DAX we obtained very similar results in terms of the magnitude of the coefficient. In the study by *Kamstra et al.* (*2023*), the coefficient of the SAD variable is 0.025, while in our current calculations it is 0.023.

For each trading day, we calculate the value of the SAD variable, multiply it by the coefficients obtained from the regression equation, and annualise the resulting return to obtain the annual return arising from seasonal depression. For example, *Kamstra et al.* (*2003*) calculated 8.2 per cent for DAX. According to our results, the return from seasonal depression is 7.98 per cent for Germany, 4.2 per cent for the UK and 5.43 per cent for NASDAQ. In other words, returns are that much higher relative to a situation without seasonal depression. These are very high values considering that the daily returns in *Table 2* correspond to annual returns of around 10, 5 and 12.5 per cent, respectively. However, the Monday effect, although significant in only one case, is associated with a negative sign and thus reduces annual returns.

Overall, of the indices included in *Table 3*, only NASDAQ shows a significant SAD_t coefficient and a strong F-statistic and accordingly, it is in the case of NASDAQ that the model is assumed to best capture the effect of seasonal depression on the risk-taking propensity reflected in stock returns.

Table 3
Regression results for selected stock indices in the US and Europe with robust standard errors

	Dependent variable:				
	Daily returns (per cent)				
	(S&P 500)	(NASDAQ)	(FTSE 100)	(DAX)	(OMX)
SAD_t	0.017 (0.010)	0.027** (0.013)	0.013* (0.007)	0.023** (0.009)	0.010 (0.009)
D_t^M	–0.033 (0.033)	–0.112*** (0.039)	–0.020 (0.033)	0.033 (0.041)	–0.024 (0.060)
Lagged variable	–6.566*** (2.286)	–1.772 (2.048)	–1.447 (1.862)	–1.198 (1.590)	–5.294** (2.463)
Constant	0.034** (0.015)	0.049*** (0.019)	0.010 (0.016)	0.007 (0.020)	0.034 (0.030)
Number of observations	9,922	9,627	8,658	8,918	3,611
R^2	0.005	0.002	0.001	0.001	0.003
Adjusted R^2	0.004	0.001	0.0003	0.001	0.002
F-statistics	15.443***	5.386***	1.795	2.505*	3.778**

*Note: *p<0,1; **p<0,05;***p<0,01.*
Source: Based on data from the Quantmod package (Ryan – Ulrich 2022)

Table 4 summarises the results of equation (6) run for the daily returns of the Polish and Czech WIG and PX indices. Apparently (with one exception), none of the coefficients associated with any of the variables will be significant, nor will the F-statistics be significant at a p-value of 5 per cent or above. It is likely that the effect of seasonal depression on returns cannot be detected through regression because the number of daily returns available for both countries is significantly smaller than for major stock markets.

This may also be supported by the fact that the SAD_t coefficient of OMX, which also has few observations on daily returns, did not turn out to be significant. In addition, it is possible that market integration is even greater, or that asymmetric returns are priced in on the market, or the analysis may not have taken into consideration an equity index or certain country-specific characteristics.

Table 4
Regression results for selected stock indices in Central Europe with robust standard errors

	Dependent variable:	
	Daily returns (per cent)	
	(WIG)	(PX)
SAD_t	0.002 (0.014)	0.011 (0.014)
D_t^M	0.084 (0.068)	0.006 (0.054)
Lagged variable	5.001 (4.683)	0.0001 (0.0002)
Constant	0.010 (0.032)	0.007 (0.028)
Number of observations	2,023	2,026
R^2	0.003	0.0004
Adjusted R^2	0.002	–0.001
F-statistics	2.247*	0.273

*Note: *p<0.1; **p<0.05; ***p<0.01.*
Source: Based on data from the Quantmod package (Ryan – Ulrich 2022)

5. Summary

As the results of the literature presented demonstrate, research focusing on investor sentiment and various seasonal patterns is a particularly important subfield of behavioural finance. Investor sentiment and seasonality may provide additional information, for example in financial market analyses, which may well make this approach a component of a successful investment strategy. Moreover, taking into consideration investor sentiment and observable seasonal effects may enable researchers to explain market anomalies that classical finance has previously observed, but failed to explain.

The results from the literature on sentiment and seasonal effects aptly demonstrate that, as we intend to explore the relationship between variables that are difficult to quantify and test, we need to be careful in our analysis. In addition to the empirical analysis, it is advisable to focus on processing subject-specific insight relevant to the analysis. Different statistically significant relationship analyses should be examined from different perspectives, as they do not necessarily explain causality on their own.

The analysis and reproduction of the Kamstra model suggests that the SAD_t variable applied in the model may be suitable to describe the effect of seasonal depression,

as it showed a statistically significant relationship in the model constructed to explain the returns on several stock indices. Since in this form, the variable is used as a reduced form of the instrumental variable, no causal relationship can be detected between the reduced risk aversion reflected in stock market returns and the degree of seasonal depression.

We found significant effects on a long-term yet relatively recent database of three major stock exchanges (NASDAQ, UK, Germany). Since Škrinjarić found that a profitable trading strategy could be developed based on the SAD phenomenon on the Croatian stock market, our analysis may be used as a basis for further investigations on these three stock markets to see whether such portfolios can be established in their case.

Given the methodological soundness of the original paper and in consideration of the significant relationship, the analysis suggests that a causal relationship may well be measured by including observations regarding the magnitude of seasonal depression. The SAD_t variable may be used as a proxy to explain stock market returns for selected stock indices. Nevertheless, for a more extensive relational and causal analysis, the model needs to be developed further, and the application of a more complex time series approach is required. Moreover, by including more stock returns and applying the fiscal year variable, the effect of seasonal depression may be investigated further for the Central European stock market.

Our research provides useful information not only for academic researchers, but also for managers of financial companies, especially in the three affected countries we identified. Since seasonal depression is calculated to be responsible for 4 to 8 per cent of annual returns, it may be worthwhile to reduce risk aversion among employees by improving their working conditions. There are numerous ways to reduce seasonal depression that companies can offer to their employees (light therapy, vitamin D, psychological counselling, etc.). This may be the subject of a new research project.

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The Impact of Trust-Building Leadership Behaviour at Selected Organisations in the Financial Sector*

Emőke Nyéki – Márta Juhász

The study investigates the extent to which trust is reflected in managers' behaviour in treating employees and how this is perceived by subordinates. Our analysis was conducted using the Pearson's chi-square test and tests determining the likelihood ratio and linear relationship. Analysing the responses of a total of 556 employees from four financial organisations, we examined how managers can build trust with their employees and how, beyond the treatment by managers, the degree of change perceived within the organisation and the attitude of trust in employees affected employee engagement. The findings confirm that the experience of trust has a knock-on effect on the manager: it increases the manager's internal security and self-confidence, which serves as an additional resource to reinforce the atmosphere of trust within the organisation.

Journal of Economic Literature (JEL) codes: M00, M51, M54, M55

Keywords: trust, leadership, people management, change

1. Introduction

Trust is the basis for financial decisions and is considered to be the main currency of the financial sector. The financial sector, like all sectors that rely on customer relationships, goes to great lengths to earn the trust of its customers. At the same time, it is the paradox of the activity and operation of financial institutions that, while they rely on the trust of customers, they are forced to use the tools of distrust to ensure their own operational security. In our research, we examine the extent to which trust was reflected in the way managers treated employees and how this was perceived by subordinates. In addition to their own organisational reliability, banks, insurance firms and financial intermediaries communicate the reliability of the

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Emőke Nyéki: Budapest University of Technology, PhD Student. Email: nyeki.emoke@gtk.bme.hu
Márta Juhász: Budapest University of Technology, Habilitated Associate Professor. Email: juhasz.marta@gtk.bme.hu

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financial services they offer or provide as part of their 'brand' messages, as indeed, for the customer financial services are transactions of trust (*Fojtik – Farkas 2001*). Financial institutions are subject to strict international and national regulations to ensure their organisational reliability; consequently, they are required to verify the true identity of the customer immediately upon contracting with the customer (KYC – Know Your Customer Policy). When providing funding, the bank is required, as part of its risk management procedure, to rate the customer, or similarly, the insurance firm needs to verify the claim reported by a policyholder client. At the beginning of a customer relationship, the financial institution seeks to assess, in a time of 'peace', how the customer relationship will evolve in the event of an unexpected and unintended crisis or 'war', even in a worst-case scenario. The effectiveness of this type of risk management – including the examination of customer character – is one of the main pillars of the organisation's reliability.

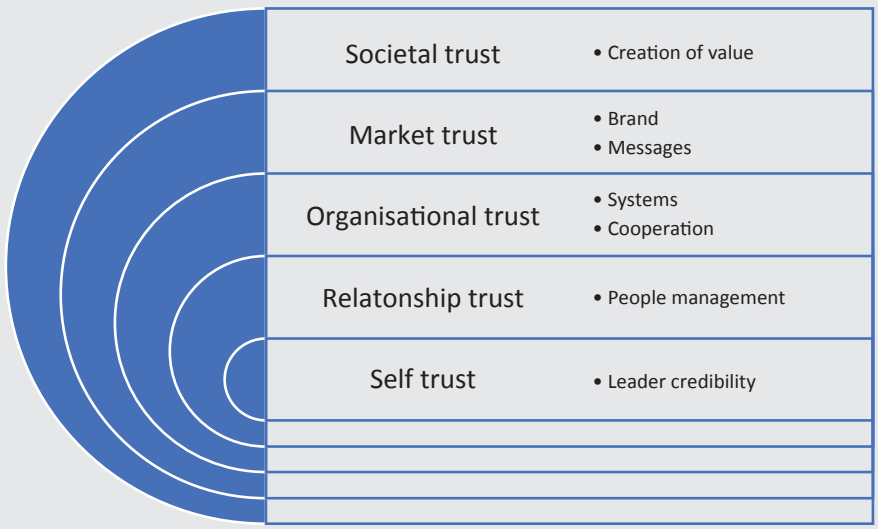
The dichotomy of trust and distrust, of empowerment and control, is not unique to the financial sector, but the trust is cited perhaps most often in this sector. The existence or importance of trust took on a new dimension in Hungary in 2023 with changes such as deposit-taking opportunities and lending conditions in a changing financial environment, the new expectations of employees regarding atypical working schemes (*Vörös et al. 2022*), arising partly from the spread of home office practices during the Covid-19 pandemic*,* the fourth industrial revolution of digitalisation, or the exponentially increasing use of data (*Müller – Kerényi 2019*). In addition to ensuring reliability and predictability, organisations need to respond to changes in the business environment.

In this ever-changing environment, organisations can respond adequately if managers are capable of introducing the changes quickly, efficiently and with a high degree of confidence, as indeed, in this case, employees will trust their leaders, feel safe around them, and follow them and their guidance voluntarily. However, the strong control resulting from operational risk may limit interpersonal trust within the organisation. An organisational culture based on core values, including trust at all levels of the hierarchy, may contribute to minimising risk, which spreads outside the organisation to customers, influencing other market players.

If a financial institution seeks to build market confidence, it should do this job from the inside out. Credible managers can consistently use '*people management'* tools to build relational trust with employees, which has an impact on the level of trust within the organisation. The way employees treat each other within the organisation will spread to the level of market trust as the 'brand' of the organisation, whether as a financial services brand or as an employer brand. Accordingly, the market trust built up by the organisation becomes the building block of social trust, creating added value and exerting an impact on society as a whole. The influence of credible leaders is like a 'ripple effect which occurs when a drop falls into a pool of water',

flowing from the inside out, with an ever-widening impact (*Figure 1*) (*Covey – Merill 2011*).

Figure 1
The five waves of trust



Source: Based on the Covey – Merill (2011) model

In our research, we sought to explore what managers needed to do to build trust in employees and to ensure that employees follow them with unbroken confidence, even in a changing operating environment. In doing so, our goal is to rely on cognitive factors to transform *blind trust* as an emotional factor *into smart trust* through comprehensible and measurable data (*Covey et al. 2012*).

We investigated the perception and prioritisation by subordinates of leadership behaviour patterns that influence the level of trust between employees and their managers at four organisations in the financial sector, and analysed the impact of such on employee satisfaction. We also examined employees' individual attitudes on trust and the impact of the changing environment, as well as employees' perceptions of managers and of the organisation as an employer. The research aims to provide measurable and comprehensible information to help managers reinforce the trust of their subordinates through their behaviour as leaders in today's ever-changing world, in a time of the often-cited confidence crisis (*Edelman 2020*). We do this because organisations examine a broad range of contexts in order to foster the achievement of their goals, but they seldom address the consequences of the lack of trust and only do so at a theoretical level (*Bencsik – Juhász 2018*). While our

study focuses on the interrelationships identified in the financial sector, we believe that our findings may also be useful for managers in other economic sectors.

In *Section 2*, we present the literature underlying our hypotheses, which are described in *Section 3. Section 4* lays out the methodology and structure of our research in detail, before the findings are discussed in *Section 5*. Finally, we summarise the theoretical and practical conclusions of our study in *Section 6*.

This article is the result of an empirical study that examines the employee Net Promoter Score (eNPS) from the employee's perspective by studying VUCA (i.e. Volatility, Uncertainty, Complexity and Ambiguity), the attitude of trust, and the expected and perceived behaviour of executives and line managers. Although our survey is sector-specific, the results of the correlations we examined may provide useful information for managers in other sectors on how the complexity of the external environment and the expected and perceived leadership behaviour affect engagement.

2. Literature review

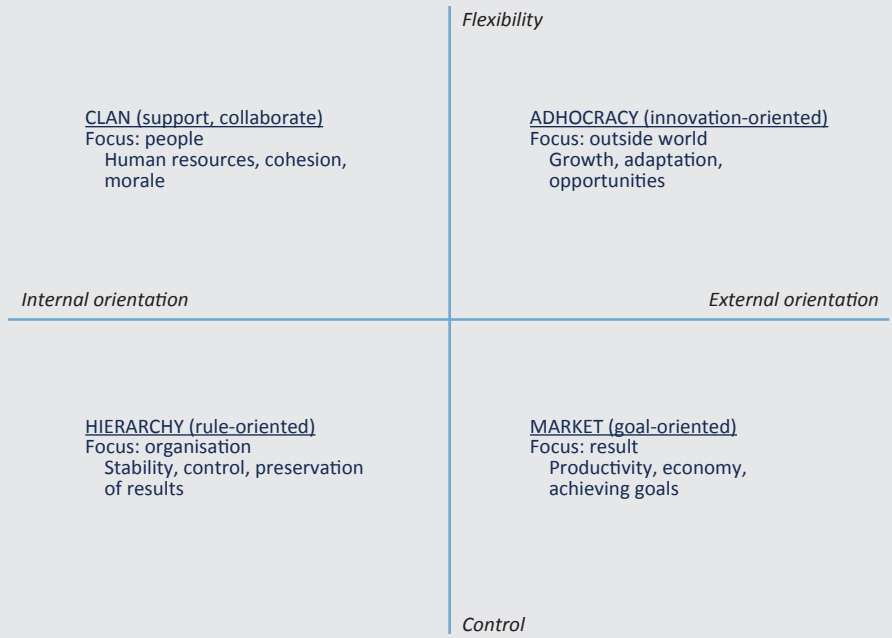
2.1. Organisational culture

Depending on whether the organisational environment is favourable or unfavourable, and to the extent it is, employees will be able to harness their skills and achieve their goals with their team (*Hinova-McNamee 2022*). The organisational environment is made up of complex values, assumptions and beliefs which, as cultural elements, determine the manner in which an enterprise does business (*Pettigrew 1990*). Organisational culture, as a tool that influences organisational efficiency, may promote the organisation's more efficient functioning by fostering collectivism and defining shared values and goals (*Tariszka 2017*). At the same time, however, it develops slowly, it is asymmetric, slow to improve and fast to deteriorate.

Quinn's model defines the types of organisational culture along the lines of a combination of four endpoints of two dimensions: hierarchy, clan, market and adhocracy. The two main dimensions express conflicting, 'competing' values. The vertical axis is the continuum of *'flexibility–control'* with versatility and flexibility at one end and consistency and persistence at the other, while the horizontal axis is on the continuum of the '*internal–external*' orientation of the organisation. Organisations with an internal focus concentrate on capabilities and the integration and integrity of their processes, while those at the other end of the continuum maintain a competitive market position; consequently, these externally-oriented, environment-focused organisations actively seek market opportunities, strive to

differentiate themselves and accordingly, focus on competition and attracting the attention of customers (*Figure 2*).

Figure 2
Dimensions of Quinn's organisational culture



Source: Quinn's model of organisational culture, based on Cameron – Quinn (1999)

2.2. Interpersonal trust in the organisation

The presence or absence of interpersonal trust is a key determinant of the organisational-environmental impact. The literature makes it clear that trust is a critical determinant of successful, high quality working relationships (*Dutton – Ragins 2017*) and performance (*Fulmer – Gelfand 2012*). Interpersonal trust is "*the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party*" (*Mayer et al. 1995:712*). In this sense, trust as an attitude is nothing more than an experience or expectation related to others, based on the trustor's perception of the trustee's ability, benevolence and integrity. The propensity to trust is a generalised and enduring predisposition that is about us, but is also related to a lifetime of experiences (*Mooradian et al. 2006*). Trust is a perception that manifests itself as an affective (emotional) attitude towards another person about whom we form an impression (*Robinson 1996*). This attitude is derived from our perceptions, convictions and personality traits; therefore, those with a high propensity to trust

assume that most people are fair, honest and well-intentioned (*Johnson 2005*). In most definitions of trust (*Blomqvist 1997*), the personal attitude of the trustor as a propensity to trust and the evaluation of the behaviour of the trustee are two basic determinants (*Cook – Wall 1980; Boon – Holmes 1991; McAllister 1995; Schoorman et al. 2007; Rousseau et al. 1998; Lewicki et al. 1998; Whitener et al. 1998*). The propensity to trust reflects a person's general willingness to trust others (*Mayer et al. 1995*). Empirical evidence suggests that the willingness to trust is especially needed in situations where we have no other information on which to rely (*Grant – Sumanth 2009; van der Werff – Buckley 2017*). Managers often find themselves in situations where they can only rely on their own willingness to trust. This is why we considered it important to examine the trust attitudes of subordinates in the context of managers' trust-building behaviours. "*Leadership is a process whereby the leader ensures the formulation and achievement of goals by way of influencing the group"* (*Répáczki – Juhász 2015:85*). This impact can be efficient and effective if employees are willing to embrace their vulnerability without checking or controlling ('testing') their own leader, because they trust them fundamentally.

2.3. The manager's proactive role in building trust

Trust is positively correlated with the satisfaction of personal needs. Accordingly, if the manager pays attention to the personal needs of his subordinates and contributes to the fulfilment of these needs through his decisions, he will facilitate the positive perception of himself (*Cook – Wall 1980*). In other words, the fulfilment of needs increases the level of trust within the organisation.

In order to illustrate why we are looking at the behaviour of managers in relation to the existence of trust between employees and managers, our starting point should be the 'agency theory' (*Eisenhardt 1989*). In the approach of the agency theory, the trustor, as the 'principal' entrusts the manager, as the 'agent' to represent his interests in maximising profits. Minimising the risk of achieving the objectives expected by the 'principal', the manager as the 'agent' controls the behaviour of the staff. At the same time, both the manager and the employee seek to maximise their personal benefits while minimising the risk inherent in the relationship. Given the limitations of controlling employees (*Grant 1992*), a high level of mutual trust between managers and employees is key to the success of the efforts made to achieve the goals. To do this, the manager should consciously demonstrate to his employees that he is not abusing their vulnerability; in addition to representing the interests of the 'principal', he also keeps in mind the interests and needs of the employees. It may seem contradictory, however, that trust is often defined by managers as a 'soft' and seemingly unmanageable concept, yet this invisible factor is an indispensable condition for gaining the competitive advantage that comes with strategic and structural innovation. The actions and habits of managers are the cognitive factors that provide the basis for trust in the *manager-subordinate*

relationship, and it is therefore the manager's responsibility to take the first step and initiate a trusting relationship (*Whitener et al. 1998*).

Organisations that successfully achieve high levels of managerial trustworthiness have a competitive advantage in the market over those that do not (*Barney – Hansen 1994*). The environment and the drive to be competitive push organisations towards more flexible or networked forms and increased attention is being paid to process re-engineering. *Hammer* and *Champy* (*1993*), for example, describe future organisations as flat and team-oriented forms in which workers do multidimensional work and make autonomous decisions. But these changes can only be achieved through greater supervision and control, increased trust between employees and management, or some combination of the two. The companies that are expected to thrive in future will be those that anticipate changes, plan their goals and activities accordingly, and encourage their managers to build relationships of trust (*Barney – Hansen 1994*). Charismatic communication by management during changes positively influences employee trust, openness to change and behavioural support for change, whereby employees facilitate the change itself. Employees' trust in the organisation during changes positively influences their openness to change, which in turn contributes to supporting employee attitudes towards change (*Men et al. 2020*).

Building a culture of trust should be seen as an ongoing and indispensable task for managers. Trust needs to be earned. An organisational culture of trust is established when managers lead with awareness, integrity and ethics, create the right atmosphere for difficult conversations, celebrate and empower their teams by practicing empowering leadership, and exercising consistent and transparent communication and compassion (*Palmer 2021*). Ethical leadership, i.e. the demonstration of behaviour that conforms to the norms accepted by the organisation through personal actions and interpersonal relationships, and the personal display of such behaviour to employees through two-way communication, reinforcement and decision-making (*Brown – Trevino 2006*), is one of the most important leadership styles that foster positive attitudes and behaviour among employees. Such a management style is important in organisations where customer satisfaction and loyalty are achieved through effective service delivery and complaints handling processes (*Eluwole et al. 2022*). Employees who consider fair treatment a priority are confident in knowing that their efforts are rewarded and valued. In addition, subordinates appreciate their superiors' concern for their well-being, as it indicates that their superiors care about them and that their ability to perform is not the only important factor in their relationship with the managers (*Bhatti et al. 2021*). Trust in the superiors based on a belief in them reflects two different degrees of trust in the individual, according to which the individual is willing to communicate sensitive and important issues and information to the managers, or

is willing to rely on the skills and competence of the managers. Managers need to raise awareness of the need to build employee trust by influencing the employee's positive perception of the manager's character, and by viewing employees as assets and valuing them as key resources in the organisation. It makes sense to develop and maintain an emotional connection with employees and to constantly motivate them to achieve even better results (*Le – Tran 2020*).

2.4. eNPS – employee Net Promoter Score

For managers to be able to count on their colleagues and subordinates to follow them and their guidelines, it is necessary to measure employee satisfaction, in particular, employee engagement, in any organisation. The concept of commitment to the manager and to the organisation refers to a person's affective reactions to management and to the employer organisation. Trust in managers and in the organisation positively correlates with organisational commitment (*Cook – Wall 1980*). Individuals with high levels of commitment are willing to devote more effort to the goals and objectives of the organisation (*Guest 1987*). There are many methods and questionnaires to measure employee engagement and loyalty. One of the simplest and most efficient ways to assess engagement is to use eNPS (*Sedlak 2020*), which is a method for measuring employee satisfaction. When asked *'How likely are you to recommend your organisation/manager to a friend or acquaintance on a scale of 1 to 10?',* those who answer 9–10 are considered by the method as *promoters*, those who answer 7–8 are considered as *passive* and those who answer 0–6 as *detractors*. A *promoter* is the one who puts in the most effort in the organisation, is satisfied and is willing to make this known, thus giving the organisation and its managers a good reputation. He forgives minor mistakes that do not compromise his commitment. *Passives* are generally satisfied but not enthusiastic, not necessarily willing to go the extra mile, and if another opportunity from another manager or organisation presents itself, they will consider it. *Detractors* are not satisfied, overall; they find it difficult to forgive mistakes and they talk about these mistakes to others, whereby they may well give the organisation and its managers a bad reputation. If another manager or organisation gives a *detractor* an opportunity to work, they will typically take it, but if they decline the opportunity and stay, they might cause more damage within the organisation than by leaving. The eNPS method subtracts the percentage of employees who are considered to be *promoters* from the percentage of employees who are considered to be *detractors*, ignores *passives,* and as a score, it assigns a percentage between –100 and +100, which is the net promoter score.

2.5. The impact of change

Employers rely on the loyal, committed efforts of their employees, and this is supported by a corporate culture founded on organisational trust and reliability. However, organisational change can jeopardise these corporate values even though

the changes may be beneficial to the organisation's performance. In many cases, organisational changes can only be understood and justified by managers, while at the level of employees they often lead to frustration, uncertainty, possibly distrust and increased stress (*Dahl 2011*). At the same time, increased compliance with organisational challenges and staff expectations can also cause stress for the manager (*Dahl 2011*), narrowing the focus and perspective and impairing the broadening of vision that might otherwise lead the organisation to a solution after the initial shock. Only from a position of inner calm can a manager inspire and encourage his subordinates, seeing the overall picture and how a change or challenge can actually serve as a stepping stone to new possibilities. The 'fight-or-flight' reaction is helpful in high-stress situations, but in today's challenging world, conscious behaviour and the consistent maintenance of internal balance are more effective than instinctive reactions (*Reeves – Fuller 2020*). The strategic goal and vision of the organisation can be achieved through interaction between people, in a healthy environment provided by the manager (*Hinova-McNamee 2022*), in which the manager is able to communicate convincingly with his colleagues. A key to creating this healthy environment is the calmness, composure and confidence of the manager, which is also essential to reduce stress levels among staff and prevent staff turnover.

As an invisible tax, employee turnover (*Covey – Merrill 2006*) weighs on the organisation's achievements and, although it is not shown as a separate heading in the financial statements, it is a burden borne by all organisations. The total direct and indirect cost of replacing a high-performing employee may amount to as much as 90–200 per cent of the employee's annual salary (*Allen 2008*). Direct costs include the cost of redundancy and its contributions, exit costs, severance pay, recruitment, hiring and training costs, and the cost of the difference in performance between entering and exiting employees (*Ambrus – Lengyel 2006*), but the level of indirect costs can also be alarming when the loss of employee morale and customer loyalty are also taken into consideration (*Allen 2008*). The high turnover rate of employees who voluntarily leave the organisation may be a warning sign for managers; indeed, it highlights the importance of treating people well. Managers' efforts to build and strengthen trust as a result of their behaviour require awareness, time and energy. This expenditure has an impact on the organisational culture and the workplace atmosphere, which are among the main factors that influence turnover (*Nemeskéri – Pataki 2007*). Increased turnover is not the only invisible tax; the chances of lower productivity and stalled innovation also increase in line with the fall in organisational trust (*Mortensen – Gardner 2021*).

According to our survey, by listening and adaptively responding to the needs of employees regardless of their distance from power, managers may have a significant impact on employee engagement towards their managers and, indirectly, towards

the workplace. It is particularly important to recognise this responsibility as, in the midst of a significant change, managers may become task-oriented, even switching to 'micromanagement'. In these situations, the organisation's response to the change needs to be rapid and efficient, and for this to happen, it is essential that employees trust and follow their leaders voluntarily. To this end, based on our survey, employees expect their line managers, first and foremost, *to trust them and to answer their questions honestly.* Besides *honesty*, it is an equally important expectation for executive managers to act as captains and to *communicate clearly to everyone concerned what their jobs and responsibilities are.*

We measured the degree of stress that employees experience in their workplace on a daily basis as a result of environmental changes by the degree of change they perceive. For this purpose, we used the dimensions of VUCA, an acronym used and researched in many fields to describe the volatility, uncertainty, complexity and ambiguity of the environment (*Bennett – Lemoine 2014; Baran – Woznyj 2021; Raja 2021*). While the acronym was originally developed as a guidance for US military strategies in the post-Cold War era, it also encompasses the contemporary context in which we face a number of complex challenges (*Van Berkel – Manickam 2020*). The four factors of VUCA (Volatility – hectic, unexpected, rapid, high-amplitude; Uncertainty – uncertain, unpredictable; Complexity – complex, complicated; Ambiguity – ambiguous, unforeseeable) are capable of triggering a stress response even individually, and when several or all four factors are combined, the intensity of the individual's stress response increases accordingly (*Kaluza – Chevalier 2018*).

This makes it worthwhile to examine how employees expect their managers to behave at different levels of the organisational hierarchy (as a cognitive factor) in order to increase their satisfaction, engagement and trust, and how this expectation is influenced by the degree of change experienced and the employee's attitude of trust (as an affective factor). Accordingly, in our research we examined seven patterns of management behaviour in relation to the respondent's attitude of trust, engagement and perception of the magnitude of change within the organisation.

3. Presentation of the research

3.1. Hypotheses

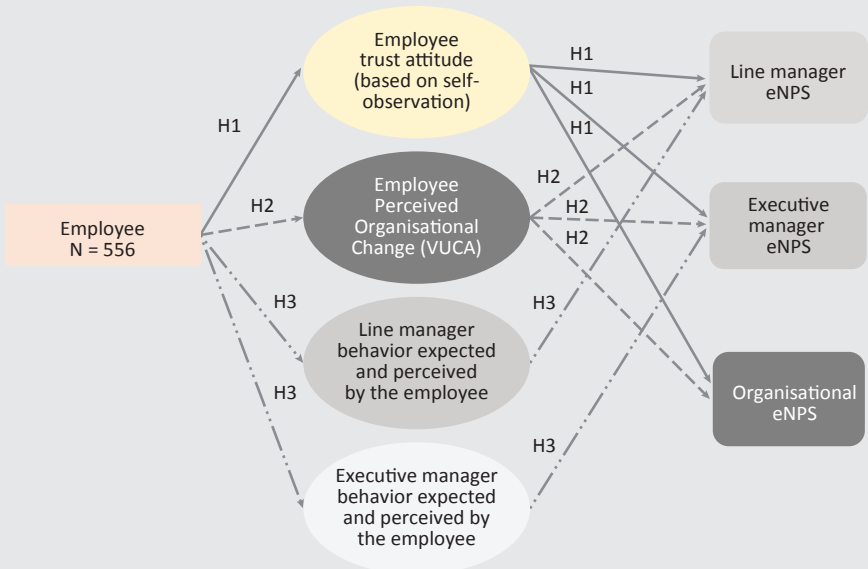
H1: In the context of the affective (emotional) and cognitive (intellectual) aspects of trust, it is hypothesised that the employee's willingness to trust influences the degree of employee satisfaction, engagement and trust (eNPS) in the manager and the organisation.

H2: In today's turbulent, volatile world, the degree of change perceived by employees affects the level of commitment to the organisation and its managers.

H3: Employees expect different behaviours from their line managers and executive managers, and if they experience the trust-building behaviours they expect, that will have a positive impact on their satisfaction with their managers.

The interrelationships between the three hypotheses are summarised in *Figure 3.*

Figure 3
Interrelationships of the hypotheses



4. Methodology

In our research, we collected data from four different types of organisations in the financial sector using an anonymous questionnaire. Participation in the survey was voluntary. We interviewed nearly 100 staff members of the directorate of a *commercial bank*, more than 500 employees of an *insurance firm*, 150 employees of a *financial intermediary* and 65 non-employee staff members of an *independent financial advisor* about the trust-building behaviours of their line managers and executive managers, and the perceived strength of changes within the organisation. Our objective was to collect and assess a diverse sample of financial sector participants and accordingly, we targeted organisations with different activities and organisational structures from the Hungarian financial sector. We felt it was important to have the support of the line manager and the executive manager for

the survey. Another selection criterion was that there should be at least three levels of management above the employees in the organisational hierarchy, in order to make the different expectations of the employees towards the different levels of management as visible as possible as a result of the power distance between the line manager and the executive manager. Finally, the timing of the survey was also important given the workload and focus of the organisation, so we sought to identify the level of staff workload resulting from projects running at the time of the planned survey and the current strategic tasks and organisational development focus. We planned and scheduled the survey process and calibrated the online platform on this basis. Following a briefing for managers and then for staff, it took three weeks to conduct the online survey at the organisations concerned.

4.1. Presentation of the sample

A total of 556 evaluable, completed questionnaires were received from non-managerial employees of the four financial sector participants, representing an average voluntary participation rate of 59.75 per cent.

In the questionnaire, we asked subordinate employees about the behaviour of their managers, because we wanted to break with the unitarist practice, where unitarism is the only aspect seen from the perspective of management regarding organisational relations, which is prejudiced in favour of management and is as damaging for employees as it is for management itself (*Siebert et al. 2015*).

Our questions were formulated in relation to the immediate line manager and the executive manager at least two levels above, in the hope that the expectations for and experiences about the manager from the two different power distances would show a striking difference (*Fiedler 1981*).

4.2. Structure of the questionnaire

In the first part of the questionnaire, the organisational culture of the respondent's employer was assessed using the questionnaire of Quinn's organisational culture model (*Cameron – Quinn 1999*). The ipsative assessment instrument assesses organisational culture in six dimensions: 1) Dominant characteristics of the organisation; 2) Organisational leadership; 3) Management of employees; 4) Organisation glue; 5) Strategic emphases; and 6) Criteria of success. Each aspect contains four statements, and for each aspect, the respondent must divide 100 points over the four statements. The scores for each aspect are aggregated to determine the dominant culture of the organisation, specifically Clan, Hierarchy, Market and Adhocracy.

In the second part, the respondent's general attitude to trust was measured in accordance with four statements taken from a validated questionnaire used by

World Values Survey[1] (*1. 'Most people are basically benevolent'; 2. 'Most people can be trusted'; 3. 'I trust people I meet for the first time'; 4. 'I tend to assume the best about others'*). Responses to the four-statement general attitude to trust were measured using a 4-point Likert scale, assessing the respondent's level of agreement, where a score of 4 indicated '*Strongly Agree'* and a score of 1 indicated '*Strongly Disagree'*.

In the next section, we measured staff perceptions regarding the magnitude of change in the organisation. The degree of perceived change in the organisation was measured by a question on the four dimensions of VUCA on a 4-point Likert scale. We asked respondents about the extent to which they felt that changes within the organisation were *volatile*, *uncertain*, *complex* or *ambiguous*. The responses to the four dimensions were used to calculate an overall measure of the strength of the perceived change.

Respondents' satisfaction and loyalty to their line manager, executive manager and the organisation was measured using eNPS questions on a scale of 1–10. For example: *'How likely are you to recommend your line manager/workplace/executive manager to a friend or acquaintance?*' The scores of the responses were used to determine the proportion of promoters (responses of 9–10) and detractors (responses of 1-–6).

Finally, we assessed the behaviour perceived by the respondent and the behaviour the respondent believes is most important for the two different managerial levels. The management behaviour patterns provided were selected based on the findings of previous surveys presented in the literature, which have been proven to have a positive impact on trust. From the findings of a global survey conducted by *Kouzes* and *Posner* (*2010*), *honesty* was highlighted for the purposes of our survey: 'My manager gives me honest answers"' An additional five behavioural patterns from the *Leader Behaviour Description Questionnaire – Form XII* (*Rodriguez 2013*), developed and validated by staff members at Ohio University in 1962, were used and may be particularly relevant in times of change: 1. *'He communicates clearly to everyone concerned what their jobs and responsibilities are'; 2. 'He gives you an opportunity to formulate and implement new ideas'; 3. 'He cares about my personal well-being'; 4. 'He represents our interests before senior management'; 5. 'He trusts me*'. Given that in terms of environmental impacts our survey specifically focused on change and its effect, we examined, as the seventh behaviour pattern and as an employer expectation, the leader's calmness and composure: '*My leader is calm and composed*.'

[1] https://www.worldvaluessurvey.org/WVSContents.jsp. Downloaded: 19 June 2024.

The thus selected seven management behaviour patterns were analysed from two aspects. First, we asked about the perceived frequency of these behaviours on a 6-point Likert scale, where 1 means that the respondent '*never experiences'* and 6 means that the respondent '*always experiences'* that particular behaviour. In the next part of the questionnaire, respondents were asked to choose a single behaviour of the seven behaviour patterns that was most important for them to trust their manager. These two types of questions had to be answered both in relation to the line manager and the executive manager. We investigated the relationship between perceived and expected behaviour and its impact on employee engagement (eNPS) for two different levels of management with the objective of understanding and demonstrating the different expectations of employees in respect of their line managers and executive managers.

The affective aspect was measured by four questions using a 4-point Likert scale. The maximum total score for the 4 questions was 16 points, of which a total score between 1 and 8 was considered low and a total score between 9 and 16 was considered high. When analysing the answers to the eNPS questions (*How likely are you to recommend... on a scale of 1 to 10?*), in line with the scoring system we classified the scores between 1–6 as 'detractors' and 9–10 as 'promoters'. A Chi-square test was used to analyse the relationship between the two qualitative variables. The statistical test was used to see if there was a significant relationship between the two variables. The respondent's attitude of trust was considered as an independent variable and the degree of commitment to the managers and the workplace as a dependent variable (*Table 1*).

Table 1
Examining the relationship between employees' trust attitudes and their commitment to their line manager and executive manager, and the organisation (Chi-square test)

	Chi-square test result	Degree of freedom	Significance level
Line manager	16.92	2	p<0.001
Executive manager	22.98	2	p<0.001
Organisation	12.16	2	p<0.001

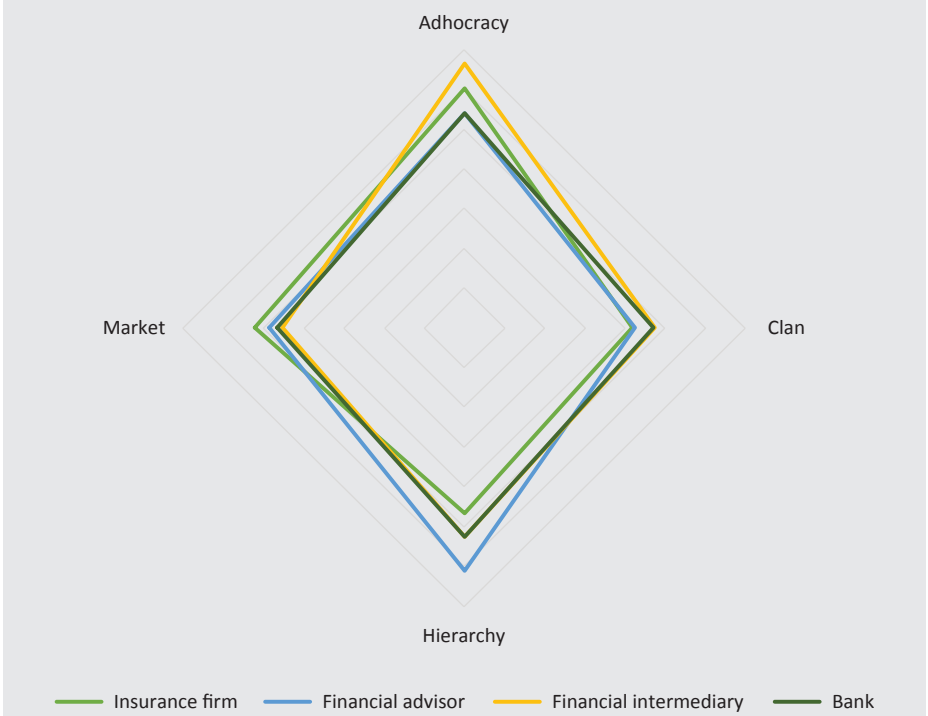
Note: Data were analysed using the SPSS 23 software package.

5. Findings

The culture of the organisations in our survey was assessed using Quinn's organisational culture questionnaire (*Cameron – Quinn 1999*). The findings show the data measured at the time of recording, being aware that these values are not constant, as the organisational culture is slow to evolve, its evolution is asymmetric: improving slowly and deteriorating rapidly. The organisational culture of the four financial organisations was found to be very similar when assessing the results

of the organisational questionnaire at the time of data collection, but there are still differences, as shown in *Figure 4*. While the diagrams of the insurance firm (Organisation I) and the independent financial advisor (Organisation II) are shifting towards adhocracy, where the focus is on the external environment and growth, and adaptation and opportunities influence the organisational culture, the financial intermediary (Organisation III) exhibits a higher value in terms of hierarchy relative to the other three dimensions, where the organisational culture focuses on the organisation itself, stability, control and the preservation of the achievements. Data of the selected directorate of the commercial bank (Organisation IV) display an almost equal emphasis in all four dimensions.

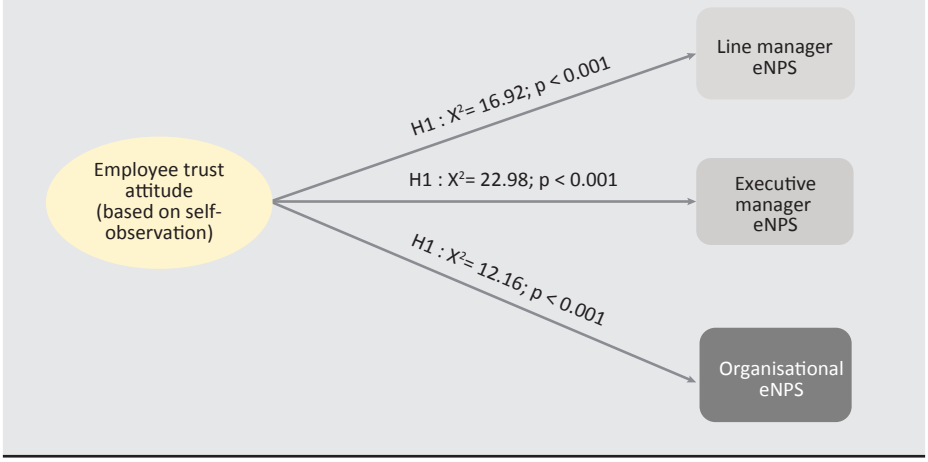
Figure 4
Comparison of Quinn's organisational culture results in the organisations under review



	Adhocracy	Clan	Hierarchy	Market
Insurance firm	30.1588	20.9047	23.3999	26.0725
Financial advisor	26.9469	21.2564	30.558	24.3151
Financial intermediary	33.2381	23.6905	26.3571	22.7143
Bank	26.914	23.5395	26.2316	23.3333

In our hypothesis H1, we investigated the relationship between affective (emotional) and cognitive (intellectual) aspects of trust (*Keszey 2015*), assuming that there was a significant relationship between employees' willingness to trust (affective) and their commitment (cognitive) to their managers and the organisation. Employees with low willingness to trust also give low eNPS also scored low in questions on employee engagement, and employees with a high willingness to trust exhibit high employee engagement (*Figure 5*).

Figure 5
Relationship between employee trust attitudes and the three eNPS's



The four questions exploring respondents' general attitude to trust were adopted from the validated *World Values Survey* questionnaire. The internal reliability of the four items (the extent to which the questions correlate with each other) was tested, yielding a Cronbach's alpha of 0.654.

As a result of the Chi-square test, we found that those who scored between 1 and 6 on the eNPS questions – i.e. the *detractors* – typically had a low attitude to trust, and that the opposite is also true: those who scored as *promoters* on the eNPS questions had a trust attitude score between 9 and 10.

The Chi-square test applied to examine the relationship between the attitude of trust and commitment to the line manager yielded a score of 16.92 (degree of freedom = 2; p<0.001). There are 273 employees with a high trust attitude of trust who are *promoters* in their relationship with their line manager according to the value of their response to the eNPS question versus the statistically expected 253.7 based on the results of the cross-tabulation analysis, while the

number of employees with a low trust attitude who are *detractors* according to the value of their response to the eNPS question is 46 compared to the expected 30.5. The results of the statistical test indicate that in both cases, the employee's attitude to trust exerts a minor impact on the employee's commitment to the line manager.

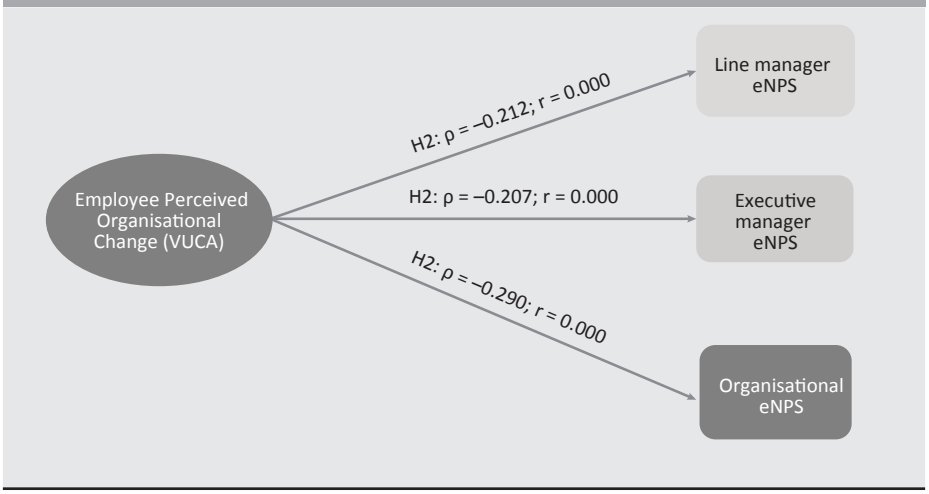
The Chi-square test applied to examine the relationship between the attitude of trust and commitment to the executive manager yielded a score of 12.16 (degree of freedom = 2; $p<0.001$). The results of the cross-tabulation analysis show that, similar to the correlation found for direct managers, the number of employees with a high trust attitude – i.e. *promoters*, based on their response to the eNPS question – is 230 relative to the statistically expected 216.7. And those with a low trust attitude – *detractors* based on their response to the eNPS question – amount to 54 compared to the expected 38.3. For both surveys, trust attitudes show a minor impact, overall, on both line manager and executive manager commitment.

The Chi-square test applied to examine the relationship between the attitude of trust and commitment to the organisation yielded a score of 22.98 (degree of freedom = 2; $p<0.001$). Employees with high trust attitudes – the *promoters*, based on their response to the eNPS question – amount to 204 versus the statistically expected 189.2 based on the results of the cross-tabulation analysis, while the number of employees with low trust attitudes – the *detractors* – is 64 compared to the statistically expected 41.6. The results suggest that, again, the trust attitude of the employees had a minor effect on the employee's commitment to the organisation.

Pearson's Chi-square test, as well as the likelihood ratio and linear relationship tests, all indicated a statistically significant relationship between the variables under review. *In conclusion, we found evidence in the statistical analysis that the correlation between the variables is statistically significant*.

Our hypothesis H2 was that the degree of change perceived by the employee would influence commitment to the organisation (*Figure 6*).

Figure 6
Relationship between the degree of organisational change perceived by the employee and the three eNPS's



The four questions on the degree of the organisational change perceived by the employee were formulated in line with the four dimensions of VUCA (*Nooh 2021*). The internal reliability of the four items (the extent to which the questions correlate with each other) was tested, yielding a Cronbach's alpha of 0.722.

We examined the correlation between the magnitude of the change perceived by the employee and the employee's commitment to the managers and to the workplace. The data were analysed using Spearman's correlation (ρ), which shows the extent to which one variable determines the degree of the other variable, and determines the direction and strength of the correlation. As a result of the analysis, we measured a significant correlation and a weak negative correlation between the perceived change and employee satisfaction in respect of both management levels and the organisation.

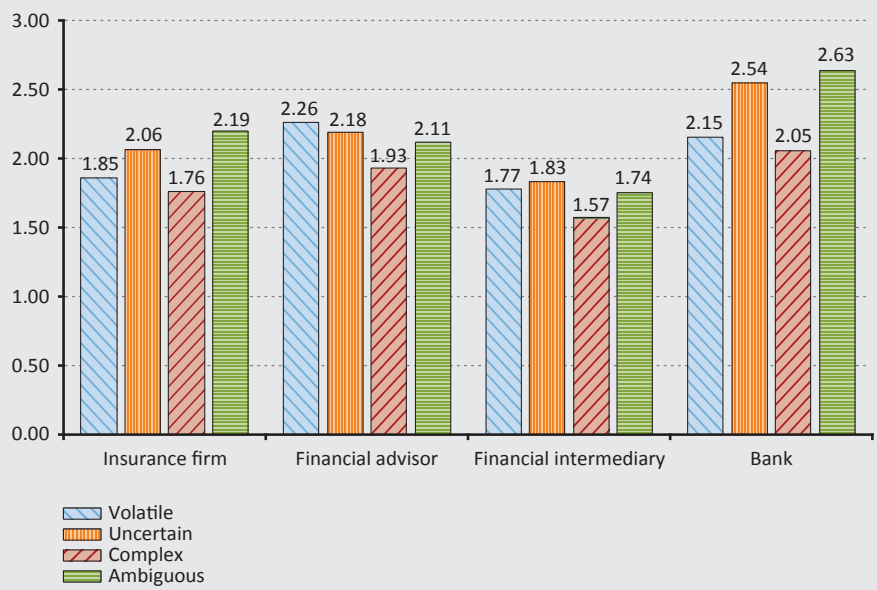
Our hypothesis H2 was confirmed by the results, namely, that there is a linear relationship between the two variables, i.e. the degree of the perceived change correlates to employee engagement (*Table 2*).

Table 2
Correlation (Spearman) between the magnitude of change perceived by the sample and employee engagement (N=556)

Question	Degree of correlation with the total VUCA score (ρ)	Significance level of the correlation (r)
How likely are you to recommend your line manager to a friend or acquaintance?	–0.212	0.000
How likely are you to recommend your workplace to a friend or acquaintance?	–0.290	0.000
How likely are you to recommend your executive manager to a friend or acquaintance?	–0.207	0.000

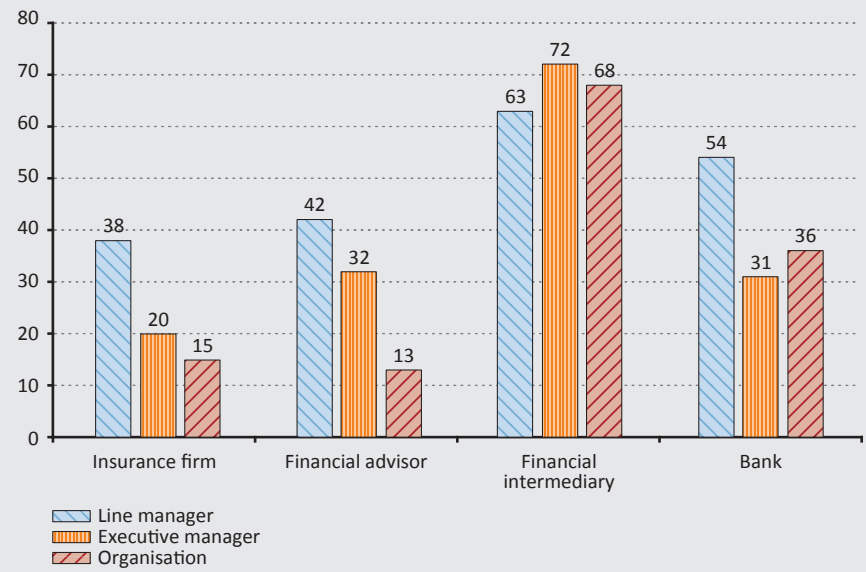
In addition to the results of the statistical test between two variables for all of the data, it is worth looking at the graphs of the values for each organisation. The degree of perceived change within the organisation also differs between the four organisations under review. As shown in *Figure 7*, the lowest scores in the comparison of the four organisations were measured for the financial intermediary.

Figure 7
Employees' perception of change in the four dimensions of VUCA, on a 4-point Likert scale



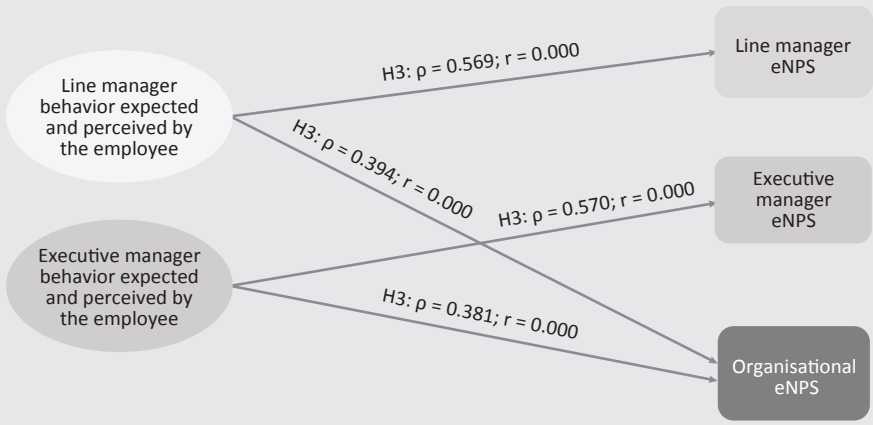
We analysed employee engagement in consideration of the change observed within each organisation. When asked '*How likely are you to recommend your line manager/workplace/executive manager to a friend or acquaintance on a scale of 1 to 10?',* in accordance with the calculation of the employee Net Promoter Score (eNPS) the percentage of promoters (9–10) is subtracted from the percentage of detractors (1–6) in order to receive the *employee Net Promoter Score. Figure 8* shows that the financial intermediary – the organisation with the lowest perception of change – has the highest employee satisfaction scores; moreover, it is the only organisation where the eNPS score of the executive manager is higher than that of the line manager.

Figure 8
Employee Net Promoter Score (eNPS)



Our hypothesis H3 was that when employees perceive management behaviours that are important to them, this will affect their commitment to their line manager and executive manager (*Figure 9*).

Figure 9
Relationship between the employee's expected and perceived management behaviour and the three eNPS's



A normality test of the data available found that the data were not normally distributed; therefore, in the statistical test we examined how often an employee who was a *promoter* based on the eNPS score perceived the behaviour pattern that was important to him. A highly significant correlation was obtained for the two levels of management and even for the organisation. In examining the relationship between employee *commitment to the line manager* and the employee's *perception of the line manager's behaviour* important to the employee, we measured a value of ρ = 0.569. This value also shows a positive correlation *for executive managers* (ρ = 0.570). Similarly, we found a positive correlation between employees' *commitment to the organisation* and their perception of the *management behaviours* that they considered important, but the correlation was lower than that measured for commitment to the line manager and to the executive manager. For the line manager this value is ρ = 0.394, while for the executive manager it is ρ = 0.381. The data show, overall, that there is a highly significant correlation between managers' trust-building behaviour and employees' commitment to managers, and that this correlation is almost equal. However, as an indirect effect, a significant correlation was also measured between the *managers' behaviour* and employees' *commitment to the organisation*, albeit lower than measured in respect of the *commitment to the managers*. It is also important to stress that we measured a stronger correlation between *line manager behaviour* and *commitment to the organisation* than we did when we examined the behaviour of executive managers; in other words, the trust-building behaviour of line managers does not only correlate to the employees' commitment to them, but also to the employees' commitment to the organisation (*Table 3*).

Table 3
Relationship between perceptions of management behaviours important to the employee and employee satisfaction (N=556)

	Correlation with the 'perception of line manager behaviour considered the most important' (ρ)	Correlation with the 'perception of executive manager behaviour considered the most important' (ρ)
How likely are you to recommend your line manager to a friend or acquaintance?	**0.569 (0.000)**	0.298 (0.000)
How likely are you to recommend your workplace to a friend or acquaintance?	0.394 (0.000)	0.381 (0.000)
How likely are you to recommend your executive manager to a friend or acquaintance?	0.303 (0.000)	**0.570 (0.000)**

Examining the data raises the question of what patterns of behaviour employees perceive and consider to be most important from their managers, and whether these differ from one another. *Figure 10* indicates the percentage of respondents who considered a particular pattern of behaviour from a manager at the corresponding level to be the most important, i.e. the sum of the distribution of the responses is 100 per cent. In *Figure 11*, the frequency of perception is plotted at two different levels of distribution, where respondents were able to mark different behaviours; hence, the percentage of each behaviour is markedly different in the two graphs and is not nominally comparable.

Figure 10 indicates that subordinates expect markedly different behaviour from their line managers and their executive managers. While they expect their line manager *to trust them* and *answer their questions honestly*, they expect their executive manager to be their 'captain', to *communicate clearly to all employees what their jobs and responsibilities are*, and equally importantly, to *answer their questions honestly.* Thus, the importance of honesty is also evident from the findings of our survey, similar to the results of the abovementioned global survey of *Kouzes – Posner* (*2010*).

Figure 11 indicates that subordinates perceive honesty from their line manager most often, but also perceive that their manager trusts them almost as often. The behaviour of an executive manager is most often perceived as communicating clearly to all employees what their jobs and responsibilities are, and almost equally, an executive manager is perceived as calm and composed, which is particularly useful in times of change.

Figure 10
Most important management behaviour patterns for employees in relation to the two different levels of management

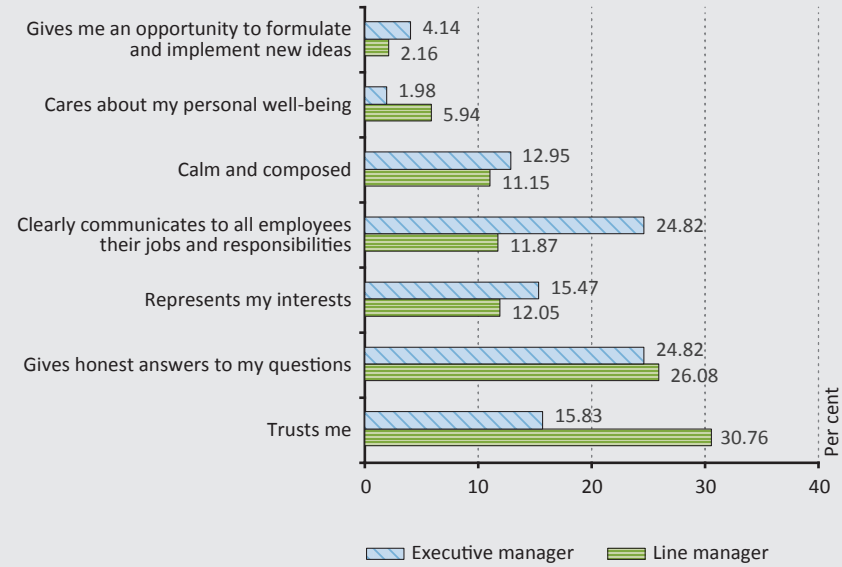


Figure 11
Frequency of perceived management behaviour patterns

6. Conclusions

This research is intended to help managers to build trust in the changing lives of organisations by highlighting the factors that influence the level of trust in interpersonal relationships with employees, emphasising the importance of specific management behaviours.

Analysis of the data confirmed our first hypothesis, namely, that there is some effect, albeit small, of willingness to trust as a personal attitude on the commitment to line managers, executive managers and the organisation. The degree of employee trust is a significant determinant of the level of commitment, but it is not the only factor influencing it: the behaviour of the management may have a significant role in enhancing it.

Analysing the responses of the employees of the four financial organisations under review, it is clear that we all have some level of trust attitude that influences our perception of the behaviour of others. This measure does not make anyone more valuable or better than others, but its impact may be reflected in our attitude towards others, our ability to relate to others, and our tolerance for uncertainty. Employees who tend to trust people less tend to be less committed to their managers and their organisation. This attitude does not exclusively influence employee engagement and accordingly, managers have the opportunity to build trust with their employees through their own behaviour, regardless of the degree of the employees' trust attitude. *We are convinced that a manager who consciously invests in building trust with his employees will reap extra rewards in the form of employee engagement.* We would like to draw the attention of managers to the fact that instead of instinctive behaviour, it is worth using consistent 'people management', as it can be assumed that an employee who trusts people less than others will be more likely to trust a manager he does not know when switching jobs if he feels that the manager trusts him and is honest with him. In this way, if the manager reciprocates employees' high trusting attitude and, at the same time, consciously builds relationships with more reserved employees, he will even be able to strengthen the long-term commitment of the latter. In the current labour market, where employers are competing for experienced, reliable workers, building trust is an important management tool.

Our second hypothesis, that *the degree of change perceived by the employee affects his commitment to the managers and the organisation*, was also confirmed. Weak, negative correlations confirm that the greater the perceived change in the organisation, the weaker the commitment towards the managers and the organisation. The question may arise whether managers, aware of the above

correlation, should try to spare their employees from changes to and within the organisation as a possible solution. We are convinced that the answer to this question is a definitive 'no', as indeed, *honesty is the most important management behaviour for employees*, and it is precisely this need that would be violated by remaining silent. At the same time, the results of our work can answer the question arising in relation to the impact of changes on employee engagement.

Our hypothesis H3 was that when employees perceive most frequently the management behaviour that is important to them, this will also have a positive impact on their commitment to their line manager, executive manager and the organisation. Subordinates expect their line manager to trust them and to answer their questions honestly, while they expect their executive manager to communicate clearly and answer their questions honestly. *When there is a noticeable change in an organisation, managers tend to become more task-oriented, even though it is particularly important in these situations to exercise 'people management', i.e. relationship management, including the strengthening of trust, in everyday life.*

Our findings show that change has a weak, but not negligible negative impact on employee engagement. The stronger the employee perceives the change, the less likely he is to recommend the workplace or his managers to others. Change can exacerbate feelings of insecurity and vulnerability in employees, regardless of their role in the organisational hierarchy, but subordinates typically look to their managers for help. Since in times of change, employees' expectations of their managers' behaviour may even change, it is worth taking the time to have feedback sessions, to inquire about individual experiences and to understand the current needs of subordinates, which will make them feel more secure and more likely to follow their managers unconditionally even in altered strategic directions. In this interpersonal relationship, employee trust will be stronger if the manager maintains his inner calm and composure, creating a safe working environment through conscious behaviour. The experience of this trust has a knock-on effect on the leader and increases his internal security and self-confidence, which serves as an additional resource to enhance the climate of trust within the organisation. The result of the strong interaction between the credibility of the manager and the trust of the employees spills over to the level of organisational trust and then to the level of market trust, based on which customers assess the reliability and credibility of an organisation.

The complexity of the external environment and the impact of the expected or perceived management behaviour on engagement should be considered relevant information in all sectors. Obviously, based on the companies that participated in the survey, the survey cannot be considered representative in terms of sector, but we believe that the replies of the 556 respondents who voluntarily participated in

our questionnaire are valuable because they represent different types of companies in the financial sector. However, the correlations identified may be relevant not only in the financial sector, but in all results-oriented organisations that continuously monitor their costs in an effort to reduce them.

Voluntary responses about perceptions of managers' behaviour may be influenced by the level of relationship and trust between employees and their managers, even rendered biased or subjective. Trust attitudes were surveyed by self-assessment, which may have been strongly influenced by the respondent's self-awareness; this may have been a distorting factor. The perception of organisational change is influenced by the individual sensitivity of the respondent, and hence individual differences should also be assumed. In future research, we intend to put even more emphasis on these by exploring and investigating the interrelationships in more depth.

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Compliance as Business Development Potential in the Credit Institution Sector*

Andrea Pelei – Ferenc Bognár – Petra Benedek

Regulatory compliance, often perceived as a burden by organisations, offers untapped opportunities for business development. By adopting, implementing and improving relevant standards and good practices, companies can increase stakeholder confidence, improve organisational reputation and reduce the legal, financial, business and reputational risks arising from various non-compliances. Drawing on literature research, the paper shows that compliance with regulations typically fosters an internal organisational environment and culture where innovation, excellence and sustainable growth can be created. Complex compliance management activities can help identify market opportunities, stimulate product development and improve customer experience. Compliance and innovation are compatible approaches that support long-term success.

Journal of Economic Literature (JEL) codes: G28, G32

Keywords: compliance management, risk management, innovation, business development, credit institutions

1. Introduction

In the past decade, several international and Hungarian studies were published (*Benedek 2014; Doyle et al. 2014; Ambrus – Farkas 2019; Braun 2019; Jacsó 2020; Kocziszky – Kardkovács 2020*), which link the concepts of compliance management, risk management and innovation and help companies to understand them, creating effective cooperation between these areas. The English-language content is typically based on the rules of the United States and England, and the Anglo-Saxon regulatory and business environment. The use of resources should therefore be geared towards

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Andrea Pelei: Budapest University of Technology and Economics, PhD Student.
Email: andrea.pelei@yahoo.com
Ferenc Bognár: Budapest University of Technology and Economics, Associate Professor.
Email: bognar.ferenc@gtk.bme.hu
Petra Benedek: Budapest University of Technology and Economics, Assistant Professor.
Email: benedek.petra@gtk.bme.hu

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the transposition of experience in line with Hungarian and EU standards, and the careful adaptation of international approaches and best practices.

Ensuring that companies operate in compliance with the laws is not only a social and economic imperative, but also in the public interest. At the same time, the operation of a company is threatened and endangered not only by conduct that is legally prohibited, but also by attitudes that are morally reprehensible. The goal of compliance management goes beyond compliance with the current legal frameworks in force, because compliance with ethical principles is also a key part of it. The question arises as to whether compliance helps or hinders business development and how its objectives can be reconciled with the objectives of business development. Can we confirm that compliance and business development actually serve a common purpose? In practice, the concept of business development is often confused with customer acquisition, and in this paper we will try to clarify and answer these questions.

The structure of the paper is as follows: the second section presents the methodology, followed by an explanation of the theoretical background, including the relevant regulations and risk-based compliance management. We then describe innovation and business development trends, and finish up with a summary of the results and recommendations, as well as the conclusions.

2. Methodology

Drawing on a range of academic, legal and business sources, this paper seeks to describe, compare, analyse and combine the existing knowledge and insights on the subject. In light of the interdisciplinary nature of the topic, it is also appropriate to explore the literature in related disciplines. Relevant scientific publications, books and online sources were selected and analysed according to a systematic procedure. In addition to the description of the relevant regulations and international standards, we selected the relevant scientific publications, primarily using the Scopus digital database. The keywords in the search were compliance management, innovation, risk management and business development. The search was extended to include reports and documents published by business development consulting companies. This approach not only provides a theoretical basis, but also includes practical business experiences and perspectives. Our goal is to provide business resources with practical guidance for companies to select and apply best practices and solutions.

3. Theoretical background

The simplified, narrowly defined concept of compliance means observing and complying with the rules and following the letter (and not necessarily the spirit) of the laws and rules. Compliance in a broader sense also includes more complex requirements. The aim should be to ensure that the operation of organisations is not only profitable in the short term, but also sustainable in the long term. This requires that abuses in the context of company operations, legally prohibited acts (e.g. fraud, embezzlement, misuse, money laundering, corruption) and behaviours that violate ethical standards (e.g. religious mockery, defamation) are detected, investigated and, if possible, prevented (*Ambrus 2020*).

Compliance management is the set of processes that aim to guarantee "regular, effective and efficient operation and the achievement of reliable reporting" (*Benedek 2019a:17*). A compliance department defines the framework of the operation, based on legal requirements and moral and ethical principles, and supports the achievement of the company's objectives by ensuring compliance with the framework and by providing the necessary and proportionate sanctions for overstepping the boundaries of the framework. The expectation today is more of an organisation-wide compliance awareness and culture, which has many elements. This includes, among other things, the commitment to compliance on the part of both top management and employees, the creation of company-level compliance documents (organisational and operating policies, conflict of interest regulations, code of conduct, data protection regulations, whistleblowing policy, etc.), the establishment of processes for the application and enforcement of standards, the integration and operation of compliance checks, continuous monitoring, correction and improvement of the system (*Ambrus 2020; Törcsváry 2023*).

3.1. Significant regulations in the area of financial compliance

The first legislative steps on corporate compliance were taken in the United States of America. Financial scandals in the corporate sector have undermined investor confidence in the credibility of financial reporting. As it later turned out, the cases of fraud that came to light in the early 2000s (e.g. Enron, Tyco, Worldcom) were made possible by the contingencies of internal controls, shortcomings in corporate governance and the intertwining of auditors and company management. The realisation that corporate governance problems could also threaten the stability of the national economy prompted the US Congress to adopt the Sarbanes-Oxley Act (SOX) in 2002. The law was primarily aimed at strengthening accounting discipline for publicly listed companies to which it applied. It made it mandatory for the CEO and CFO to deposit a statement audited by an independent auditor together with

the annual balance sheet declaring, aware of their legal and financial responsibility, that the company's internal financial control system had been audited and that the procedures used during the audit worked effectively (*Liber 2009*).

The development of corporate compliance in the US has both a direct and an indirect impact on the daily lives of European companies. In the case of the US Foreign Corrupt Practices Act (FCPA) and SOX compliance processes of business partners subject to the FCPA/SOX Act, Hungarian companies may also be affected (*Ambrus – Farkas 2019*). The provisions introduced by SOX and subsequently transposed into the legislation of European countries and the European Union are based on the recognition that "in the corporate sector, the disclosure of not only business results but also of misconduct and failures enhances overall business confidence" (*Benedek 2019a:18*).

Compliance first came to the fore in the banking sector – not coincidentally, as the first significant framework regulations were introduced in this area. In 2004, Directive 2004/39/EC of the European Parliament and of the Council on Markets in Financial Instruments,[1] known as the Markets in Financial Instruments Directive (MiFID I), was adopted with the aim of regulating the financial markets in the region, increasing transparency and protecting investors, as well as establishing compliance as a mandatory function. MiFID focused on stock exchanges, and thus the transparency of OTC transactions remained low. It also placed the regulation of third countries and their institutions under the jurisdiction of Member States, creating inequalities in the regulatory environment that were difficult to accept. The recognition of these shortcomings, together with the financial meltdown caused by the 2008 economic crisis and practical experience, made it necessary to review the regulation. Directive 2014/65/EU of the European Parliament and the Council[2] (MiFID II), adopted in 2014 and applicable from 3 January 2018, and its companion rules, including Regulation (EU) No 600/2014/EU[3] (Markets in Financial Instruments Regulation, MiFIR), aim to create a single financial market. The common regulatory requirements are defined for authorisation, operating conditions, the operation of data providers and oversight by the authorities to ensure that investors are adequately protected. The scope of these legal acts also extends to third-country companies providing investment services in the EU. The MiFIR's trading and

[1] *Directive 2004/39/EC of the European Parliament and of the Council of 21 April 2004 on Markets in Financial Instruments amending Council Directives 85/611/EEC and 93/6/EEC and Directive 2000/12/EC of the European Parliament and of the Council and repealing Council Directive 93/22/EEC.* OJ L 145, 30.04.2004, pp. 1–44. http://data.europa.eu/eli/dir/2004/39/oj (Repealed from 2 January 2018).

[2] *Directive 2014/65/EU of the European Parliament and of the Council of 15 May 2014 on Markets in Financial Instruments and amending Directives 2002/92/EC and 2011/61/EU (recast) (recast) Text with EEA relevance*. OJ L 173, 12.06.2014, pp. 349–496. Amended text in force from 28 March 2024. http://data.europa.eu/eli/dir/2014/65/oj.

[3] *Regulation (EU) No 600/2014 of the European Parliament and of the Council of 15 May 2014 on Markets in Financial Instruments and amending Regulation (EU) No 648/2012 Text with EEA relevance*. OJ L 173, 12.06.2014, pp. 84–148. Amended text in force from 28 March 2024. http://data.europa.eu/eli/reg/2014/600/oj.

regulatory transparency requirements are directly applicable to all investment companies operating in the EU by virtue of the form of the Regulation.[4] In Hungary, Act CXXXVIII of 2007 on Investment Enterprises and Commodity Exchange Service Providers[5] (hereinafter: 'Bszt.') was amended to incorporate the innovations introduced by MiFID II into domestic law. Financial supervision regulations have also necessarily changed.

In 2013, Recommendation No 6/2013 (III.11.) of the President of the Hungarian Financial Supervisory Authority (HFSA)[6] provided guidance on the establishment and operation of internal lines of defence and the implementation of governance and control functions of financial institutions, and included expectations regarding the compliance function. With the merger of HFSA, the Magyar Nemzeti Bank (the central bank of Hungary, MNB) revised and published its Recommendation No 5/2016 (VI. 6.) on the establishment and operation of internal lines of defence, and the governance and control functions of financial institutions.[7] Further changes were brought about by the 'Best Practice Code' published by the Hungarian Banking Association[8] and Recommendation No 27/2018 (XII.10.) of the Magyar Nemzeti Bank,[9] which provides guidance for credit institutions on the practical operation of the compliance management system. The summary material aimed to help with the identification and effective management of legal violations and compliance risks (*Dénesné Orcsik 2023*), and both the Banking Association and the MNB advocate for the establishment of a compliance function in order to strengthen the legal awareness and voluntary compliance of financial institution employees. The aim

[4] Fenyvesi, R. (2015): *A pénzügyi eszközök piacairól szóló szabályozásban várható változások (a MiFID I és MiFID II közötti főbb változások és a MiFIR tartalmi elemei)* [*Expected changes in the Markets in Financial Instruments regulation (main changes between MiFID I and MiFID II and the content of MiFIR)*]. https://www.mnb.hu/sajtoszoba/sajtokozlemenyek/2015-evi-sajtokozlemenyek/fenyvesi-reka-a-penzugyi-eszkozok-piacairol-szolo-szabalyozasban-varhato-valtozasok-a-mifid-i-es-mifid-ii-kozotti-fobb-valtozasok-es-a-mifir-tartalmi-elemei. Downloaded: 6 June 2024.

[5] *2007. évi CXXXVIII. törvény a befektetési vállalkozásokról és az árutőzsdei szolgáltatókról, valamint az általuk végezhető tevékenységek szabályairól* (*Act CXXXVIII of 2007 on Investment Enterprises and Commodity Exchange Service Providers, and the Rules Governing their Activities*). https://net.jogtar.hu/jogszabaly?docid=a0700138.tv.

[6] *A Pénzügyi Szervezetek Állami Felügyelete elnökének 6/2013. (III. 11.) számú ajánlása a belső védelmi vonalak kialakításáról és működtetéséről, a pénzügyi szervezetek irányítási és kontroll funkcióiról* (*Recommendation No 6/2013 (III.11.) of the President of the Hungarian Financial Supervisory Authority on the establishment and operation of internal lines of defence, and the governance and control functions of financial institutions*). https://www.mnb.hu/letoltes/2013-iii-11. Downloaded: 18 March 2024.

[7] MNB (2016): A *Magyar Nemzeti Bank 5/2016. (VI.06.) számú ajánlása a belső védelmi vonalak kialakításáról és működtetéséről, a pénzügyi szer-vezetek irányítási és kontroll funkcióiról* (*Recommendation No 5/2016 (VI.06.) of the Magyar Nemzeti Bank on the establishment and operation of internal lines of defence, and the governance and control functions of financial institutions*). https://www.mnb.hu/letoltes/5-2016-belso-vedelmi-vonalak-kialak-es-muk.pdf. Downloaded: 7 August 2024.

[8] *A compliance (megfelelőség biztosítási) funkció működtetésének legjobb gyakorlata* (*Best Practice Kódex*) [*Best practice in the operation of the compliance function (Best Practice Code)*]. https://www.bankszovetseg.hu/Content/alapdokumentumok/Compliance_Best_Practice_Kpdex_HUN_ENG.pdf. Downloaded: 18 March 2024.

[9] *A Magyar Nemzeti Bank 27/2018. (XII.10.) számú ajánlása a belső védelmi vonalak kialakításáról és működtetéséről, a pénzügyi szervezetek irányítási és kontroll funkcióiról* (*Recommendation No 27/2018 (VI.10.) of the Magyar Nemzeti Bank on the establishment and operation of internal lines of defence, and the governance and control functions of financial institutions*). https://www.mnb.hu/letoltes/27-2018-belso-vedelmi-vonalak.pdf. Downloaded: 18 March 2024.

is therefore to ensure that employees not only comply with legal requirements for fear of supervisory control, but also that they develop a natural desire for moral and ethical behaviour, and that compliance awareness and culture permeate the entire organisation and its ethos (*Ambrus 2020*).

Subsequently, the introduction of the compliance system was also regulated at the legislative level in Act CCXXXVII of 2013 on Credit Institutions and Financial Enterprises[10] (hereinafter: 'Hpt.'), which entered into force on 1 January 2018. All organisations subject to Hpt. are required to have in place an independent compliance function, i.e. a compliance management system.

The next milestone was the MNB's Recommendation No 12/2022 (VIII.11) on the establishment and operation of internal lines of defence, governance and control functions of financial institutions[11] (hereinafter: 'MNB Recommendation'). The MNB Recommendation is a means of transposing a non-binding legal instrument, which at the same time serves as a means of transposing the guidelines and recommendations of the European Supervisory Authorities (European Banking Authority – EBA, European Securities and Markets Authority – ESMA, European Insurance and Occupational Pensions Authority – EIOPA, European Systemic Risk Board – ESRB). The purpose of the Recommendation is to increase the predictability of the application of the law, to promote the uniform application of the relevant EU and domestic legislation and to present the principles and methods proposed by the MNB. The recommendation requires financial institutions to establish and maintain internal lines of defence that, in respect of the organisation in question, support:

- its operation in a reliable, prudent and efficient manner, in accordance with legislation and internal rules;
- the protection of its assets, its social function and of the economic interests of its owners and customers; and
- the full maintenance of confidence in the financial organisation and its control functions.

Three lines of defence can be distinguished and it is essential that there is a clear separation between the different control functions, including their respective roles and levels of responsibility. The first line of defence is management controls integrated into the process, followed by controls focusing on risk identification and

[10] *2013. évi CCXXXVII. törvény a hitelintézetekről és a pénzügyi vállalkozásokról* (*Act CCXXXVII of 2013 on Credit Institutions and Financial Enterprises*). https://net.jogtar.hu/jogszabaly?docid=a1300237.tv

[11] *A Magyar Nemzeti Bank 12/2022. (VIII.11.) számú ajánlása a belső védelmi vonalak kialakításáról és működtetéséről, a pénzügyi szervezetek irányítási és kontroll funkcióiról* (*Recommendation No 12/2022 (VI.11.) of the Magyar Nemzeti Bank on the establishment and operation of internal lines of defence, and the governance and control functions of financial institutions*). https://www.mnb.hu/letoltes/12-2022-belso-vedelmi-vonalak-ajanlas.pdf. Downloaded: 18 March 2024.

assessment, including the compliance function. The third is internal control, which also serves to control the first two lines of defence (*Dénesné Orcsik 2023; IIA 2020*).

Compliance management has a prominent role in the financial sector, as credit institutions are in direct contact with their customers' financial assets and the financial market. The activities of financial institutions entail significant risks, for example in the areas of anti-money laundering and counter terrorism financing, market manipulation, data protection and data security (*Stevens et al. 2020*). The risks can have serious legal and reputational consequences for customers and the financial world. Compliance management helps financial organisations to ensure that all aspects of their activities comply with the applicable laws and regulations.

In summary, the first major regulatory milestone in corporate compliance in the United States was the Sarbanes-Oxley Act of 2002, which came in response to major financial scandals. The SOX Act aimed to strengthen accounting discipline and internal controls by requiring CEOs and CFOs to certify the accuracy of financial reports. This legislation had a major impact on global corporate compliance and prompted European countries to adopt similar measures for transparency and investor protection. For example, MiFID I of 2004 was designed to regulate financial markets and protect investors in the EU. It was later revised by MiFID II and MiFIR to address the deficiencies and improve consistency in the financial sector. As a result of the EU level regulations, several laws affecting financial institutions and credit institutions in Hungary were amended and recommendations were prepared to present good practices (MNB Recommendation, Banking Association Best Practice). The continued development of compliance regulations underlines their importance in promoting ethical behaviour, preserving financial stability and strengthening public confidence in financial systems.

3.2. Compliance risk management

In general, risk management aims to proactively mitigate potential threats and minimise damage from adverse events. A risk is the occurrence of an adverse event that is accidental, that threatens to cause us danger or harm, or the damage caused when it occurs. Risk management includes the activities and preventive measures that aim to reduce the likelihood of a threatening event occurring or mitigating the severity of the impact (*Jenei 2016*). A risk management strategy is a structured approach to managing risks, risk exposures and risk events applicable to any industry.

Compliance risk is the risk to an organisation's business, financial results and reputation arising from a breach of laws, regulations or internal rules and policies. A risk event may be non-compliance with industry-specific laws and regulations, such as those applicable to credit institutions, or breaches of internal rules and policies. Assessing compliance risks is of crucial importance for banks and other

financial institutions. These risks may arise from the activities, business model and regulatory environment of the credit institutions concerned. Within the banking sector, compliance risks arise from possible breaches of legal and ethical standards. Risks in the financial domain can be interpreted mainly in relation to legal, financial, business and reputational environmental impacts (*Benedek 2019b; Jacsó 2019*). Effective risk management includes the systematic identification and assessment of these risks, the application of prioritisation methods and the development of appropriate mitigation strategies (*Esayas et al. 2015*). The methods generally focus on assessing the severity and probability of risk and analysing the effectiveness of preventive measures. In addition, it is also important to identify risks in time and take appropriate measures to reduce them. Credit institutions can strengthen their resilience and protect themselves against the risks inherent in their operating environment by applying robust risk management frameworks.

Risk management tools include a range of methods and frameworks designed to effectively identify, assess and mitigate risks:

1. Risk assessment methods help to identify and assess different risks, including the severity and probability of risks. These include risk maps or matrices, PRIZMA maps, SWOT analysis, risk indices, risk assessment questionnaires and statistical models (*Bognár et al. 2023*).

2. A risk management plan is a document that sets out the risks, the related measures and responsibilities. It helps organisations to manage risks in a structured and traceable way.

3. Early warning systems are crucial for identification and indication of potential risks and problems in due time. These include automated monitoring systems, event logging, monitoring systems and regular reports.

The development of robust risk management practices is a legal obligation and is particularly important for credit institutions, given the financial risks associated with their operations. However, individual risks are highly dependent on factors such as the business model of the organisation, market environment and customer behaviour. Credit institutions and financial enterprises need to have complex risk management strategies in place to maintain their economic stability and reputation and to comply with legislative requirements. Appropriately developed and effective risk management models and systems can contribute to this (*Mishchenko et al. 2021*).

Effective risk management is not simply compliance with legislation and a series of development steps, but an iterative process characterised by the continuous identification, assessment, management and monitoring of emerging and ongoing

risks (*Homolya 2012*). The risk management process is illustrated in *Figure 1.* This process allows assessments to be updated and reviewed when new, unexpected events occur (e.g. fraud, abuse), so that timely action can be taken to protect persons and assets.

Figure 1
The risk management process

The role of risk management within an organisation's compliance system is defined by frameworks such as the Three Lines Model (*IIA 2020*) of the International Organization of Internal Auditors (IIA), which was revised and updated in 2020. This model places compliance management in the first and second line. In this context, monitoring and control tasks serve as the oversight function. The second line of defence includes risk management and the third line of defence is the internal control function. According to the 2022 MNB recommendation,[12] the implementation of responsible internal governance is ensured through an appropriate organisational structure, the establishment and operation of an appropriate board system, and the exercise of management and supervision functions. The MNB recommendation underlines the importance of a well-defined governance framework.

Compliance risk management within domestic credit institutions is divided between the governance and supervisory functions, in line with the three lines model, embodying the dual function. In this, risk management acts as an operational first line of defence and an individual second line of defence. Internal control systems within credit institutions, are primarily designed to combat money laundering and terrorism financing, prevent market abuse, outline financial and investment services, mitigate fraud risks and protect personal data.

[12] See footnote 9.

Risk management can strengthen and facilitate predictable operations from several perspectives. Risk management processes promote advance planning and preparation for unexpected events and uncertain situations. Risk management must also respond to technological changes.[13] Regular risk assessments and updates help organisations monitor and manage risks, thereby increasing organisational resilience. Finally, risk management processes provide transparency to organisations, stakeholders and markets, which promotes market confidence and stability in operations (*Arellano-Gault – Del Castillo 2023*).

Like companies in all kinds of industries, the operation of credit institutions is subject to a number of standards approved by the International Organization for Standardization (ISO). Among the standards, the ISO 37001:2018 standard on anti-corruption management systems and the ISO 37301:2021 standard on compliance management systems are worth highlighting. (The latter is a further improvement of the 2014 ISO 19600:2014 recommendation on the establishment and operation of a compliance management system.) Both standards require a risk-based approach and both follow the four-step Plan-Do-Check-Act (PDCA) process development cycle. The PDCA model, which is an improved version of the 'Shewhart learning and development cycle' associated with Deming, supports organisations in improving their performance through standardisation (*Demeter et al. 2008*). While ISO 37001 focuses on one aspect, i.e. anti-corruption management, ISO 37301 takes a holistic approach to compliance management. An important part of ISO 37301 is the development of corporate culture and the transfer of ethical and business values into practice. The introduction of ISO 37301 helps to standardise and systematise compliance processes and increase transparency, proportionality and accountability.

Banks and other financial enterprises play an indispensable role in the functioning and operation of economic systems. Large institutions pose an increased risk to the financial system as a whole, as their potential bankruptcy has serious spill-over consequences (*Móra 2019*). Effective risk management in credit institutions contributes to economic stability in several ways. On the one hand, it helps minimise potential losses by proactively preparing for and preventing risk events. In this way, economic systems may mitigate negative impacts. On the other hand, robust risk management promotes a sense of trust and stability within organisations and in the wider market. This increased confidence serves as a defence against panic and market volatility, contributing to market stabilisation efforts. Furthermore, by ensuring compliance with the relevant legislation, organisations enhance their reputation, reduce the probability of sanctions for non-compliance and increase the level of social responsibility in the world of financial markets.

[13] *Staying ahead of change: Real-time compliance management*. https://www.pwc.co.uk/audit-assurance/assets/pdf/2018-state-of-compliance-study.pdf. Downloaded: 18 March 2024.

In summary, the overall aim of risk management is to proactively mitigate potential threats and minimise the damage caused by adverse events. Compliance risk due to non-compliance with laws, regulations or internal policies can jeopardise the business activities, financial results and reputation of financial institutions. Effective risk management for credit institutions includes the identification, assessment and mitigation of these risks. Tools such as risk assessment methods, risk management plans and early warning systems are crucial to the process. The three lines model ensures the continuous identification and mitigation of risks, while following the requirements of the ISO 37001 and ISO 37301 standards increases transparency, which together help financial organisations to comply with the rules and thus facilitate the predictability and stability of the financial system.

4. Innovation and business development trends and challenges

Business development in the most general sense refers to strategies to promote business growth. The toolbox varies from sector to sector, and often from company to company, but the literature distinguishes between business development processes for financial and non-financial organisations. The basis for the distinction is the method of risk assumption. The risk for traditional manufacturing and service provider companies is that they will lose the proceeds of their work in the case of non-performance. By contrast, financial service providers transfer financial assets and therefore also run the risk of not receiving back the assets delivered (*Imreh 2005*).

Business development rests on three pillars: (1) strengthening market position; (2) improving performance; and (3) ensuring future sustainability. The purpose of business development is to assess the current situation and market potential of the business in light of the prevailing environment (social, legal, economic and political conditions), to monitor and respond to changes, to adapt to international trends, to seek new business opportunities and to develop services, products and processes in a manner that ensures the business is successful in a continuous and sustainable way. For credit institutions, innovation and business development are key factors in maintaining and increasing competitiveness. Business development is framed by a dynamically changing regulatory and technological environment (*Doyle et al. 2014*).

The emergence of new technology-based business models (including artificial intelligence, blockchain and extensive data analysis) and the rise of digital financial services both hold enormous business potential and raise new regulatory demands[14] (*Gerlach et al. 2017; Van den Broek – Van Veenstra 2018; Mishchenko et al. 2021*).

[14] *Compliance on the forefront: Setting the pace for innovation*. https://www.pwc.ch/en/publications/2019/ch-pwc-2019-state-of-compliance-study-final-secured-en.pdf. Downloaded: 18 March 2024.

The introduction of the General Data Protection Regulation (GDPR) and the increasing frequency of cyber-attacks targeting financial market participants also present new security challenges and obligations.

The collection of data, the use of artificial intelligence and the information and knowledge asymmetry between the credit institution and the customer involve a number of ethical issues. The values and ethics of each credit institution influence the operation from product development to product information and investment policy to product sales and customer relations. The compliance management function plays a major role in enforcing ethical principles and encouraging and enforcing ethical behaviour among employees and managers.

Understanding and managing these challenges and trends is crucial for companies to ensure sustainable, successful business operations (*Table 1*).

Table 1
Current challenges and trends affecting the operation of credit institutions

Challenges	Trends
Rapidly changing legislative environment	Electronic system for cooperation with regulatory authorities
Increasing data volume and complexity	Data protection and GDPR
Technological challenges, digitalisation, disruptive technologies and business models	AI and chatbot applications, digital products
Formal and informal Environmental, Social and Governance (ESG) requirements	Responsible lending and investment, community economy (sharing), reporting in line with the UN Sustainable Development Goals (SDGs)

The spread of distributed ledger technology (DLT) and cloud-based services creates new opportunities for credit institutions. Unlike traditional databases, distributed ledgers do not have a central repository or administration function. In the distributed ledger, each node processes and checks all items, thereby registering each item. A shared general ledger can be used to record both static data, such as records, as well as dynamic data, such as financial transactions. One new option is the smart contract, which facilitates the smooth execution and settlement of commercial transactions along with cross-border payments. A smart contract is a self-service computer program that automatically creates a transaction without the involvement of a third party when the conditions for concluding a contract are met. Its use allows for a more flexible management of resources, but it also requires the introduction of appropriate technological improvements and compliance with data protection requirements (*Mishchenko et al. 2021*).

The field of cryptocurrencies, which is widespread, deserves special attention. In decentralised financial systems, new actors and business models have emerged alongside traditional actors such as credit institutions and central financial institutions, to which current traditional financial regulation cannot be effectively applied. The philosophy behind the EU's digital finance strategy is innovation-friendly, with EU legislative initiatives seeking to unlock the potential of new technologies while reducing risks to financial stability and consumer protection (*Pavlidis 2021*).

In 2023, Regulation (EU) 2023/1114 of the European Parliament and of the Council on Markets in Crypto-Assets (MiCA)[15] entered into force, laying the foundations for uniform EU regulation. Regarding the Hungarian implementation of the Regulation, a bill is already before Parliament, according to which the implementation of MiCA and the supervision of Hungarian-based crypto service providers will fall under the MNB's competence after a grace period lasting until 1 July 2026. It is expected that crypto service providers, like other financial service providers, will be able to operate as cross-border service providers in other Member States (subject to registration) if they are licensed in an EU Member State. This means that the host country's central bank (including the MNB) has only limited powers to act; in their case, it can exercise prudential and consumer protection supervision.[16]

Regulation (EU) 2022/2554 on Digital Operational Resilience[17] (Digital Operational Resilience Act, DORA), issued by the European Commission, aims to contribute to increasing the resilience of credit institutions and financial companies to various operational risks and to respond more quickly to them, including cyber threats, IT disruptions and other technology-related risks. Digital technology presents new risks and challenges for operational flexibility (*Grima – Marano 2021*). The European Supervisory Authorities (EBA, EIOPA and ESMA) also published four draft Regulatory Technical Standards (RTS) and one draft Implementing Technical Standard (ITS). These standards are intended to provide a uniform and harmonised legal framework in the field of risk management involving information and communication technologies, major incident reporting and third party risk management. Following DORA, financial enterprises will also be responsible for the compliance of the fintech

[15] *Regulation (EU) No 2023/1114 of the European Parliament and of the Council of 31 May 2023 on Markets in Crypto-Assets, and amending Regulations (EU) No 1093/2010 and (EU) No 1095/2010 and Directives 2013/36/EU and (EU) 2019/1937 (Text with EEA relevance) L 150/40*, 09.06.2023. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32023R1114. Downloaded: 6 June 2024.

[16] *Fokozott befektetői kockázattal járhatnak a kriptoeszközök, kriptotőzsdék* (*Crypto-assets and cryptocurrency exchanges may involve increased investor risk*). MNB, press release. https://www.mnb.hu/sajtoszoba/sajtokozlemenyek/2024-evi-sajtokozlemenyek/fokozott-befektetoi-kockazattal-jarhatnak-a-kriptoeszkozok-kriptotozsdek. Downloaded: 18 March 2024.

[17] *Regulation (EU) No 2022/2554 of the European Parliament and of the Council of 14 December 2022 on Digital Operational Resilience in the Financial Sector and amending Regulations (EC) No 1060/2009, (EU) No 648/2012, (EU) No 600/2014, (EU) No 909/2014 and (EU) 2016/1011 (Text with EEA relevance)*. PE/41/2022/INIT. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32022R2554

companies that provide them with services. This extended responsibility can have a number of effects on financial innovation. We assume that stricter due diligence and verification procedures will ensure that only robust and safe innovations are implemented. This may initially slow down the pace of financial innovation, but in the long run it is likely to lead to safer, more reliable and sustainable financial innovations, while increasing customer confidence in innovative financial solutions.

Financial technology is undoubtedly the fastest-changing area of financial services, posing significant challenges for market participants, legislators and supervisors. It is revolutionising money flows, credit management, equity markets, regulatory compliance and virtually every segment of financial services. Meanwhile, regulators and supervisors, lagging several steps behind, are struggling to catch up with the latest innovations. Although legislative progress is being made (for example, the Council of Europe approved a regulation on the harmonisation of rules on artificial intelligence on 21 May 2024), the current situation is that the principle of 'same risk, same regulation' is not yet applied in all areas[18] (*Kerényi – Müller 2019*).

The use of technology-based solutions to support business processes, such as data mining, data analytics and artificial intelligence, requires the application of several ethical considerations. In principle, data protection should be ensured by complying with rules similar to GDPR, while maintaining transparency on data collection and use. Automation can significantly increase the efficiency of credit institutions, but it does not relieve them of their decision-making responsibility, and accountability must still be pursued. Automated systems are tools that support, but do not replace, human decision-making. For this reason, the role of ethical practices in the organisational culture and procedures of financial organisations and credit institutions will remain and is expected to become increasingly valuable in the future.

Business development includes strategies to promote business growth, which vary from sector to sector and from organisation to organisation. The main pillars include strengthening market position and improving efficiency and future stability. Technological developments such as AI, blockchain and digital financial services present both opportunities and regulatory challenges. Adapting to and complying with GDPR, MiCA, DORA and other relevant regulations are all business challenges that trigger product and process improvements in individual organisations and their supplier networks.

[18] Council of the European Union (2024): *Artificial Intelligence Act: Council gives final green light to the first worldwide rules on AI* – Consilium (europa.eu). Press release. https://www.consilium.europa.eu/en/press/press-releases/2024/05/21/artificial-intelligence-ai-act-council-gives-final-green-light-to-the-first-worldwide-rules-on-ai/. Downloaded: 6 June 2024.

5. Results, proposals

In the financial sector, the compliance function was originally introduced for regulatory control; however, its importance has expanded and it has become an integral part of everyday business operations. The constantly evolving legal and regulatory environment has made compliance management an increasingly complex activity, and traditional approaches need to be reassessed. Over the last two decades or so, a risk-based approach to compliance has come to the fore, with resources being focused on the most risky compliance issues and areas of law (e.g. consumer protection). A structured and systematic methodology to identify, assess, mitigate and monitor compliance risks is essential to allow for consistent intervention, back-testing and data re-use (*Esayas – Mahler 2015*).

The rapid evolution of the regulatory framework and its increasing importance is (also) logical from a business perspective and offers opportunities for financial institutions that are reflected in business performance. Effective compliance management significantly increases business development potential by strengthening reputation across different markets (e.g. customers, suppliers, investors, employees), business confidence, service quality and customer experience. Compliance helps to build goodwill by fostering trust and credibility among stakeholders, thereby strengthening the reputation of the company. In practice, this is achieved by operating in accordance with standards, guidelines and regular audits, while the impact of compliance-driven product or process improvements can be measured through brand perception and stakeholder feedback. By meeting industry standards, service quality, consistency, timeliness and punctuality regarding performance are increased. This can also be measured and monitored through customer satisfaction measurements and compliance audit results. The improvement of customer experience can be quantified through indicators on complaints handling, customer retention and problem incidents. Among other things, these indicators can demonstrate the impact of compliance management on business performance.

One should also not ignore views that highlight the dangers of over-regulation. There is no doubt that both in the European Union and in Hungary, a robust set of rules has been put in place to prevent money laundering and to combat terrorism financing, or more recently, to comply with the sanctions and laws against Russia. Compliance with these rules is one of the core areas of financial institution compliance. There are, however, indications that financial institutions are sometimes overly elaborate in their customer due diligence. This is particularly true for customers with foreign ownership, management or business activities that can be considered atypical, even if there is no specific risk element in their case.

Banks, fearing that their practices will subsequently be found unsatisfactory by the supervisory authority, will sanction customers (for example, by refusing to open an account). The problem for businesses can be a lack of transparency or demonstrable operational activity. Businesses therefore often see compliance required by financial institutions as an obstacle, as a 'deal breaker', especially when they see a dichotomy in practice. For example, a business branch refuses to open an account, but a retail branch is willing to open an account for the same customer at a much higher cost (*Fogarasi 2022*). The solution to the problem is predictable, transparent regulation that customers can understand. The European Banking Authority pointed this out in its 2022 report, stressing that "unwarranted de-risking and ineffective anti-money laundering practices can result in the exclusion of legitimate customers".[19]

To promote compliance and business sustainability, we propose the following:

1. Managers should strive for strategic commitment to compliance systems, while at the same time developing procedural alignment that links these functions to the company's business objectives. Secondly, the experience and established systems of the credit institutions operating in the same segment, in this case credit institutions, should be shared in a partnership to ensure the coherence of the system. However, group reciprocity is also needed in the development of common surveillance systems, which allows information exchange and cooperation between organisations. It seems contradictory to suggest sharing compliance practices while arguing that they contribute to a company's competitive advantage. The reality is that compliance and risk management systems are highly organisation-specific, tailored to the needs, objectives, values and environment of each organisation. The principles of compliance are similar, but the implementation of the principles is unique and can vary significantly between organisations. Furthermore, sharing best practices in compliance is a common goal among business actors, as it promotes a stable and reliable market environment. Information exchange can mitigate systemic risks. A collaborative approach benefits the market as a whole, contributing to a more robust, flexible business ecosystem.

2. Technology can be used and exploited to reduce compliance risks. Through technological innovation and innovative approaches, organisations are able to manage compliance processes effectively and improve performance (*Deloitte 2015*). Automation (data analysis, questionnaire research, data aggregation, troubleshooting, etc.), the use of chatbots and artificial intelligence may reduce

[19] EBA (2022): *Opinion of the European Banking Authority on 'de-risking'*. EBA/Op/2022/01. European Banking Authority, 5 January https://www.eba.europa.eu/sites/default/files/document_library/Publications/Opinions/2022/Opinion%20on%20de-risking%20%28EBA-Op-2022-01%29/1025705/EBA%20Opinion%20and%20annexed%20report%20on%20de-risking.pdf . Downloaded: 6 June 2024.

time-consuming and costly tasks and reduce human errors and mistakes. The latest technologies may provide statistical indicators that can be incorporated into risk prevention systems and help measure the impact of changes on business development (for example, in the areas of product development, consumer protection or customer relations).

3. In addition to observing external and internal rules and standards, the corporate compliance function is also responsible for enforcing the ethical standards set by the company (e.g. ISO 37301). The usual compliance tools – such as compliance procedures, labour law sanctions, etc. – do not always detect and address ethical problems (*Törcsváry 2023*). Collecting and analysing employee feedback supports the management in fostering a culture of integrity, aligning employee interests and promoting long-term organisational success.

6. Conclusions

A compliance department defines the framework for operations, based on legal requirements and moral-ethical principles, and supports the achievement of the company's objectives by ensuring compliance with the framework and by imposing necessary and proportionate sanctions for overstepping the boundaries of the framework. Our study sought to highlight the links between compliance, risk management and innovation and the contribution of such to business development. In addition to regulatory compliance, a compliance mindset may add business value that can be reflected in corporate strategy, product development, risk assessment, customer experience and outcomes. Examining credit institutions, we demonstrated that compliance with regulations typically fosters an internal organisational environment and culture where innovation and sustainable growth can be created. An internal environment that focuses on innovation and excellence, taking into account external and internal regulations and the dynamic nature of the related compliance processes, may contribute to the stabilisation and development of financial institutions and thus the economy (*Novak et al. 2015*).

In today's business environment, effective compliance risk management, intertwined with innovation and business development, is essential for all companies, including credit institutions. These interrelated management areas have a significant impact on a company's performance, long-term reputation and business sustainability. It is important to take an organisation-wide approach (*Haelterman 2022*). The scope of compliance risk management extends to all areas of the business and supporting back-office areas.

We called attention to the phenomenon of financial institutions engaging in 'unwarranted de-risking' or flawed anti-money laundering practices, simply for fear of supervisory action and sanctions.[20] On the one hand, this raises the importance of legislators' and supervisors' roles in ensuring that regulation is transparent, predictable, known and understandable to customers. On the other hand, it calls for a change of approach on the part of financial institutions. They need to realise that banking compliance is not a regulatory activity, but a service activity, designed to be multi-faceted, but in no way to discourage customers. It is also in the interests of economic operators if compliance can effectively screen out those who are actually at risk, but does not unnecessarily complicate the process of persons, businesses and other organisations that do not have a risk element becoming customers (*Fogarasi 2022*).

The key findings of the study are summarised below:

1. Compliance management is an interdisciplinary field, and thus collaboration between legal, business and risk management experts is crucial, in order to effectively identify, assess and manage compliance risks.

2. The continuous review and improvement of compliance processes (e.g. planning, monitoring, incident management, etc.) by managers is essential to keep up-to-date with the changing business environment and regulatory requirements. In addition, decision-makers (regarding civil, labour and criminal law) are accountable for the performance of the company and the information disclosed. Managers have a key role to play in supporting and promoting the development and strengthening of compliance awareness and culture (*Teichmann – Wittmann 2024*).

3. Legislators, regulators and supervisors play a decisive role in ensuring a sound, stable and sustainable financial market environment. Their role includes developing rules, standards and recommendations that support market integrity and transparency and encourage prudent risk management practices, and business leaders and decision-makers need to understand the intersection of compliance, risk management and innovation. To do this, they need to develop fit-for-purpose processes, systems and policies that enable the organisation to meet its legal obligations, mitigate risks and encourage innovation.

[20] See footnote 10.

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Experiences from the MNB's Green Preferential Capital Requirement Programme and the Extension of the Programme*

Donát Kim – Eszter Raciborski – Bálint Várgedő

The study examines the Green Preferential Capital Requirement Programmes of the Magyar Nemzeti Bank, with a special focus on their extension, and presents the information on which the decision is based, the theoretical background of the programmes, the international regulatory environment, the mechanism of the preferential capital requirement and the results of the programmes. The results and feedback from market participants suggest that the preferential capital requirement programmes have a market and institutional development impact across the financial institutions system. From a prudential perspective, the green preferential capital requirement programmes did not have a material negative impact: they reduced banks' capital requirements by up to 0.31 per cent only. In view of the positive results, having been extended for a uniform period, these programmes are expected to continue to encourage green lending.

1. Motivations and main features of the programme

Climate and environmental risks are challenging for credit institutions in several regards, for example, because of their time horizon and the increasing magnitude of the risks concerned. In such an environment, the timing of regulatory and supervisory action is also a key factor in nudging the economy onto a path of orderly transition. Based on these considerations, the Magyar Nemzeti Bank (central bank of Hungary, MNB) introduced its preferential capital requirement programme in 2020. Within the framework of these programmes, the MNB reduces the Pillar 2 capital requirements of participating institutions.

Green preferential capital requirement programmes are relevant instruments in the MNB's green toolkit, both for managing environmental risks and for mobilising green resources. In terms of risk considerations, the MNB's objective when introducing the programmes was to shift, to the extent possible, banks' portfolios towards

* 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.

Donát Kim: Magyar Nemzeti Bank, Head of Department; Corvinus University of Budapest, PhD Student. Email: kimdo@mnb.hu
Eszter Raciborski: Magyar Nemzeti Bank, Supervisory Advisor. Email: raciborskie@mnb.hu
Bálint Várgedő: Magyar Nemzeti Bank, Analyst; Corvinus University of Budapest, PhD Student. Email: vargedob@mnb.hu

green activities, customers and industries, thus reducing institutional and systemic transition risks. In addition, the database accumulated during the programme – which is unprecedented even by international standards – can also contribute to the future management of environmental risks. While the programme is a positive incentive for the banking system in itself, through its *Green Recommendation* (*MNB 2023*) the MNB has also required banks to adopt increasingly prudent environmental risk management practices in recent years.

The programmes provide incentives for banks to offer increased financing to green participants in the real economy, thus indirectly promoting the green transition. These incentives can potentially give green market participants access to more advantageous financing opportunities, for example, through lower cost of capital or larger credit amounts. Another important objective of the programmes related to financing the green transition was the creation of a green credit market in Hungary. The green definitions that followed the EU taxonomy became a guideline for market participants, and several subsequent central bank measures were based on the framework. The launch of GCC[1] and GCR[2] was also intended to raise awareness of the importance of environmental sustainability in finance. Subsequently, these measures have led to the accumulation of organic green financial insight across the sector as a whole. In addition, among the MNB's green instruments they represent tools that can be used continuously across economic and credit cycles by nature.

In this paper, we also cover the theoretical basis of the programme, the scope and operation of the preferential capital requirement and the regulatory environment. Finally, the impact mechanism of the programme is illustrated with calculation examples, and the main indicators and results of the programme are also reviewed.

2. Theoretical overview of the programme

The two groups of differentiated capital requirement frameworks that respond to climate change and environmental risks are the regulatory tools referred to as the green supporting factor (GSF) and the dirty penalising factor (DPF). GCC and GCR programmes are classified into the former, supporting group. *Kim and Várgedő* (*2024*) provide an overview of green microprudential measures, which is briefly summarised below.

According to *Dafermos and Nikolaidi* (*2021*), the introduction of the GSF and DPF reduces global warming and hence physical risks by increasing the appeal of green instruments for the purposes of lending. However, the introduction of the DPF reduces the volume of lending due to higher capital requirements for banks, which

[1] Green preferential capital requirement for corporates and municipalities
[2] Green preferential capital requirement for retail customers

has a negative impact on economic output and, *ceteris paribus*, increases loan default rates. The downside of the GSF is that it increases banks' leverage, which might jeopardise financial stability. From the perspective of the climate, however, it can be concluded that the combined use of the GSF and DPF contributes to reducing emissions. The study of the authors demonstrates that their effects on the real economy and financial stability offset one another. The impact of these instruments is minor in itself, but it may strengthen when combined with green fiscal policy.

According to *Lamperti et al.* (*2021*), the GSF increases the credit portfolio, but it nudges lending towards riskier loans and thus increases credit losses. The authors found that the introduction of the GSF did not significantly reduce emissions due to its stimulating effect on the real economy. Optimal regulation can be achieved through a combination of green financing instruments, such as guarantees and carbon-related risk instruments. In addition to the GSF, *Dunz et al.* (*2021*) also stress the need for additional instruments, such as a carbon tax.

Oehmke and Opp (*2022*) argue that although the GSF and the DPF ensure optimal regulation, without a broader toolkit they are insufficient to meet the green mandate. The authors warn against the introduction of an exclusive DPF as it may crowd out lending to green firms. In addition to risk factors, the impact of capital requirements on financing is a key issue for policymakers.

Admati and Hellwig (*2014*) pointed out that the capital structure of banks did not necessarily affect lending activity, as they issue capital by adjusting leverage. In the short term, it may be difficult to raise external capital, but in the long run banks may achieve higher capital levels. Empirical studies, however, question this argument. In Belgium, *De Jonghe et al.* (*2020*) found that even though higher capital requirements entailed a lower credit supply, their impact on aggregate bank lending was rather moderate. Similar observations were made in the Swiss mortgage market (*Basten 2020*). Based on the findings of *Benetton et al.* (*2021*), mortgage interest rates declined in the UK following a reduction of capital requirements.

The SME supporting factor introduced in the EU generated mixed results for the analysis of the GSF. The European Banking Authority (*EBA 2016*) did not find an increase in SME financing, while *Dietsch et al.* (*2019*) identified a positive effect. Few empirical results are available on the introduction of the GSF and the DPF. In Brazil, environmental risks have been integrated into the annual internal capital adequacy assessment process and review (ICAAP) for large banks since 2017. Examining the impact of regulation, *Miguel et al.* (*2022*) found that large banks had shifted their loans away from sectors with high environmental risk. The impact of the new regulation on the real economy and on greenhouse gas emissions was moderate.

3. Preferential capital requirement in Hungary

The MNB is in a unique position in Europe, as its green ambitions are also supported by the sustainability mandate adopted by the Parliament on 28 May 2021. The mandate was published in the Hungarian Official Gazette on 2 June 2021 and entered into force on 2 August 2021. Since then, the MNB has launched a number of green initiatives in a wide range of central bank oversight areas, such as monetary policy (*Kolozsi et al. 2022a*), foreign exchange reserve management (*Kolozsi et al. 2022b*) and financial stability (*Ritter 2022; Várgedő 2022*). One of the first steps was the introduction of green preferential capital requirement programmes from early 2020. The programmes were open to the green loan exposures of banks for contracts signed after 1 January 2020. By international standards, this instrument puts the MNB at the forefront of green finance, as among the central banks/supervisory authorities of the EU the MNB is the first European authority to facilitate the green transition through bank capital regulation as well.

The preferential capital requirement applied by the MNB essentially means that the authority reduces the credit institution's Pillar 2 capital requirement for a given year under the ICAAP. The reduction amount is 5 or 7 per cent of the gross value of green exposures. The reduction may result in a negative Pillar 2 add-on for individual green transactions, but at the level of retail and corporate portfolios, the capital cannot be reduced below the Pillar 1 capital requirement. The maximum rate of the discount is 1.5 per cent of the credit institution's total risk exposure amount (TREA). In addition, if a transaction becomes non-performing, it is removed from the programme. The preferential capital requirement is available to credit institutions and their subsidiaries established in Hungary, and to the subsidiaries of financial enterprises providing financial lease services. In the case of foreign subsidiaries, the Hungarian parent bank can claim the discount on a consolidated basis. Taking recourse to the programmes is voluntary and subject to data disclosure.

GCC, which originally covered investment or project loans, bond exposures and green bond exposures financing renewable energy production, was expanded from 31 August 2021 to cover financing under electromobility, sustainable eco-farming and food processing (including bee pasture plantation and habitat development), energy efficiency investment, acquisition of green business equity and green finance frameworks, and from December 2021 to cover sustainable real estate investment. At the same time, as the term of the programme was extended, the range of activities covered was expanded further in autumn 2023. Green bonds issued under the Green Bond Principles or Climate Bonds Standards are also eligible. Similarly, the GCR was amended in August 2021 and June 2022. Loan purposes that fully comply with the EU taxonomy criteria receive a discount of 7 per cent, while those that cannot provide full, documented evidence of taxonomy compliance (together with a significant contribution to the environmental target, avoiding significant damage

and meeting minimum social standards) but fulfil the other criteria set out in the programme receive a 5-per cent discount.

4. International regulatory environment and the leeway of domestic supervision

One may wonder why the MNB applied the GSF procedure to the Pillar 2 capital requirement. Examining the different aspects of the capital regulation clearly reveals that certain regulatory instruments fall under regulatory competence above the national competence. One example is the issue of modification in the case of risk weights. In their definition, some initiatives around 2020 (*Finance Watch 2020*) advocated the use of "one-for-one risk weighting", which proposed a 1,250-per cent risk weighting for exposures related to new fossil fuel projects. As a result, financial institutions would have to finance these transactions 100 per cent from their own capital (=1,250 per cent * 8 per cent), which would eliminate the contagion effect spreading to foreign sources. *Finance Watch* (*2022*) recommended less ambitious risk weights of 150 per cent.

Given the limited national competence, it is important to review the approach of supranational organisations. To sum up briefly, the international financial supervisory authorities and working groups currently take a subdued position on these types of regulations, issuing neither a clear recommendation nor a clear prohibition. Further analysis will be undertaken in the coming years to demonstrate the direction and strength of the links between sustainability and riskiness. The EBA recommends, in general, that for all similar schemes the regulator's exit option should be maintained through the use of a "sunset clause"[3] or a built-in phase-out mechanism.

In the area of prudential regulation, the EBA has taken the initiative to examine whether it would be appropriate to modify the current prudential treatment of exposures to take account of environmental and social considerations (under Pillar 1). At present, *EBA* (*2023*) does not recommend the use of either supporting or penalising factors under Pillar 1 until data pertaining to a sufficient quantity and quality of defaults or the probability of default justify it. However, the text includes a clause stating that it is not only the Pillar 1 capital regulation that is suitable to address environmental and social risks. In addition, it lists a number of options in the current Pillar 1 framework where the impact of environmental risks could be incorporated even in the short and medium term. For example, support for the inclusion of environmental and social factors in credit risk ratings in the models of external credit rating agencies, which banks can use to complement their internal risk analysis.

[3] A provision in a regulation to the effect that the regulation automatically expires on a particular date, provided that the date in the clause has not been changed or another regulation with the same content has not been adopted before that particular date.

In contrast to the green supporting factor, the introduction of the dirty penalising factor was not made possible by existing data disclosures and information collection. It is important to underline that the preferential capital requirement is available to institutions subject to reporting requirements, where the credit institution is responsible for verifying the green loan purpose and providing the necessary documentation. The introduction of a DPF, while theoretically possible, would require significantly more complex and longer timeframes to implement in practice. The MNB is exploring the possibility of similar measures to ensure the resilience of the banking system.

As can be seen from the literature review, one common criticism of GSF programmes is that there is insufficient historical basis for such a differentiation of risks. In the prudential framework, a predominantly statistical approach to risk is used, while GSF schemes take into account additional aspects when determining capital requirements. The standard approach to risk assessment is based on the predominance of historical information (e.g. financial performance) and only to a lesser extent on forward-looking estimates (e.g. assessment of refinancing risk). However, transition risks, such as regulatory and technological risks, are inherently difficult to quantify on the basis of historical information and can be assessed using forward-looking methods.

Another important aspect is that, due to the nature of the transition risks, these effects manifest over the longer term. In addition, the mobilisation of green resources is time-bound. The first major milestone in the green transition will be 2030. Most of the European Union's interim green economy development targets for achieving climate neutrality by 2050 are linked to 2030. However, the transition is a process and is expected to take place both before and after the target dates. GCC and GCR are intended to provide incentives for the bank financing of these activities by reducing the costs of capital. As the green transition process will require significant financing over the next six years to meet the 2030 climate targets, the programme will support lending activities that serve green objectives to be implemented in the medium to long term.

5. The impact of capital requirement calculation through an example

The following example illustrates the calculation of the green supporting factor (*Table 1*). Assume that for a project exposure compliance with the capital requirements programme can be ensured at 50 per cent; this is called the *green ratio*. Assume also that it meets the taxonomy criteria and therefore qualifies for a 7-per cent discount at 50 per cent. In the fictitious example, the gross exposure value is HUF 100 and the risk weight assigned to the exposure type is 80 per cent.

Table 1
Calculation example of the preferential capital requirement at transaction level

Gross exposure	HUF 100	
Green ratio	50%	
Rate of discount	7%	
Risk weight	80%	
P2 add-on (above 8%) without discount	5%	
Risk-weighted exposure (RWA)	HUF 80	= HUF 100 * 0.8
Capital requirement for P1	HUF 6.4	= HUF 80 * 0.08
P2 capital requirement without discount	HUF 4	= HUF 80 * 0.05
Capital requirement discount (upper limit)	HUF 3.5	= HUF 100 * 0.5 * 0.07
P2 capital requirement with discount	HUF 0.5	= HUF 4 – HUF 3.5
P1 + P2 capital requirement without discount	HUF 10.4	= HUF 6.4 + HUF 4
P1 + P2 capital requirement with discount	HUF 6.9	= HUF 6.4 + HUF 0.5

For this transaction, the Pillar 1 capital requirement is 8 per cent of the risk-weighted exposure (RWA); therefore, an additional capital allocation of HUF 6.4 is required under Pillar 1. For the sake of simplicity, let us assume that the supervisory authority has set a 13-per cent SREP capital requirement for the transaction type, of which 8 per cent is the capital requirement under Pillar 1 and 5 per cent is the add-on under Pillar 2. Therefore, additional capital of HUF 4 (100* HUF 0.8*0.05) is required under Pillar 2 after the transaction. This can be reduced by the preferential capital requirement, which is the gross exposure (HUF 100) multiplied by the green ratio (50 per cent) and the discount rate (7 per cent). Accordingly, the discount will be up to HUF 3.5, as the portfolio level limits may still reduce this value. Thus, the transaction will have a Pillar 1 and Pillar 2 capital requirement of HUF 6.9, instead of the HUF 10.4 calculated without the discount, and the total capital requirement (lower limit) on the RWA will be 8.625 per cent instead of 13 per cent.

The calculation of portfolio-level discounts can also be illustrated with an example. Suppose a bank has a corporate and retail portfolio of HUF 100,000 and HUF 150,000, respectively, with green holdings of 6 and 10 per cent, and the corresponding risk weights are 80 and 50 per cent for the two segments (*Table 2*). Furthermore, the discount rate is 5 per cent for corporate and 7 per cent for retail green loans, and suppose that the supervisory Pillar 2 additional capital requirements are HUF 3,200 and HUF 750, respectively. It can then be seen that the amount of Pillar 1 and Pillar 2 capital requirements are reduced from 12 to 11.63 per cent for the retail part and from 9 to 8 per cent for the corporate part (in proportion to RWA). For the retail portfolio, the preferential capital requirement is constrained by the fact that the total capital requirement cannot fall below the Pillar 1 requirement. Therefore, the applicable rule becomes an active limitation.

The Pillar 1 and Pillar 2 requirements for the entire loan portfolio amount to 10.55 per cent of the RWA without the discount and 9.87 per cent with the discount. Since the difference between the two is less than 1.5 per cent, the upper limit is not activated; thus the 9.87 per cent is the final figure.

Table 2
Calculation example of the preferential capital requirement at the portfolio level

	Corporate loan portfolio		
Corporate	Gross corporate loan exposure	HUF 100,000	
	of which gross green exposure (6%)	HUF 6,000	= 100,000 * 0.06
	Risk-weighted assets (80%)	HUF 80,000	= 100,000 * 0.8
	Discount (5%)	HUF 300	= 6,000 * 0.05
	Capital requirement for P1	HUF 6,400	= 80,000 * 0.08
	P2 add-on without discount	HUF 3,200	
	P1 + P2 capital requirement without discount	HUF 9,600	= 6,400 + 3,200
	P1+ P2 capital requirement rate without discount	12%	= 9,600 / 80,000
	P1 + P2 capital requirement with discount	HUF 9,300	= 6,400 + max(0;3,200 – 300)
	P1 + P2 capital requirement rate with discount	11.63%	= 9,300 / 80,000
	Retail loan portfolio		
Retail	Gross retail loan exposure	HUF 150,000	
	of which gross green exposure (10%)	HUF 15,000	= 150,000 * 0.1
	Risk-weighted assets (50%)	HUF 75,000	= 150,000 * 0.5
	Discount (7%)	HUF 1,050	= 15,000 * 0.07
	Capital requirement for P1	HUF 6,000	= 75,000 * 0.08
	P2 add-on without discount	HUF 750	
	P1 + P2 capital requirement without discount	HUF 6,750	= 6,000 + 750
	P1+ P2 capital requirement rate without discount	9%	= 6,750 / 75,000
	P1 + P2 capital requirement with discount	HUF 6,000	= 6,000 + max(0;750 – 1,050)
	P1 + P2 capital requirement rate with discount	8%	= 6,000 / 75,000
	Total portfolio		
Total	*P1 + P2 capital requirement without discount*	HUF 16,350	= 9,600 + 6,750
	P1+ P2 capital requirement rate without discount	10.55%	= 16,350 / (80,000 + 75,000)
	P1 + P2 capital requirement with discount	HUF 15,300	= 9,300 + 6,000
	P1 + P2 capital requirement rate with discount	9.87%	= 15,300 / (80,000 + 75,000)
	Capital requirement discount rate	0.68%	= min(10.55% – 9.87%;1.5%)

The calculation example is simplified in several respects: it partly ignores a number of rules, such as capital buffers and capital guidance. We also assumed that a uniform discount rate and homogeneous risk weight values were used. The total calculation shows that the institution's TSCR (total SREP capital requirement, i.e.

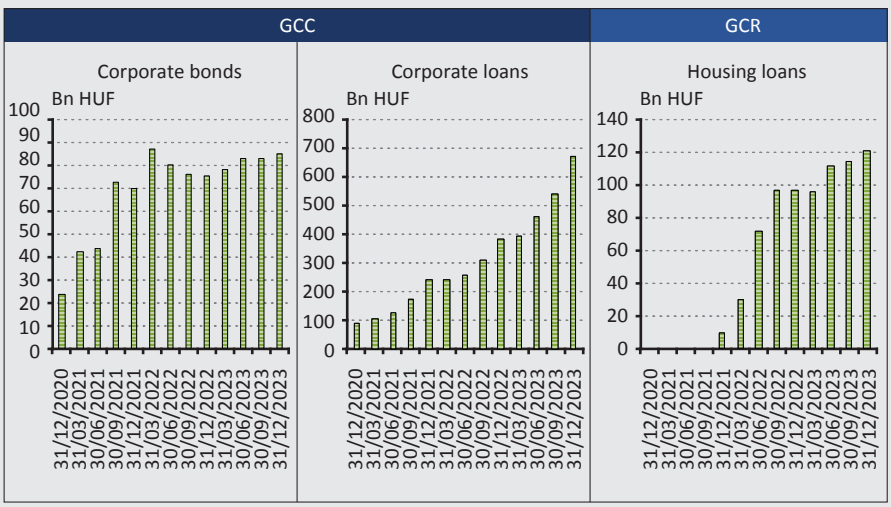
the sum of Pillar 1 and Pillar 2 capital requirements) for the following year will decrease by 0.68 per cent.

Experience from recent years shows that, from a prudential perspective, the green preferential capital requirement programmes have not had a material negative impact on banks' capital adequacy. At the end of 2023, the TSCR-reducing effect of capital requirement discounts ranged between 0.07 and 0.31 percentage points for the institutions participating in the programme. In other words, the discount had a much smaller impact than shown in the fictitious example. It should also be noted that the capital adequacy of Hungarian financial enterprises is stable and is not affected negatively by GCC/GCR to a material degree.

6. Results of the programmes

The preferential capital requirement programmes have expanded significantly since their initial announcement. As at 31 December 2023, capital requirement discounts were claimed for bank exposures amounting to HUF 880 billion in total. Of this amount, HUF 85 billion represented bond exposures, HUF 673 billion were corporate loan exposures and HUF 122 billion housing loan exposures (*Figure 1*).

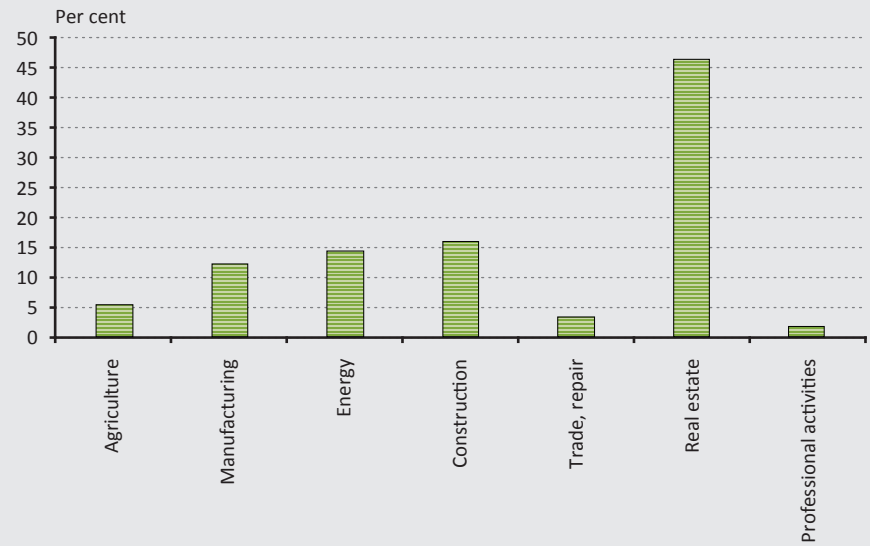
Figure 1
Historical evolution of end-quarter GCC and GCR portfolios



Source: MNB

In the case of bonds, banks mainly claim discounts regarding the transactions of borrowers with real estate investments that meet energy efficiency criteria (construction and real estate companies), and to a lesser extent the transactions of borrowers engaged in manufacturing or energy supply activities (*Figure 2*).

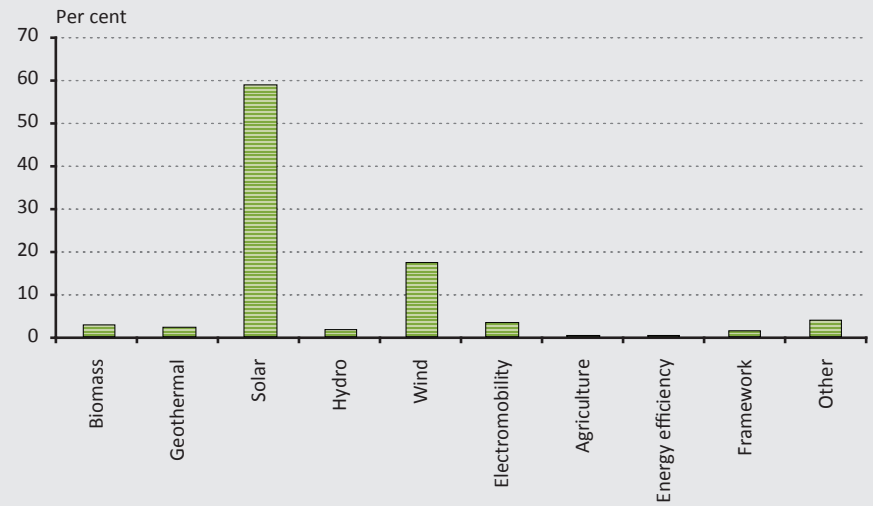
Figure 2
Distribution of corporate bonds by sector in the GCC programme at end-2023



Source: MNB

At present, corporate loans eligible for the green discount are heavily dominated by loans for the installation of solar farms (59 per cent), which by all international standards are considered a significant contribution to climate change mitigation, similar to wind and geothermal energy, which are also present, albeit to a lesser extent (*Figure 3*). Transactions for the financing of the acquisition and operation of electric vehicles and financing under the Green Framework have also started to appear. To date, the discount has not been applied to municipal loans.

Figure 3
Distribution of loan purposes for corporate loans in the GCC programme at end-2023



Source: MNB

In the case of GCR, as well, a concentration in newly-built real estate can be observed. A significant proportion of these loans are loans disbursed under the Green Home Programme (ZOP). It should be noted, however, that as the programmes were extended and amended in a staggered manner while maintaining the original deadline in several cases, the possibility of diversification was limited at the outset by the original, tight deadline of the programmes (31 December 2024).

As regards the maturity structure, it can be observed that credit institutions typically apply the green discount for long-term transactions in the case of all three instruments. Bonds have a maturity of 5–10 years, most corporate loans have a maturity of over 10 years with only a smaller proportion maturing in 5–10 years, while housing loans are disbursed, almost exclusively, at a maturity of over 10 years.

In addition to the quantified results, it should be noted that programmes have had a market- and institution-building impact on the financial institution system as a whole. Evidence indicates that the programmes provided a basis for the design of the green finance frameworks of Hungarian financial enterprises and for their product developments aimed at green finance. Several domestic banks have green finance frameworks in place already, and the programme has also induced dedicated product development at numerous institutions, for example, in the case of products designed to finance green home renovation and electromobility. In April 2023, the

terms and conditions of Certified Consumer-friendly Housing Loans (CCHL) were also amended, with the introduction of the Green CCHL scheme, under which creditors may waive the disbursement fee, waive the fee for a certified energy certificate and may offer additional green interest rate discounts.

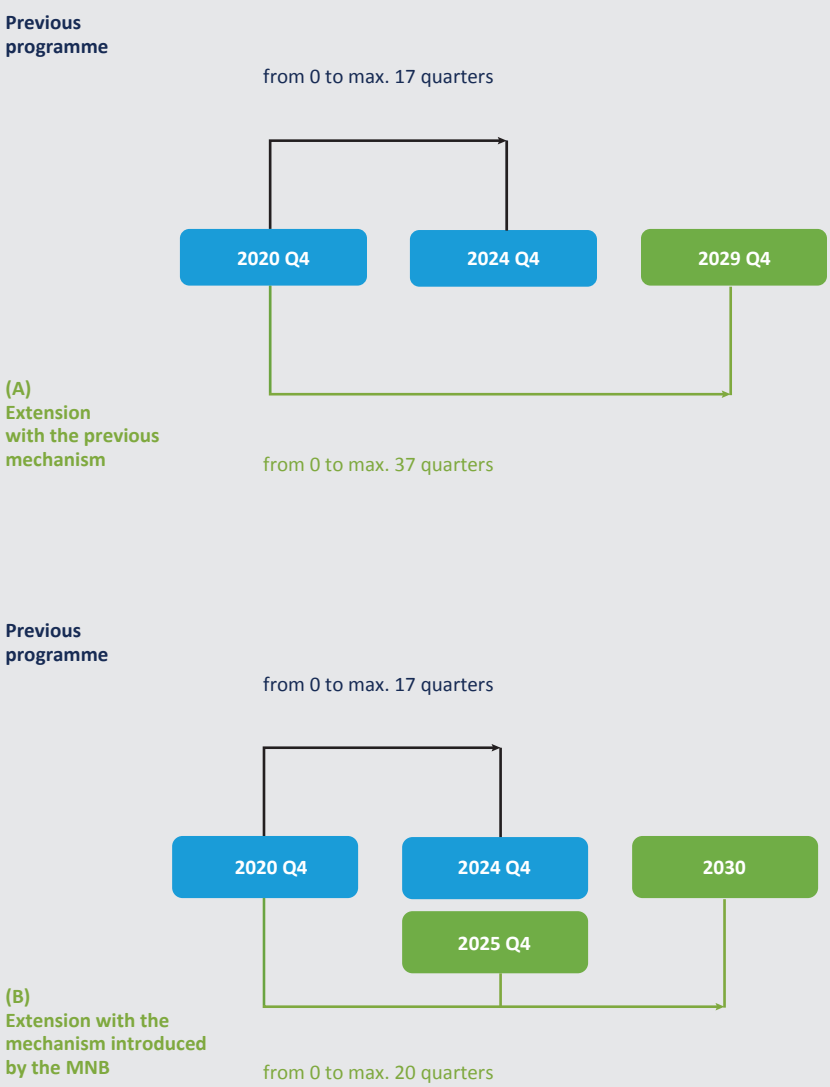
7. Method and effect of the extension of the term

In order to understand the practical application of capital incentives, the MNB conducted in-depth interviews with several market institutions on the institutional processes involved in green finance and the transactions financed. All of the banks agreed that the preferential capital requirement programmes had a strong market development effect and that an extension of the programmes would support the growth of the green credit market in Hungary. Several banks indicated that they were in the process of developing new green credit products at their institution, building on the preferential capital requirement programmes. The definitions of green loan purposes provide a bridge between EU taxonomy and Hungarian lending practice that is ambitious and forward-looking, but at the same time achievable and can be incorporated into the lending practice. The MNB's criteria system has become a best practice standard in the market, generally recognised and accepted by foreign parent banks as well.

Feedback from market participants suggests that the programmes also contribute to the adaptation of green guidelines and standards to the domestic market, as they act as a guideline for financial institutions and participants of the real economy, taking into account the structural characteristics of the Hungarian economy (e.g. loan purposes aligned with the Hungarian energy strategy, ecological agricultural strategy, construction quality requirements). The programmes also required the development of green finance competences and practices that contribute to financial institutions' compliance with the Green Recommendation. The capital requirement discount also plays a role in compensating for the administrative burdens and costs (e.g. additional risk assessment, loan purpose verification) associated with the prudent operation of green finance. It also supports other central bank initiatives (e.g. the expansion of certified consumer-friendly housing loans).

The MNB considered two mechanisms as an option for extending the deadline: firstly, to maintain the previous mechanism and modify the deadline for the programmes until 31 December 2029 (*Option A*). Secondly, to apply a modified mechanism whereby the programmes expire on 31 December 2025, with the proviso that all transactions concluded by 31 December 2025 benefit from the capital requirement discount (including existing transactions) for the first five calendar years of the term (*Option B*). *Figure 4* shows a comparison of the (maximum) benefit periods under the two extension options.

Figure 4
Schematic presentation of the maximum time horizons for benefiting from the preferential capital requirement under the previous mechanism and under the extension alternatives



Under *Option A*, all transactions previously included in the programmes would benefit from the preferential capital requirement until the end of the lifetime of the programmes, i.e. until the 2030 ICAAP review at the latest. However, for new transactions concluded from 2026, the period during which the ICAAP discount could be claimed would fall below the 5-year period that is considered effective, i.e. the stimulating effect of the programmes would become degressive. Thus, from an incentive point of view, this extension mechanism runs the risk of over-rewarding the current portfolio while not providing sufficient incentives for new transactions. By contrast, *Option B* removes the degressivity of the stimulating effect over the entire time horizon, because the preferential capital requirement can be applied for five years even for transactions concluded on the last day of the term (for 2030 at the latest during the 2031 ICAAP reviews).

The theoretical higher saturation risk (i.e. that the bank would exhaust 1.5 per cent of the TREA) also argued against *Option A*; however, since the current utilisation of the programmes varies between 4.72 per cent and 20.55 per cent per bank only (as at 31 December 2023), keeping the existing portfolio in the programme for such a long period would not pose a threat of crowding-out effects for the time being. In the event of a possible phase-out, it would be in favour of *Option B* that it is closer in spirit to the "sunset clause" proposed by the EBA. Environmentally and socially adjusted capital regulation is a developing field. As the database accumulates, we will obtain a more accurate view of the optimal regulation. It is therefore justified to maintain, for the time being, a "sunset clause", with a view to considering an extension of the programme in the event of further positive experiences. Another argument in favour of *Option B* is that it enables banks to make simpler calculations from a pricing point of view. Predictability is an important factor in product development; consequently, it is preferable to have a generally uniform period from the disbursement of the loans for claiming the preferential capital requirement.

In summary, in order to maintain the stimulating impact effective over the full time horizon, to avoid over-rewarding the existing portfolio and to provide a stronger incentive for new transactions, the MNB extended the terms of the GCC and GCR programmes under *Option B*. The programme has also been expanded to cover three new loan purposes in the case of green corporate and municipal capital requirements: energy storage, greening of district heating systems and electric grid development.

8. Conclusion

Overall, all banks considered the MNB's green preferential capital requirement programmes to be successful and useful. The extension of the term of the programmes is important to maintain the initial momentum of green finance and to enable it to gain ground in more segments of corporate and retail lending. The green financial market and institutional development impact of the programmes is visible. In addition to the successful incentives, the discount schemes do not have a material adverse impact on the capital adequacy of banks, which is key to financial stability. The internationally unique database that will be accumulated thanks to the programmes will also provide the means for the assessment of the green hypothesis, i.e. sustainability and credit risk. Extended in the light of their results, the programmes may continue to encourage the further development of green financial markets and the growth of the share of green finance.

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The Role of Financial Information in European Banking Regulation – The Past, Present and Future of FINREP*

Éva Kissné Ladányi

European banks have been providing financial information to their supervisory authorities for ten years under the single FINREP reporting system developed by the European Banking Authority. This article reviews the role of financial information, and in particular the application of IFRS, in the consolidation of European banking regulation, the specificities of the FINREP reporting system, which presents bank financial information in a comparable way, and the possibilities and limitations of the statistical use of financial data.

1. Introduction

Financial information and financial reporting based on regulated accounting principles has become increasingly important for businesses with ownership and management being separated. Ownership control and investment decision-making in public companies are essentially based on financial information, which is why it has become necessary to standardise such information, initially at the national level and then, with globalisation, increasingly at the international level. In the European Union, the application of International Financial Reporting Standards (IFRS), adopted by the EU for companies issuing publicly traded securities, became mandatory for consolidated financial reporting in 2005, rendering the application of national accounting standards increasingly obsolete. In Hungary, too, more and more companies are switching from Hungarian accounting rules to IFRS, a process that was given a significant additional boost by the 2015 amendment to the Accounting Act,[1] which allowed the use of IFRS instead of Hungarian accounting rules (HAS) not only for consolidated financial statements, but also for individual financial statements, and made it mandatory for banks to use IFRS instead of HAS

* 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.

Éva Kissné Ladányi: Magyar Nemzeti Bank, statistician. Email: kissne1960eva@gmail.com

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[1] International Financial Reporting Standards. Current consolidated version: 10/04/2008. http://data.europa.eu/eli/reg/2002/1606/oj
Act CLXXVIII of 2015 on implementing the application of the International Financial Reporting Standards in Hungary for individual reporting purposes and the modification of certain financial laws.

from 2018.[2] This amendment of the Accounting Act ensured that the application of IFRS would not be an additional burden on public companies that are also required to prepare consolidated accounts, but that they could choose to apply IFRS at both the individual and consolidated level, instead of the Hungarian accounting standards.

Understanding and applying the system of IFRS, especially during the transition period of changeover/first-time adoption, is a major challenge for users. For the Hungarian banks in transition, this coincided with the introduction of the new standard on financial instruments, IFRS 9, the impact of which was analysed from a supervisory perspective by *Háda* (*2019*). The advantage of using IFRS is that financial information can be prepared on the basis of principle-based, continuously evolving standards, which are developed and continuously maintained by a recognised, highly professional international organisation,[3] which supports preparers and users of financial statements with a range of publications, guidance and events. IFRS are developed with the needs of the primary users, the owners/investors, in mind, which does not mean that financial information under IFRS does not play an important role for other users, creditors, authorities and statisticians. Of particular relevance to our topic *is the use of financial information for banking supervision purposes, and the data requirements of supervisory authorities.* The outstanding economic importance and specific risks of financial institutions require a robust prudential regulatory framework. Compliance with these rules is monitored by supervisory authorities, partly through financial information and the regular additional data reporting that builds on it.

2. The role of financial information in banking regulation

European banking regulation, taking into account the Basel recommendations, aimed to establish a single set of requirements for banks' capital adequacy in relation to their risk exposure, already starting in 1989, and later on for the management of liquidity risks. The application of a converging set of rules within the European Union has been accompanied by uniform reporting obligations with an increasing content. The COREP (common reporting framework) reporting system for monitoring compliance with prudential rules, recommended for introduction from 2008, was implemented by the Member States, which meant only minimal harmonisation. Until 2014, the frequency and level of detail of the reporting requirements varied widely, but since then a truly uniform reporting regime applicable to all EU-based banks has been introduced under the CRR.[4]

[2] Domestic banks fully transitioned to IFRS at the individual level over three years, from 2017 to 2019.
[3] IASB: https://www.ifrs.org/
[4] CRR: *Regulation (EU) No 575/2013 of the European Parliament and of the Council of 26 June 2013 on prudential requirements for credit institutions and investment firms and amending Regulation (EU) No 648/2012*: https://eur-lex.europa.eu/legal-content/en/TXT/?uri=celex%3A32013R0575

In the context of maximum regulatory harmonisation realised with the entry into force of the CRR, a single FINREP report containing financial information was introduced alongside COREP from September 2014, the purpose of which is set out in Article 99(4) of Part 3 of the CRR as follows:

"(4) The financial information referred to in paragraph 2 and the first subparagraph of paragraph 3 shall be reported to the extent this is necessary to obtain a comprehensive view of the risk profile of an institution's activities and a view on the systemic risks posed by institutions to the financial sector or the real economy in accordance with Regulation (EU) No 1093/2010."[5]

This means that, unlike IFRS, the financial information presented in supervisory reporting must meet the needs of a specific user group, the supervisory authorities, which explains why the IFRS report of a credit institution that also prepares a FINREP report is not identical to a FINREP report, with significant differences in content and format (*Turner – Sedlacek 2015*). The need to reflect systemic risks, as stated in the purpose of the report, indicates that, unlike the financial report of an individual company, the FINREP report must be capable of aggregation, and comparability is also a key requirement in this regard.

The requirement for comparability has not only come to the fore in the case of reports to supervisors. The third pillar of European banking regulation, the disclosure requirements, is also increasingly subject to the requirement to present information in a unified content and format and to ensure consistency with supervisory data reporting.

In order to standardise the content and form of supervisory reporting, the European Banking Authority (EBA) was mandated to develop implementing technical standards, which are mandatory for all EU credit institutions from 2014, significantly reducing the shortcoming of International Accounting Standards (IAS) namely that IFRS, which are elaborated for all entities, do not prescribe mandatory levels of detail and schemas, but those can be determined by the preparer of the financial statements, taking into account the principle of materiality and adapted to the nature of the business entity. This means that even the IFRS-based financial statements of companies operating in the same sector, and the financial indicators based on them, are only comparable to a very limited extent, and differences in detail, in addition to differences in accounting policies, also represent a barrier. While the Hungarian accounting standards, complementing the Accounting Act by government accounting decrees have introduced a uniform balance sheet structure and accounting standards allowing for comparison that take into account the specificities of the financial sectors, IFRS are not sector-specific. The financial

[5] Ibid., Part 3, Article 99(4)

reporting package, FINREP,[6] developed by the EBA as a draft implementing technical standard under the mandate given to it by the CRR and applicable by law, fills this gap for credit institutions. In this paper, I show the importance of the introduction of a standardised FINREP taxonomy and the advantages and limitations of using banking data standardised in FINREP.

As mentioned in the introduction, the FINREP report, based on the specificities of the activities and risks of credit institutions, is intended to complement the COREP report, which is the primary measure of regulatory compliance, and therefore the scope of consolidation to which the financial data refer is not the same as the scope of consolidation defined in IFRS. In the case of capital adequacy rules to be complied with at both the consolidated and individual level, the competent supervisory authority determines the institutions belonging to the group, the scope of consolidation for the COREP report, based on the principles of CRD.[7] Due to the different detailed rules for accounting and prudential consolidation, there may be a number of differences in the scope of consolidation method between the institutions concerned. In practice, this is a significant difference in the case of financial conglomerates, where the group to be consolidated under IFRS also includes an insurance company. Due to the specific risks of insurance activities, their risk-weighted minimum capital requirements are different in this case from those of credit institutions, and they are therefore subject to a different set of capital adequacy rules. The CRR capital requirements for a conglomerate apply to a narrower group of institutions, and in line with this, the consolidated FINREP report also covers the financial data of the narrower group.

Currently, the CRR only imposes a FINREP reporting obligation uniform at the European level on a consolidated level for groups of credit institutions applying IFRS that are headquartered in an EU Member State. The largest European banking groups typically operate in several countries, and thus their consolidated financial data and the indicators based on such reflect their overall activities and their risks in an aggregated way, without isolating the financial markets of each country. This feature makes the report suitable for drawing conclusions on the stability of the European banking system from the analysis of the financial data of the largest banking groups, which the EBA publishes in its regular publications, notably the quarterly Risk Dashboard.[8] The statistical publications are made possible by the collection of quarterly COREP and FINREP reports by the EBA through the

[6] *Commission Implementing Regulation (EU) 2021/451 of 17 December 2020 laying down implementing technical standards for the application of Regulation (EU) No 575/2013 of the European Parliament and of the Council with regard to supervisory reporting of institutions and repealing Implementing Regulation (EU) No 680/2014 (Text with EEA relevance):* https://eur-lex.europa.eu/eli/reg_impl/2021/451/oj

[7] CRD: *Directive 2013/36/EU of the European Parliament and of the Council of 26 June 2013 on access to the activity of credit institutions and the prudential supervision of credit institutions and investment firms, amending Directive 2002/87/EC and repealing Directives 2006/48/EC and 2006/49/EC*: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32013L0036

[8] https://www.eba.europa.eu/risk-and-data-analysis/risk-analysis/risk-monitoring/risk-dashboard

supervisory authorities of the EU Member States, starting in 2021 not only for large banks but also for the nearly 5,000 credit institutions and groups of credit institutions operating in the EU. However, the regular statistical publications of the European Banking Authority continue to focus only on the large banks, and the financial indicators of individual Member States also reflect the highest levels of consolidation. In the case of Hungary, this currently includes primarily the two banking groups which are also supervised at group level by the MNB (OTP and MBH), and, in order to meet the confidentiality criterion (at least 3 groups of credit institutions), this is supplemented by the data of one additional EU-based banking group supervised at the highest consolidation level by the ECB, subconsolidated at the Hungarian level. Thus, these average risk indicators, also broken down by country, do not purely reflect the stability and performance of the financial market of a given country, depending on the weight of banking groups active in several countries.

The EBA's collection of financial information does not yet cover the so-called solo FINREP data at the non-consolidated level. The European Central Bank (ECB), as the supervisory authority, imposes a solo FINREP reporting obligation by regulation,[9] but this only applies to banks supervised by the ECB within the euro area or the single supervisory mechanism (SSM). In line with the proportionality principle, which also applies to reporting, the ECB Regulation does not impose the solo FINREP reporting obligation uniformly, but at four levels of detail, namely full, simplified, further simplified and containing data points only, depending on the size and complexity of the institutions. This practice, which is justified from a supervisory point of view in order to ensure proportionality of costs for banks, does not allow for the production of aggregated financial data for all credit institutions in full detail, and the ECB therefore publishes aggregated financial data for euro area banks separately for institutions classified as significant and those classified as less significant. The former send the full FINREP package to the ECB on a quarterly basis, while the latter provide much less detailed financial information.

The broader usability of FINREP data is hampered by the fact that, unlike IFRS reports, a bank's FINREP report is not public, and individual bank data collected for supervisory purposes are confidential. Therefore, only aggregates containing data from at least 3 credit institutions may appear in statistical publications.

The ECB regulation requiring the application of the FINREP at the individual level – given that Hungary is neither a member of the euro area nor has voluntarily joined the SSM – does not apply to banks supervised by the MNB. The MNB, as the supervisory authority, regulates data reporting by domestic banks in its own

[9] *Regulation (EU) 2021/943 of the European Central Bank of 14 May 2021 amending Regulation (EU) 2015/534 on reporting of supervisory financial information (ECB/2021/24)*: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32021R0943

regulations. As of 2018, in addition to the application of FINREP at the consolidated level, the MNB collects financial information at the individual level in an integrated approach with statistical needs, which means that the FINREP data model at the consolidated level has been extended at the national level to include the separation of resident and non-resident stocks, as well as a number of other details that are relevant for the domestic market, but are not included in the single FINREP data model applied in the euro area. The EBA also seeks to collect non-consolidated financial data from European banks that are not part of the group, as well as from group members, for its analytical and regulatory impact assessments. To achieve this, in addition to the still missing statutory mandate, the development of a single solo FINREP data model is also required, which will most likely be based on the ECB's tiered data model, which is identical in content to the consolidated FINREP, so as not to impose additional burdens on banks supervised under the SSM system. In the medium term, it is expected that the MNB will also have to adapt to the way the ECB collects solo financial information from the banks it supervises.

Having said that, let us take a closer look at FINREP, which was developed by the European Banking Authority as an implementing technical standard and whose application has been required since 2014 by the European Commission Regulation referred to above.

3. Additional features of the FINREP reporting system and its statistical use

Credit institutions applying national accounting rules, in addition to those applying IFRS, shall also provide financial information at the consolidated level in the form and with the frequency required by this Regulation, where the competent supervisory authority has extended the obligation also to them in accordance with Article 430(9) of the CRR, i.e. there is a separate FINREP standard for national accounting rules. It is understood that domestic banks will only use the FINREP templates provided for in Article 11 of the Regulation and set out in Annex III thereunto, the completion of which is regulated in Annex V to the Regulation.

One important feature is that, unlike an IFRS report, a FINREP contains almost exclusively numerical information, with no textual reporting attached to the FINREP templates. Currently, the IFRS FINREP set of templates consists of 36 main templates. Several templates are broken down into numbered sub-templates, which present financial data in different levels of detail and dimensions. One of these dimensionalities is the geographical breakdown of exposures, which is shown in template F 20. This breakdown provides the opportunity to aggregate and analyse a significant part of the financial data at the highest European consolidation level of internationally active EU-based credit institutions also at the Member State

level. However, statistical use is limited by the fact that these templates are only reported by banking groups with foreign exposures exceeding 10 percent of their total exposures, so this form of reporting is not complete. The number of potential data points in the FINREP data model – the cells in the Regulation's templates – is now close to 10,000, as supervisory information needs have grown steadily since its introduction. The data points form a consistent system. The data model includes validation rules that point out formal and content-related correlations, which are automatically checked at submission to ensure the right data quality for users.

The majority of FINREP data has been available to the relevant supervisory and regulatory authorities on a quarterly basis for ten years, since 2014. During this period, minor and major changes to the data model can be tracked on the EBA website through the FINREP version numbers. The biggest change to the data model in the ten years since its introduction was IFRS 9 on financial instruments, which was adopted by European banks from 2018. For more information on the domestic experiences from the introduction of the new standard; see *Gulyás – Somogyi* (*2019*); *Gulyás – Rátky* (*2023*)*; Kocsis – Seregdi* (*2021*)*.* The new accounting standard has brought significant changes in the classification and valuation of financial instruments and in the impairment regime, which is reflected in the data model from FINREP version 2.2.1 onwards. It is also worth mentioning that the EU-wide uniform definitions of non-performing exposures/loans and forbearance were first defined in the FINREP Completion Guide for the purpose of uniform reporting, and later introduced in the first level regulation with the amendment of the CRR effective from 2019.[10]

The standardised reporting format – currently the XBRL standard[11] – and the content defined in a common data model allow the report recipients, the supervisory authorities, to define and calculate indicators reflecting different risks on this rich data content, and to produce and publish time series and cross-sectional statistics; see *Tarpataki et al.* (*2022*) for more details. Examples of key risk indicators that can be built on FINREP data include profitability ratios (ROE, ROA), risk cost trends, non-performing exposures and non-performing loan ratios, forbearance ratios, coverage of non-performing or forborne exposures with impairment and collateral, and, following the introduction of IFRS 9, the impairment losses recognised for impairment stages and the proportion of exposures classified in each stage, to mention only the most important ones.

[10] *Regulation (EU) No 2019/630 of the European Parliament and of the Council of 17 April 2019 amending Regulation (EU) No 575/2013 as regards minimum loss coverage for non-performing exposures*: https://eur-lex.europa.eu/eli/reg/2019/630/oj

[11] XBRL (eXtensible Business Reporting Language): a free and global framework for exchanging business information.

The need to standardise the reporting format was raised not only for banks, but also for the publication of financial reports by businesses. One important objective of the new European Single Electronic Format (ESEF) developed by the European Securities and Markets Authority (ESMA) is to make it easier for creditors to process and analyse the ratios underlying corporate IFRS reports (*Tarpataki et al. 2022*).

Following the practice of the European institutions (the EBA and the ECB), the MNB was the first among the Member States to start processing and publishing the main data of the COREP and FINREP reports in 2018, with a comprehensive thematic statistical approach, which it has extended from time to time since then. The latest quarterly publication is also available in interactive format on the MNB website: https://sta.mnb.hu/Reports/powerbi/STA/HitelintPrudencialis_EN?rs:embed=true

4. Conclusions

The standardisation of financial reporting requirements in Europe, taking into account the specificities of the banking system, was achieved with the introduction of FINREP in 2014. The experience of the past ten years has shown not only how significant a step this has been in the supervisory methodology of banks, but also the wide potential for using comparable financial data for analytical and statistical purposes. For the time being, only supervisory authorities with direct access can fully use these possibilities. In addition to the wider dissemination of FINREP, the challenge for the period ahead will be to work out how to share the primarily supervisory-purpose dataset with secondary users at a deeper level, while respecting confidentiality constraints.

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The Historical Development of Economic and Financial Theories and Strategies*

István Kőrösi

Beáta Farkas:
A közgazdasági gondolkodás rövid története
(*A Brief History of Economic Thought*)
Akadémiai Kiadó, 2022, p. 488
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Outstanding in the extremely rich oeuvre of university professor *Beáta Farkas*, this book is an academic, synthesising, theoretical-historical work unique in our generation (also available on the Internet), which presents the historical development of economic thought from its beginnings to the present day. It also provides important lessons on economic policy, international economics and finance. From the Hungarian literature on the subject, the timeless and valuable works of *Antal Mátyás* and *Zsuzsa Bekker* come to mind. In the important areas of science, every generation must do their groundwork. Farkas' work is an excellent summary of the history of economic thought and unparalleled in its field in Hungarian and international literature.

I would like to invite the reader to read, study and reflect on the fifteen chapters, which are structurally interlinked. My review is not an abstract; I would instead like to present the original responses of the various authors of our time to many of the problems that still exist today, based on the book, in which the author has taken great care in processing the original sources.

Chapter 1 is titled "Reflections on the economy before capitalism". Economics is considered to be a young science, counting as an independent academic discipline since *Adam Smith*'s work "The Wealth of Nations", published in 1776. Economic issues have been dealt with since ancient times; the word 'economics' is of Greek origin. The practical questions of the state, the trade in and use of land, and the functioning of households always had to be answered. In his work "The Republic", *Plato* also expressed his thoughts on ideal economy. He pointed out the need

* 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.

István Kőrösi: Hungarian Academy of Sciences, retired Senior Research Fellow; Pázmány Péter Catholic University, retired Associate Professor. Email: drikorosi@gmail.com

for a division of labour as it increases efficiency. *Aristotle*, in his work "Politics", described bartering on the basis of needs as useful and acceptable, while he condemned speculative money-making for unlimited wealth and Crematism, and in "Nicomachean Ethics" he wrote in detail about social justice, distinguishing between two main forms thereof: distributive and corrective justice.

In Chapter 2, Farkas points out that the modern capitalist spirit has two important components: the pursuit of material goods and economic rationality. In his "The Spirit of Law", *Montesquieu* formulated the separation of powers and assumed that the spirit of commerce brings with it the spirit of moderation, management, restraint, work, prudence, tranquillity, order and rule. (It would be ideal if they were implemented in reality!)

Chapter 3 is entitled "Mercantilism and the precursors of classical political economy". *Thomas Mun's* major work was published in 1664, entitled "England's Treasure by Foreign Trade". He argued for the development of trade, and recognised that foreign trade surpluses should not be achieved with each individual country, but with all countries. French mercantilism is largely associated with *Jean-Baptiste Colbert*. Industry was developed through state subsidies, tax benefits, the granting of monopoly rights and tariff protection. The big loser of Colbert's forced industrialisation was agriculture. The Austrian and Swedish version of mercantilism is called Cameralism, which also aimed at industrial protection, protective tariffs and a foreign trade surplus.

The emergence of quantitative monetary theory is interesting. After the discovery of America, large quantities of precious metals flowed into Europe, causing a dramatic increase in prices. The quantitative theory of money was popularised in the 16th century by *Jean Boldin*, who identified five factors as the cause of price increases: the abundance of gold and silver, the existence of monopolies, the scarcity of goods, which is also caused by exports, the luxuries of kings and nobles, and debasement. He considered the abundance of gold and silver to be the fundamental reason for this.

Chapter 4, entitled "The intellectual background of 18th century economic thought", provides important context on the issues of natural law, empiricism and rationalism. The next chapter provides an analysis of "The Enlightenment and economic thought". The name physiocrats comes from the words nature (phýsis) and power (kràtos). Their predecessor, *Boisguilbert*, argued that the source of the wealth of nations is not money, but rather the totality of their possessions.

The Chapter on "Classical political economy" is an overview of key importance. The Industrial Revolution began in 1769 with James Watt's invention of the steam engine. The use of steam led to breakthroughs in the textile, iron and steel and

transport industries (steam ships and steam locomotives). The pioneer of classical political economy was *Adam Smith*, a moral philosopher and professor. In 1759 he wrote "The Theory of Moral Sentiments". Adam Smith can be considered as the father of economics, although he had no intention of founding a new discipline. His work which established the science of economics is entitled "An Inquiry into the Nature and Causes of the Wealth of Nations". Smith argues that the opposing forces of self-interest and empathy combine to create social order from the actions of individuals. The metaphor of the invisible hand referred to divine providence. Man is driven by the pursuit of wealth and power, but these do not provide real satisfaction and happiness. According to Smith, nature deceives us, but it is still beneficial because it awakens the human drive to work and increase productivity. In this way, the self-interest of individuals can ultimately lead to a harmony between the individual and social interest. He traced back trade relations to absolute benefits. It should be stressed, and Farkas is right to point out that Smith gave the state essential tasks such as justice, defence, the building and maintenance of schools and roads, and regulating the issue of banknotes. It is clear from the book, and the author summarises well, why Smith is the father of economics. In short, because he systematised the economic context, explored the correlation between economic growth and development, and developed a scientific methodology, his work gave rise to a new discipline, classical political economy.

Jean-Baptiste Say, Thomas R. Malthus and *David Ricardo* are prominent representatives of classical economics. Jean-Baptiste Say's name reminds us of Say's dogma, according to which every supply in the market creates its own demand, and therefore he rejected the possibility of general overproduction. He also assumed that savings would be immediately converted into investments. These theories have clearly been disproved by the economic crises of history. Malthus became famous for his population theory, according to which the population, if not restrained, grows geometrically, while food supply grows only arithmetically. The theory is repeatedly put forward in the context of demographic crises in developing countries but the direction of migration has reversed: in Malthus's time, emigration from Europe was the main direction to the colonies; now it is the other way round, from developing countries to Europe.

David Ricardo's major work was published in 1817 under the title "On the Principles of Political Economy and Taxation". Ricardo explained that the main task of political economy is to explain the laws of the distribution of income between the owners of land, capital and workers. He sought to formulate a pure theoretical model. It is commendable that when his own personal interests and his convictions of principle clashed several times in his life, Ricardo always chose the latter. He was a shareholder in the Bank of England, but protested against the bank's excessive profits. He benefited from high grain prices through his vast land holdings, yet he

fought against corn duty. Ricardo developed his theory of ground rent, according to which, as the demand for agricultural products increases, more and more land of poorer quality has to be brought under cultivation. The amount of work done on the worst land that has not yet been cultivated determines the price of corn.

Chapter 7 is titled "Rebellion against capitalism". It gives a summary, based on original sources, of the utopian socialists, who were essentially non-violent, peaceful reformers. The names of *Owen, Saint-Simon* and *Fourier* are well known from history. According to the latter, in a well-organised society, the division of labour may serve to enable people to find jobs that are attractive and enjoyable in production communities established on a voluntary basis, the phalanstère. It reminds us all of Madách's "The Tragedy of Man", in Act XII, Michelangelo, in the phalanstère, carving a chair leg.

Chapter 8 discusses neoclassical economics. *Bentham* outlined action utilitarianism and rule utilitarianism, although he did not use these concepts, that individual actions should be judged and considered good or bad according to their consequences. *Mill*, on the other hand, took the view that an action is right or wrong according to whether it complies with the rule that everyone in similar circumstances should follow. In this field, much later, in the second half of the 20th century, *János Harsányi*, the Hungarian Nobel Memorial Prize recipient in Economic Sciences in 1994, developed the theory of preference utilitarianism, which assumes general goodwill and human compassion, and therefore excluded antisocial preferences. He was awarded the Nobel Prize for his work in game theory.

Alfred Marshall is a prominent exponent of neoclassical economics. According to him, economics should be concerned with the individual and social actions that lead to the creation of the material conditions for wealth. Marshall wanted to create a synthesis between the work value theory of the classics and the utilitarian theory of value. His famous analogy was that we can argue as intelligently about whether cost or utility determines value just as we can about whether the upper or lower blade of the scissors cuts the paper. Marshall also made important points in his theory of money. He demonstrated that the use of credit instruments increases the amount of money in circulation.

Irving Fisher is best known for his work in econometrics and statistics, in "the making of index numbers", which is what the Fisher Price Index is a reminder of. According to Fisher, interest rates are influenced by two forces: on the one hand, the preferences of economic agents, i.e. how much they prefer present goods and income over future ones; on the other hand, they weigh investment opportunities, i.e. the return that can be achieved. By this he meant the rate of return over costs. Fisher is also a forerunner of adaptive expectations. Importantly today, he pointed out that present consumption also depends on future prospects.

A prominent representative of the Lausanne school is *Vilfredo Pareto*, whose name is marked by the development of the Pareto theory of efficiency, or Pareto optimality. The Pareto optimality describes a scenario in which the situation of one economic agent cannot be improved without at least one other economic agent's situation deteriorating.

Chapter 9 is about "(The) challengers of mainstream economics". In contrast to mainstream economics, the German historical school broke new ground. Its forerunner was *Friedrich List*, who advocated state intervention in the interests of industrialisation and catching up with England, and a trade policy that promoted industrialisation and protected the economy. He saw protective tariffs (in his words "educative tariffs") as an important means of achieving this.

The *German historical school* is extremely rich and heterogeneous, with important common features. They rejected the existence of a universal law of nature in economics, focusing on the process of historical development. Building on historicity, induction and statistical historical data collection and time series analysis were valorised by them. They argued that the individual can only be understood in a historical and cultural context. A nation is not a mere concept, but a real being, a living organism. They did not accept that free competition and the pursuit of self-interest would lead to social welfare.

Alongside historicism, the role and impact of institutions became the focus of research by *Thorstein Veblen*, who became the founder and proponent of institutional economics. According to Veblen, events in the historical past partly underpin and partly limit the path of development that can be followed in the future. In doing so, he established the idea of path dependence, which is also very important in today's institutional economics, although he did not yet use this concept. A late representative of the trend analysed in the 20th century is *John Kenneth Galbraith*, whose main work is illustrated by the titles of his three seminal works: "American Capitalism: The Concept of Countervailing Power" in 1952, "The Affluent Society" in 1958 and "The New Industrial State" in 1967. Several of his main claims have proved to be enduring. In a society of plenty, companies themselves generate needs through advertising, consumer sovereignty does not exist. In a joint-stock company, the owners of the capital are no longer able to exercise any meaningful control over the companies, the real control is in the hands of technostructure.

Chapter 10 is entitled "The triumphal appearance of macroeconomics: Keynes and his contemporaries". This is one of the most exciting and richest chapters in the book, providing a wealth of new information and in-depth analysis even for those familiar with the subject. *John Maynard Keynes* was a dominant figure in 20th century economics, comparable to the influence of Smith in the 18th century and

Ricardo in the 19th century. Keynes took part in the peace negotiations after World War I and wrote "The Economic Consequences of the Peace", in which he argued that the peace treaty would destroy Europe's international trade and financial cooperation, destabilise and cripple Germany, and that the fragmentation of the Central European region would cause serious damage to Central Europe and Europe as a whole. Keynes was a leading figure in the economic debates after World War I. He explained that a return to the gold standard brings on the threat of deflation and crisis. As is well known, this indeed happened in 1929. The Great Depression broke out and Britain had to abandon the gold standard system in 1931. Keynes' major work was published in 1936 under the title "The General Theory of Employment, Interest and Money". Farkas summarises well the main connections of the general theory, efficient and aggregate demand, the Keynesian investment function and especially Keynes' views on the active role assumed by the state. In addition to the theoretical-historical context, Keynes provides an in-depth analysis of the economic policy tools of the state and their application. Keynes played an important role in the 1944 Bretton Woods negotiations on the post-war international financial system and the founding of the International Monetary Fund and the World Bank.

Friedrich von Hayek is a prominent figure in the conservative movement of the 1980s. His cycle theory is fundamental to his work. According to him, economic agents' decisions are not influenced by the price level, but by price ratios and interest rate changes.

Joseph Alois Schumpeter started from the Austrian school. He focused on the phenomenon of innovation. Progress is made when the entrepreneur innovates by creating a new combination of factors of production. Innovation is financed by credit from another important player, the banker. Adaptation to innovation is achieved, in Schumpeter's famous phrase, by "creative destruction", which eliminates uncompetitive firms and their production.

Chapter 12 discusses "The (German) social market economy". From a theoretical and economic-political point of view, this is of paramount importance both for post-World War II development and for addressing the problems of our time. Farkas summarises the historical processes and the emergence of the social market economy very well and expressively. The fundamental starting point for the developers of the social market economy was the need to find a new way out of the bankruptcy of the abandoned free market, 'Manchester' capitalism and centralised state dirigiste economy. The theoretical foundations of *Walter Eucken* and the Freiburg School provided the integrated approach that established and developed the system of the social market economy. In addition to Eucken, *Franz Böhm* and *Hans Grossmann-Doerth* were among the founding fathers, and *Wilhelm Röpke* and *Alexander Rüstow*, whose thinking involved deep social-scientific terms, were also among the system's developers. The economic policy and practical concept of

the social market economy model was developed under the leadership of *Ludwig Erhard*. Central to Erhard's economic policy were fair competition, the regulatory role of the state free from the influence of interest groups and the guarantee of the stability of the value of money. The economy cannot be made independent of moral values. In the social market economy model, the word social is not an adjective but an integral part of the system. Society and the economy must build jointly on freedom and responsibility. At the same time, social assistance should help the individual to regain independence (Hilfe zur Selbsthilfe). The basic principle is subsidiarity, i.e. the principle of mutual aid, whereby decisions should always be taken at the lowest level of the citizen where the capacity to solve a problem exists. This has been the organising principle of the European Union since 1993, when the Maastricht Treaty came into force, but it is increasingly being violated today.

Chapter 13 is titled "Economic theory after Keynes". The neoclassical synthesis was largely created by *John Hicks*. Hicks considered the classical theory one-sided because it focused only on income in determining money demand, while Keynes focused only on the interest rate. He demonstrated that the equilibrium of the commodity and money markets should be considered together as a function of income and interest rate.

Paul Samuelson 's major work is "Foundations of Economic Analysis", published in 1947. In his work he discussed that the most fundamental assumption of economics is that of a maximising and optimisation-based behaviour. According to the duality principle, optimisation problems always occur in pairs. The defining work of Samuelson's life is his work "Economics", published in 1948, which became a successful economics textbook worldwide, translated into 41 languages. *William Nordhaus* co-authored the revised editions from 1985. One of the most enduring achievements of the renowned Hungarian-born economist *Béla Balassa* is the theory of international economic integration and the phasing of integration. According to the Balassa-Samuelson effect, there is a distinction in international trade between tradable and non-tradable goods, typically local goods and services. Productivity differences are higher for goods that enter international trade than for goods that do not.

The theme of Chapter 14 is "Return to neoclassical roots". The Chicago School was already active between the two World Wars and was marked by *Milton Friedman* and *Georg Stigler* in the new post-World War II era. Friedman is the central figure of monetarism. According to his now famous theory of the consumption function, households adjust their consumption expenditure to their so-called permanent income. In his analysis of money supply, Friedman distinguished five forms of wealth: money, bonds, equities, physical non-human goods and human capital. On monetary policy, he argued that there can be many delays in its application, causing distortions. According to him, money is the overall engine of the economy, and if it

fails, the other mechanisms of the economy will also fail. *Georg Stigler* discussed the relationship between the market and state regulation. He developed the economics of information acquisition. He attributed persistent price differences to the costs and demands of obtaining information. (The same products can and do have very different prices in different stores and from different suppliers).

The last chapter of the book, Chapter 15 is: "At the frontiers of mainstream economics". I consider Farkas' analysis to be a courageous, well-founded and valuable analysis, which presents two very different, but parallel trends in new institutional economics and behavioural economics, and the claims of their representatives, in a balanced and in-depth way.

Farkas' impressive, highly valuable work traces in detail the historical arc of the development of economic thought from antiquity to the present day. The book is not only a work of theoretical history, but also a comprehensive presentation of how economics has judged and judges the relationship between the economy, society and the individual in different ages and today, in which value system, what answers it has given to the basic questions of the functioning of the economy, the relationship between production and consumption, the state and the market, the relationship between the real and the monetary economy, and the driving forces of human activity.

By presenting and analysing the original line of arguments of the different views, the author provides an authentic overview of the development process in which different, often opposing, viewpoints and their representatives sought and are seeking the theoretical, strategic and economic policy options for building a better functioning economy that serves people better and functions more efficiently.

Farkas' book is a complex work covering hundreds of fundamental works, a basic scientific work, in which the author draws important lessons on strategic issues of finance and lending by analysing real and financial processes together. A detailed index is provided to help readers browse the content and search. It can be used as a textbook for teaching the history of economic theories, as well as for doctoral training and the preparation of researchers.

Professor Beáta Farkas' book represents a new value, both in Hungarian and international dimensions. It would be ideal if it were also published in English, so that its values could be recognised in international academic and university circles.

The Future of the Economic and Monetary Union*

Antal Gálfi

Péter Halmai (ed.):
A Gazdasági és Monetáris Unió jövője – Európai perspektívák
(*The Future of the Economic and Monetary Union – European Perspectives*)
Ludovika Egyetemi Kiadó, Budapest, 2021, p. 290
ISBN: 978-963-531-044-9 (printed)
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ISBN: 978-963-531-323-5 (ePub)

The volume is based on the extensive work done in the framework of the Ludovika Key Research Workshop "New Dimensions of the Economic Role of the Modern State" headed by *Péter Halmai.*[1] It discusses the current state of reforms in the European Union in detail. It also presents the analyses of outstanding experts from Hungary and abroad to cover the entire model of the Economic and Monetary Union (EMU): the possibilities of building EMU 2.0, its sustainability and future prospects and topics related to its expansion and reinforcement. It discusses the structural features and challenges of a fiscal union (FU), the place of independent fiscal institutions in the European system of economic governance and the capital markets union.

In the opening chapter, entitled *Introductory Thoughts. European Reforms: the Future of the Economic and Monetary Union (EMU) – European Perspectives*, *Péter Halmai*, the editor of the book, provides a comprehensive overview of the most important milestones of the last 70 years of European integration, the creation of the internal market and the introduction of the euro in particular.

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* 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.

Antal Gálfi: Ludovika University of Public Service, PhD Student. Email: antalgalfi@gmail.com

[1] Important further outputs of this research have been published, for example, in:
Péter Halmai: *Európai Gazdasági Integráció* (*European Economic Integration*). Budapest, 2020, Dialóg Campus.
Péter Halmai: *Mélyintegráció. A Gazdasági és Monetáris Unió ökonometriája* (*Deep Integration. The Econometrics of Economic and Monetary Union*). Budapest, 2020, Akadémiai Kiadó.
Péter Halmai: *Mélyintegráció-paradigma* (*Deep-integration Paradigm*). Közgazdasági Szemle (Economic Review), May 2024: 514–558. https://doi.org/10.18414/KSZ.2024.5.514

The book analyses the key challenges faced by the Economic and Monetary Union. The global economic and financial crisis of 2008–2009 revealed the most significant shortcomings and prompted the EU Member States to take important steps to strengthen the Economic and Monetary Union through new policy instruments and institutional changes. At the same time, years of low growth, or even no growth, have left a lasting mark on Europe's social, economic and political fabric. Many countries continue to struggle with the legacy of the crisis – from soaring unemployment to high debt in the public and private sector. While support for the single currency is strong and even growing, the mechanisms of the Economic and Monetary Union and the added value of the euro will be questionable if these mechanisms remain broadly unchanged.

In the first chapter of the volume, *EMU 2.0? Towards a Fully Fledged EMU*, *Halmai* examines the progress of the Economic and Monetary Union to the next stage and the possible future scenarios of economic integration in a comprehensive approach. He points out that the effects of the global economic crisis can still be felt in the euro area after 10 years, justifying the reason for the completion of the Economic and Monetary Union. However, it is still unclear what EMU 2.0, i.e. "complete" EMU, would actually mean. The divergences between Member States, notably in terms of their level of development, pose further problems in the integration process. The chapter underlines that the precondition for economic integration obviously depends on political decisions made at the top level. Two crucial aspects need to be distinguished in the system of multi-speed integration: "core integration", which is most prevalent in the most advanced Western core countries of the European Union, and differentiated integration, which provides a framework for integration for Member States outside the euro area. In order to deepen economic integration, the White Paper published by the European Commission outlines five possible scenarios for the future of Europe for 2025, depending on what decisions are taken regarding the key issues of future integration, the main dimensions of which are the single market and trade, Economic and Monetary Union, Schengen, migration and security, foreign policy and defence, the EU budget and the capacity to deliver. The chapter discusses in detail and compares the five different scenarios.

The next chapter, written by *Anna Iara*, is entitled *Deepening the Economic and Monetary Union: Opportunities and Prospects*. *Iara* presents the shortcomings in economic governance, analysing the problems induced by macroeconomic imbalances and unsustainable international capital flows in the context of the failures of the institutional setup established in the Maastricht Treaty. She identifies the risks in the financial sector and the imbalances arising from similar economic structures or a lack of flexibility. This chapter also examines the question of fiscal sustainability, highlighting the lack of a fiscal safety net for illiquid states and banks, as well as the absence of coordinated reforms to improve competitiveness. The

author argues for the legitimacy of the concept of a multi-speed Europe, citing the different degrees of EU Member States' economic development.

In their contribution, *Member State Preferences and/or Common Interest: Reflections on the Possibility of Fiscal Union*, authors *István Benczes* and *Ferenc Kollárik* point out an important asymmetry. In the context of deepening economic integration, monetary policy has been escalated to EU level, while fiscal discipline remains the responsibility of Member States. This left the European economy too vulnerable during the global economic crisis. The euro area recovered after 2010, but the crisis in the real economy and high unemployment lasted for years. The need to rethink EMU and put it on a new footing became an agenda item.

In the subchapter *Deepening in the Perspective of Integration Theory*, the authors explain the theory of neofunctionalism, the intergovernmental process of advancing European integration. Following the approach of integration theory, they present the idea of a European Fiscal Union, i.e. the creation of a budgetary union, stating that "Fiscal federalism" would strengthen the economic (in a narrower sense, the fiscal) aspect of EMU and would concurrently bring about a deeper and tighter integration structure." The authors provide a comprehensive analysis of the literature on the subject. The Member States still have not decided in favour of the immediate introduction of the fiscal union, since the economic development of the member countries does not allow for its establishment, and individual states have different attitudes on the issue. Given the complexity of the issues at stake, the European Union voted in favour of deepening the integration of the EMU.

Similarly to the previous chapter, *László Jankovics* explores the fiscal aspects in his chapter on *Independent Fiscal Institutions in the European System of Economic Governance*. He discusses the potential of independent fiscal institutions (FFIs) for economic and monetary integration. These institutions can check the tendency towards deficit and make a "pro-cyclical" fiscal stance less prevalent, in order to make economic integration more efficient. The chapter briefly describes the economics of FFIs, reviews their structural characteristics and summarises actual experiences. The analysis divides FFIs into two groups. On the one hand, the "independent fiscal authorities" can directly set budget balance or debt targets and formally intervene in the structure of the expenditure and revenue side. On the other hand, "fiscal councils" can influence budgetary decisions indirectly through independent analyses and forecasts. Jankovics underlines that − thanks to the European legislative reform process that started after 2010 − there is now at least one such institution in each EU Member State, and concludes by stressing the importance of independent fiscal institutions, recommending the expansion of the legislative framework in Member States for these to operate more efficiently.

Dóra Piroska explores the system of *New European Bank Governance (NEBG),* which incorporates EU state aid rules and fiscal regulations. According to the author, the global economic crisis of 2007–2008 was also a key factor in prompting the development of the new bank governance system. The chapter highlights what European-level regulations – apart from the banking union – were introduced in the aftermath of the crisis that affect the banking policies of the Member States, limiting their room for manoeuvre and increasing the control of the European Central Bank, DG Competition, the European Commission and the European Council over EU Member States. However, the author concludes that the changes will allow central banks and other regulators integrated into the European system to fend off criticism much more effectively. These processes can weaken confidence in democratic institutions, especially on the European periphery.

In the next chapter, – *How Much Impact Euro Area Membership Has on the Current Account Balance?* –, *Gábor Kutasi* explores the question of whether the participation of individual Member States in the euro area has had any effect on their current account balance. It also underlines the importance of Member States' compliance with the Maastricht criteria, in particular with regard to the degree of budgetary deficit. It looks at other factors, apart from the exchange rate regime, influence the current account balance. The analysis shows that the patterns in the dynamics of the balances of individual Member States were not directly related to euro area membership. The only difference is between nominal and real adjustment rates.

In his paper entitled *European Capital Market Developments in the Light of Brexit*, *István Magas* reviews the most conceivable developments in the European Union's financial and capital markets after Brexit, partly in the light of mature theoretical considerations long known in the capital markets, and partly in the light of financial integration efforts that gained momentum in the wake of Brexit. One of the key questions asked in the study is whether there are any sufficiently sound economic arguments to support the disintegration of capital markets. At the theoretical level, a variety of approaches (such as modern information and network theories) endorse the opposite, i.e. international capital market integration.

The chapter entitled *Some Questions Regarding the Sustainability of an Economic and Monetary Union* takes us back to the main theme of the volume. *Miklós Losoncz* reviews the uncertainties about the long-term sustainability of EMU, which have, for longer and shorter times, intensified during peaks of tension in the decade after the crisis. The author believes the key to the sustainability of Economic and Monetary Union is the fulfilment of the Maastricht criteria and analyses their relevance in detail. The main finding of the analysis is that the sustainability of EMU could have been challenged *inter alia* because monetary integration was not accompanied by fiscal integration. While monetary policy has been raised to EU level, fiscal policy – an essential element of national sovereignty – remains a Member State

competence. The sustainability of the euro area depends to a large extent on the structural reforms that the countries of southern Europe will have to implement. The expected deterioration in external conditions, including rising interest rates, makes this even more compelling. Other euro area countries should also support southern European countries in their adaptation efforts.

Péter Mocsáry's analysis, *Deepening and widening the Economic and Monetary Union,* underlines that the development of EMU has now become a central issue. It is urged not only by the EU centre countries, as other Member States around the centre would also like to see closer integration. Two important challenges are discussed in relation to the development of EMU. The first is the exchange rate movements of non-euro area Member States' currencies, and the second is the fact that Member States have different levels of development. In addition to the commitment of Member States, closing the gap in economic development is also crucial for the success of EMU and the enlargement of the euro area. At the height of the crisis, some predicted the disintegration of the euro area and a deterioration in the quality of monetary integration, but experience has shown that the system demonstrated considerable capacity for self-correction.

The volume concludes with a piece by *Péter Halmai* entitled *Some Peculiarities of the System of the Economic and Monetary Union*. The chapter reviews the different aspects of EMU, highlights the importance of the convergence mechanism and ends with a discussion of the possible content and timing of EMU reform, as well as a confrontation between vision and reality. Special focus is placed on the European Union's cohesion policy as the primary tool of tackling regional disparities. The author also points out that Hungary's accession to the euro area will be a recurrent agenda item in the future. He examines in detail the role of the different dimensions of convergence in the operation of the EMU. He provides convincing evidence to prove that persistent disturbances in the operation of the convergence mechanism jeopardise the smooth functioning of integration, in particular its deepening. The study also takes a look at the recovery from the crisis. The divergences in recovery processes are driven by structural differences. The in-depth analysis in this chapter is supported by a number of figures. In the last section, the author sums up what the EMU 2.0 reform could entail in view of the analyses presented so far. (Radical and incremental reforms are equally possible, designated as the "big" or "small" EMU reform package, respectively.)

This book's content and timely analysis can help better understand the opportunities for reform in Europe and the changes that lie ahead. It is, therefore, highly recommended for students of International and European Union studies and for all who wish to become more knowledgeable and familiar with the current processes mentioned above.

Sustainability from a Finance Perspective*

Kinga Szabó

György Kocziszky (ed.):
A jövő fenntarthatósága – A fenntarthatóság jövője
(*Sustainable Future – The Future of Sustainability*)
Magyar Nemzeti Bank and Budapest Metropolitan University, 2024, p. 364
ISBN: 978-615-5459-30-6

The collection of studies entitled *A jövő fenntarthatósága – A fenntarthatóság jövője* (*Sustainable Future – The Future of Sustainability*) edited by György Kocziszky, Rector of the Budapest Metropolitan University, summarises the academic papers on sustainability produced and published in the research workshops of the university. The volume is a continuation of the publication *Sustainability in Economics – Theoretical Foundations, Uses* which was issued in early 2024 with Péter Halmai as editor.

One of the cornerstones of sustainable development is that, in addition to the requirements of economic development and growth, it must take into account both the expectations concerning environmental sustainability and the needs of society. The question often arises: What is the relationship between economic growth and the sustainability of the natural environment? This in turn leads to other questions, such as whether economic growth is a barrier to sustainability, or whether there are frameworks where growth and sustainability can coexist and complement each other.

According to the 1987 Brundtland Report[1] of the UN World Commission of Environment and Development, sustainable development ensures that it meets the needs of the present without compromising the ability of future generations to meet their own needs.

Addressing climate change and its consequences is an increasingly pressing issue. In this respect, a consensus has been reached in scholarly circles that climate change is primarily a consequence of greenhouse gases emitted by humans.

* 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.

Kinga Szabó: Budapest Metropolitan University, Head of the Rector's Office. Email: kszabo.01@metropolitan.hu

[1] https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf

The environmental pressure on our planet has now reached such a magnitude that economic growth in its current form can no longer be sustained, as future generations would be left with far fewer healthy natural resources.

Sustainable economic growth requires sustainable financial systems. The focus of this volume is on topics related to economics, in particular the sustainability of finance: the authors examine both the future of financial sustainability and the financial sustainability of the future, covering topics such as the conditions for green central banking, the impact on the labour market stemming from companies' green transition, the impact of household cash holdings, the impact of artificial intelligence (AI) on the financial sector, sustainable carbon neutrality, trends shaping future developments in the automotive industry, large automotive firms and their supplier networks, the impact of IFRS9[2] on the stability of the credit institutions sector, the enforcement of green capital requirements in domestic practice, the impact of automotive megatrends on sustainability, the rise in preference for the portfolios of companies that produce renewable energy, sustainability rules in the insurance sector and the inclusion of sustainability aspects in the prudential regulation and supervision of credit institutions.

Without being exhaustive, I would like to give a brief insight into a few of the studies that I find particularly interesting.

The first step towards future financial sustainability is the incorporation of green finance into a framework, the history of which is presented in *A zöld pénzügyi tudományos kutatások evolúciója* (*The Evolution of Research into Green Finance*) by Balázs Sárvári. Green finance links economic growth with the financial sector and environmental protection, and accordingly it has a significant academic and societal role, as it contributes to sustainable development and environmental protection. After a review of the literature, the author outlines four main areas of green finance that contribute to environmental and sustainability goals, as scientific research can identify the impact of financial systems and instruments on environmental sustainability, and thus help develop strategies for financial institutions and markets to exert a positive effect on the environment. This includes an analysis of investments that contribute directly or indirectly to environmental protection or other sustainability goals, such as green bonds, green shares, infrastructure projects and other sustainable investments.

Combating climate change and reducing greenhouse gas emissions are a key issue for green finance, and research in this field will contribute to the development of financial instruments to increase energy efficiency and promote the use of renewable energy. By designing new financial instruments, products and markets,

[2] https://www.ifrs.org/issued-standards/list-of-standards/ifrs-9-financial-instruments/

it is possible to foster measures to support the achievement of sustainability goals, which can effectively advance the use of sustainable energy.

Climate change and other environmental challenges also engender financial risks that need to be analysed and addressed through relevant green finance research. Such research can, for example, identify the financial consequences of greenhouse gas emissions. The main goal is to support sustainable development and facilitate green economic growth.

Green finance research includes the study of ESG factors that influence the environmental impact (E for environmental), the social responsibility (S for social) and the governance practices (G for governance) of companies or investments.

Among the many important topics (such as green financing and the correlation between green finance and standard finance), the author identifies three key issues: How can green technologies and innovation be financed and stimulated through the financial system? How can large databases be used in green finance to enhance efficiency and to support the achievement of sustainability goals? How is it possible to raise the awareness of the importance of green finance among financial actors and in society at large, and to encourage sustainable financial choices?

In her study, *What is the Future: Robotic Work or Working Robots? The Impact of Robotisation on the Labour Market,* Eszter Kovács points out that, as has been repeatedly demonstrated in past decades, technological innovations have not led to a considerable contraction in demand on the labour market. Robots and human labour have not replaced each other, but rather complemented each other. Processes carried out by DAR (digital, automated, robotic) technologies contribute to the development of global production and also to the transformation of the labour market, as DAR technologies are taking the place of manual labour. Smart work tools and industrial robots assigned to human labour make production processes more efficient, because it is sufficient to monitor the different work phases through a central control system, while DAR technologies also provide automatic troubleshooting. According to surveys by various analyst firms, almost half of all work tasks can be done using DAR technologies, which means that the uptake of these technologies will surge in the coming years. This will have a dual effect: on the one hand, physical work will become less and less prevalent (DAR eliminates jobs), while on the other there will be more areas of intellectual labour and new positions will emerge (DAR creates jobs). Robotisation transforms workflows and amplifies the polarisation of the workforce, with some traditional forms of work being replaced by platform work. The author concludes that the adoption of technological solutions will have a positive impact on the economy as a whole and will not cause significant unemployment, as its growth will be checked by the 'invisible hand'.

In his analysis entitled *Mesterséges intelligencia a pénzügyi szektorban és a munkaerőpiacon* (*Artificial Intelligence in the Financial Sector and the Labour Market*), Tamás Babai-Belánszky examines the transformative effect of artificial intelligence (AI) on the financial system. AI also plays an increasingly important role in the evolution of the financial sector, since it transforms financial products, the functioning of financial organisations and, ultimately, the financial system as a whole. However, its emergence entails new cybersecurity risks. The IMF is particularly concerned about the new cybersecurity risks AI presents, which also pose a threat to financial stability.

According to the 2020 fintech and digitalisation report of the Magyar Nemzeti Bank (MNB) *(MNB 2020*),[3] in the field of new advanced technologies, the use of artificial intelligence could have one of the strongest impacts on the financial sector in the short run. Firms are predicted to replace human labour with AI in their preference for minimising costs, where it is technologically feasible and results in lower expenditure. The biggest challenge with the emergence of AI in the labour market is that its technological development is exponential, and moves at a speed that the regulatory and the legal domains can barely keep up with. In this context, training and retraining are key when it comes to the labour market. Generative AI is particularly important in the rise of AI, because it is no longer just capable of analysing data and making predictions, but can also create products that to date only humans have been able to do, as it has the ability of abstraction, creativity, intuition and empathy that have been unique to humans.

According to an OECD study,[4] the impact of AI is felt most by the majority of workers through changes in their current job tasks and working environment rather than the loss of their job. The impact of AI on wages is not yet clear. It may mean an increase in wages for employees who use AI to complement their own job expertise or who are involved in the development and implementation of AI. AI can complement and support work, allowing workers to perform the same tasks more efficiently; however, it may cut back interactions between people. With the use of AI, processes can be automated, and with less decision-making involved, and it can reduce workers' autonomy, potentially leading to weaker worker motivation. At the same time, it may relieve workers of some of the stress associated with work, for example by decreasing information overload.

One of the most comprehensive analyses of future sustainability in the volume is the work of Anikó Kacsné Kovács, Máté Lakatos and Tünde Ökrös Ilona: *Autóipari megatrendek a világban* (*Automotive Megatrends across the World*). Their study contains a wealth of statistics on car manufacturers, the workforce and the level

[3] https://www.mnb.hu/kiadvanyok/jelentesek/fintech-es-digitalizacios-jelentes/fintech-es-digitalizacios-jelentes-2020-aprilis
[4] https://www.oecd.org/employment-outlook/2023

of R&D. The automotive industry is a key sector for the prosperity of the European Union and Europe, directly and indirectly employing nearly 14 million people, which accounts for more than 6 per cent of total EU employment. Automotive megatrends are pointing towards a significant growth in electromobility, with the production and sales of electric cars rising significantly in recent years, according to a report by the International Energy Agency.[5] In 2020, 5 per cent of all new cars sold were propelled by an electric motor, while in 2022, this figure was 14 per cent. This brisk growth is redefining previous manufacturing, regulatory and environmental processes and regulations.

The emergence of platforms has made carpooling or carsharing popular as a response to the phenomenon of urbanisation. According to an article by Gábor Kaszás published in April 2023,[6] which profiles the three major carsharing companies operating in Hungary, i.e. MOL Limo, ShareNow and GreenGo, carsharing providers could be long-term competitors to owner-used cars. The uninterrupted rise in the popularity of carsharing is demonstrated by the proliferation of users and the dramatic increase in revenue. Studies show that carsharing could replace up to 7–10 private cars in urban transport, significantly reducing the number of parking spaces needed and the degree of congestion. As there are fewer cars that spend more than 95 per cent of their operating time parked, more parking spaces are freed up, allowing the space occupied by these cars to be made better use of.

According to a study by McKinsey published in April 2023,[7] the number of private cars will decline massively over the next decade, and the number of people subscribing to car use as a service will increase, reducing the number of cars owned. However, the high proportion of people who own their car is unlikely to change significantly for a long time, as car ownership is a status symbol.

Closely related to car ownership is the question of car purchase financing: according to an article by Ernst & Young from May 2022,[8] the majority of domestic buyers would use own funds to cover their next car purchase. However, those who do not have the purchase price available should consider carefully what financing model they choose. They could opt for a loan from a bank or financial company, or pick a closed-end or open-end lease. Service users also need customised digital solutions for mobility funding as well as complex financial product packages in which companies offer maintenance, insurance or oversight services for (conventional and electric) vehicles and services for electric vehicles. Large automotive companies'

[5] https://iea.blob.core.windows.net/assets/dacf14d2-eabc-498a-8263-9f97fd5dc327/GEVO2023.pdf
[6] https://index.hu/gazdasag/2023/04/26/auto-automegoszto-carsharing-autoberles-mol-limo-sharenow-greengo/
[7] https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/shared-mobility-where-it-stands-where-its-headed
[8] https://www.ey.com/hu_hu/consulting/autovasarlasi-szokasok-sokan-valtananak-egyre-nepszerubb-az-alternativ-hajtas

own financial service providers (e.g. Ford Motor Company, General Motors Financial Company Inc., Mercedes-Benz Mobility, Toyota Financial Services, Volkswagen Finance Private Limited, etc.) are the biggest financers of car loans and are forecast to remain dominant players in car finance in the next decade. To remain competitive, they need to strengthen their digital services to meet changing needs with new technologies such as blockchain, artificial intelligence, digital payment systems and online mobile banking.

Car manufacturing and car use have left, and continue to leave, a huge carbon footprint. Considering the size of the global industry, it is timely to take sustainability into account in the automotive sector by increasing the share of electric cars, carsharing, community use, R&D, the use of renewable energy and innovative projects in the field of environmental protection.

All of the papers in this volume are recommended for professionals and university students interested in sustainability.

Flow Experience in the Organisational Culture*

Éva Kovácsné Laczkó

Andor Czinege:
A szárnyaló szervezet – Hogyan teremtsd meg a flow-t a cégedben?
(*The Soaring Organisation – How to Create Flow in Your Company?*)
APG Kreatív Kft., Budapest, 2023, p. 244
ISBN: 9786150181936

Andor Czinege, an organisational development consultant and one of the founding members of AD Sidera Group, is involved in a number of national and international corporate culture development projects. He puts the professional focus on the balance of excellence, supporting sustainable success. The author's book, *The Soaring Organisation – How to Create Flow in your Company?,* which can be categorised as a business textbook and focuses on business development, was published in 2023 in Budapest by APG Kreatív KFT. It highlights problems that are of high priority today, thus underlining the pressure generated by increasing competition in the market. It answers questions that arise in the area of corporate culture development. This work is primarily aimed at practising managers who are looking for innovative solutions in order to overcome crisis situations in their companies in the field of organisational development. In his book, he provides a well-structured overview of his experiences to help readers put them into practice.

It is worth highlighting some concepts from the book. A flow experience is a positive state of mind that makes the experiencing persons feel happy and helps them to immerse themselves in the activity they are currently doing. It depends on the active engagement of managers regarding how they support the emergence of the flow experience for employees as part of the organisational culture, inherent in the PDCA[1] cycle. PDCA, although still a less widespread method in terms of culture development, serves as a regular check on quality and efficiency improvement, measuring effectiveness and allowing corrective intervention where necessary. The main elements of the process for developing a corporate culture are mission, vision and values. The term "soaring organisation" used in the title of the book contradicts

* 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.

Éva Kovácsné Laczkó: University of Sopron, PhD Student. Email: evalaczko94@gmail.com

[1] Plan-Do-Check-Act

the interpretation that profit orientation is the main structure of a company's existence. Excellence (peak performance) emerges when profit maximisation is achieved while the employee flow experience is fulfilled, as the profit of companies is generated by the work of human resources.

In practice, organisational development often faces difficulties, as management styles and feedback to staff often create a sense of threat, which has a stress-inducing effect. The result is that instead of cooperation, it is a feeling of resentment that makes its way through. There is often a misconception among managers that corporate goal and task setting is an unobstructed process. Thus to make excellence sustainable, it is essential to set clear and comprehensible goals and objectives. While goals are being achieved, employee engagement can decline as soon as they no longer feel challenged or valued. As employees progress, it is not advisable to keep them engaged in a specific task for long. The correct assessment of changing employee competences is a management task that requires a great deal of attention.

In the first part of the book, the author explains why it is so difficult to embark on a journey of organisational development as a leader, when everyday life is dominated by stressful situations and a feeling of lack prevails in the performance of tasks. Bringing about change is difficult, mainly due to labour shortages, generational differences and difficulties related to the online space. So the fundamental problem is caused by a circumstance that would justify the rationale of organisational development in practice. This is the basis for the second chapter, which deals with basic sensations, perception and perspectives leading to action in terms of consciousness and energy. It classifies states of consciousness at a practical level, distinguishing between dissociation, the pursuit of (inner) peace and the achievement of the flow experience. In the third part, we come to the process of organisational development, the initial stage, which is based on goal-setting and the development and application of strategies to facilitate this. Here we can learn about the positive impact of the PDCA cycle in organisational development, the goal-setting for shaping our vision and a culture that creates values. The fourth part deals with the implementation of the organisational development process, such as putting the right tasks into practice, assessing the situation and increasing efficiency in the direction of continuous growth, with targets and feedback. Chapter five presents the development methodology that has been implemented and discusses how it becomes sustainable once it is embedded in the organisational culture.

To sum up the concept, the book seeks to refute the profit-driven corporate view of employees as easily replaceable assets participating in the production process. It is based on the idea that the attitude of individuals is a determining factor in the work processes they perform, so the success of organisational development is based on creating a working environment where employees enjoy the work performed,

which is an employee-centred approach. The value of a motivated workforce that is well integrated into corporate culture is recognised in international practice. The author takes a theoretical approach to the fulfilment of human needs through the experience of flow inherent in work processes. He also takes a theoretical approach to the process of planning, working, checking back and following up, illustrated by practical examples and well-structured guidance. The author puts his professional experience into a framework through examples, with the aim of providing practicing managers with an easy-to-understand set of steps to strive for sustainable success. The current labour market situation on the employee side and the lack of relevance of management goal-setting and communication difficulties often stand in the way of organisational development strategies.

INSTRUCTION FOR AUTHORS

Manuscripts should be submitted in accordance with the following rules:

- The length of the manuscripts should be limited to 40,000 characters (including spaces) but a ± 50 per cent deviation is accepted. Manuscripts should be written in Hungarian and/or English.
- The unnumbered footnote of the author's name contains his/her position, the institution the author works at, his/her email address and any other relevant information and acknowledgment regarding the article.
- Papers always begin with an abstract which should not exceed 800–1,000 characters. In the abstract a brief summary is to be given in which the main hypotheses and points are highlighted.
- Journal of Economic Literature (JEL) classification numbers and keywords should be given (three at least).
- Manuscripts should be written in clear, concise and grammatically correct Hungarian and/or English. Chapters and subchapters should be bold.
- Manuscripts should contain the list of references with the first and surname of the authors (in case of non-Hungarians the initials of the first name is required), the year of publication, the exact title of the book, the publisher, the place of publication. In case of papers, the exact title of the journal, the year, the volume, and the pages should be indicated. References in the text should contain the surname and the year. When citing the exact page should be indicated.
- Tables and figures are to be numbered continuously (chapters and subchapters should not contain restarted the numbering). Every table and figure should have a title and the units of quantitative values are to be indicated. Tables are to be made in Word, while figures must be edited in Excel. Notes and sources are to be put directly at the bottom of the tables, figures.
- Equations should be aligned to the right and should be numbered continuously in parenthesis. (Chapters and subchapters should not contain restarted the numbering.)
- Manuscripts are to be sent to the Editorial Office only. Papers are peer-reviewed by two independent and anonymous reviewers.
- Manuscripts should be sent as attachment by email in MS Word file. Figures should be sent in MS Excel file both in Hungarian and English.
- In case of further questions related to the manuscript visit the following website: *https://en-hitelintezetiszemle.mnb.hu/authors-guide*

Thank you!

The Editorial Office of the Financial and Economic Review
H-1013 Budapest, Krisztina körút 55.
Phone: +36-1-428-2600
E-mail: szemle@hitelintezetiszemle.hu

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