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Inflation in the Digital Age: Inflation Measurement and Bias in the 21st Century*

György Matolcsy – Márton Nagy – Dániel Palotai – Barnabás Virág

In a highly timely move, several major central banks have announced a thorough review of their inflation targeting systems in recent months. Official statistics show that consumer inflation in the developed world has remained consistently below central banks' target rates for almost a decade, in spite of the extraordinary efforts of these central banks. If central banks miss targets permanently, they may incur credibility problems and, over time, this could erode the social acceptance of their decisions. The world and our economies in it are undergoing an extraordinary transformation. 21st century megatrends such as digitalisation, the transformation of globalisation, ageing societies or even climate change are introducing new patterns into how economies function. Closely related to these megatrends, phenomena such as changing consumer habits and an increased importance of services pose new challenges for the measurement of economic processes, including the rate of inflation. One first step in the reconsideration of inflation targeting frameworks can be to correctly identify new types of bias in the measurement of inflation and to understand the new patterns determining the changes in consumer prices. Besides its challenges, technological progress offers new solutions as well. The widespread adoption of big data technologies has also created a significant opportunity for enhancing economic statistics; benefiting from these advantages, economic theory can help economic policymakers again, providing them with more solid support than over the past decade.

Journal of Economic Literature (JEL) codes: E2, E31, E50, F62, O30, Q54, Q55

Key words: inflation, economic theories, megatrends, measurement, demographics, digitalisation, globalisation, Phillips curve

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1. Motivation and introduction

In a highly timely move, several major central banks have announced a thorough review of their inflation targeting systems in recent months. Official statistics show that consumer inflation in the developed world has remained consistently below central banks' target rates, in spite of the extraordinary efforts of these central banks. If central banks miss targets permanently, they may incur credibility problems and, over time, this could erode the social acceptance of their decisions.

The world and our economies in it are undergoing an extraordinary transformation. Technologies, new monetary systems, mobility, data revolution and climate change are just a few of the new challenges of the 21st century. Robotics, big data and artificial intelligence are reshaping an ever greater slice of our lives and the global map is undergoing fundamental geopolitical changes. Closely related to these megatrends, phenomena such as changing consumer habits and an increased importance of services pose new challenges for the measurement of economic processes, including the rate of inflation. One first step in the reconsideration of inflation targeting frameworks is to correctly identify new types of bias in the measurement of inflation and to understand the new patterns determining the changes in consumer prices. Besides its challenges, technological progress offers new solutions as well. The widespread adoption of big data technologies has also created a significant opportunity for the enhancement of economic statistics; benefiting from these advantages, economic theories can help economic policymakers again, providing them with more solid support than over the past decade.

This paper examines inflation in the 21st century, i.e. the digital age; it seeks an answer to the question whether inflation, as it is currently known, provides an accurate understanding of the 'true' changes in prices, taking into account the impact of megatrends. The paper is structured as follows: *Chapter 2* presents the theories most frequently used in the past fifty years to explain inflation. *Chapter 3* examines the factors that are currently less suitable for describing inflation trends, while *Chapter 4* presents the new factors having an increasing effect on inflation. *Chapter 5* deals with inflation measurement and biases. Finally, *Chapter 6* summarises the main conclusions.

2. Theories to explain inflation

From time to time, economists and economic policy makers would monitor different factors underlying the understanding of the given period regarding the development of prices. In the pre-crisis period, the two pillars of inflation thought and theory were the quantity theory of money and the Phillips curve.

2.1. The quantity theory of money

For traditional correlations, we have to go back as far as the 1960s, when Nobel laureate economist Milton Friedman developed the new foundations for monetarism and the quantity theory of money. Different versions of the quantity theory of money date back as far as the 16th century, when the precious metal flows from the Americas to Europe gave rise to the observation of a linear relationship between the quantity of money and the level of prices. Among others, the philosophers John Locke and David Hume and the economist Richard Cantillon tackled the subject.

The earliest version of the quantity theory of money was developed by Irving Fisher. His assumption was that market participants held money for transaction motives only, and that the velocity of money was exogenous. John Maynard Keynes was highly critical of this approach, pointing out that, in addition to the transaction motive, market participants may also hold cash for precautionary or speculative motives. Market participants have a precautionary demand for money to prepare for unexpected future expenditures; this is dependent on their expected future incomes. With the speculative motive, wealth can be held in cash or in bonds. Bonds are recommended in this case because, unlike cash, they also have a yield. These two motives introduce the role of the interest rate into the theory: the velocity of money changes as a (positive) factor of the interest rate.

The Keynesian approach is an improvement on Fisher's assumptions because it uses more motives to explain why market participants hold money and declares the velocity of money to be dependent on the interest rate. However, the speculative motive is unable by itself to justify the need for diversifying asset portfolios by dividing them between cash and bonds.

Modern monetary policy emerged after the collapse of the Bretton Woods system in 1971. A deeper understanding of inflation became the focus for economic research with the monetary revolution led by Milton Friedman who, in his book published in 1963¹, presented a reformulated quantity theory of money using the example of the US economy; in this theory, the nominal money supply determines the rate of inflation:

$$M \cdot V = P \cdot Y,$$

where M is the nominal money supply, V is the velocity of money, P is the price level and Y is the real output of the economy. In contrast to the Keynesian approach, one of the assumptions in the theory is that the velocity of money is constant, i.e. the money available in the economy is spent by market participants

¹ Friedman, M. – Jacobson Schwartz, A. (1963): *Monetary History of the United States 1867–1960*. Princeton University Press, Princeton, 1963.

on goods and services at similar degrees in all periods. Another assumption is that the additional demand resulting from the additional quantity of money in the economy must always meet with adequate supply. Friedman warned, however, of increasing the quantity of money too quickly. In an optimal scenario, therefore, increasing the quantity of money will first lead to increased demand and economic growth (short-term impact), and will then have inflationary consequences in the longer term. In contrast to Keynes' theory, Friedman did not consider it necessary in his monetarist approach to separate the speculative and the transaction motives, nor did that approach attribute a significant role to the impact of interest rates. Although Keynes and Friedman never debated their theories in person, a comparison of their theories can reveal how stark the contrast was between them.

2.2. The Phillips curve

In addition to the quantity theory of money, the consensus before the 2008 crisis sought to capture price changes using an economic relationship first discovered in the 1950s. The Phillips curve correlation was developed on monetarist foundations and tied the changes in inflation to the cyclical positions observed in the economies. In his article published in 1958, Phillips tested the relationship between unemployment and wages (wage inflation) on data from the United Kingdom, and found a stable inverse relationship, which became a milestone in the development of macroeconomics (*Phillips 1958*).

The original correlation needed fine-tuning from time to time, however: in the 1960s, Solow and Samuelson replaced the changes in wages with changes in prices; in the mid-1970s, inflation expectations were added; and in the 1990s the theory was given its microeconomic foundations based on Neo-Keynesian logic (*Szentmihályi – Világi 2015*).

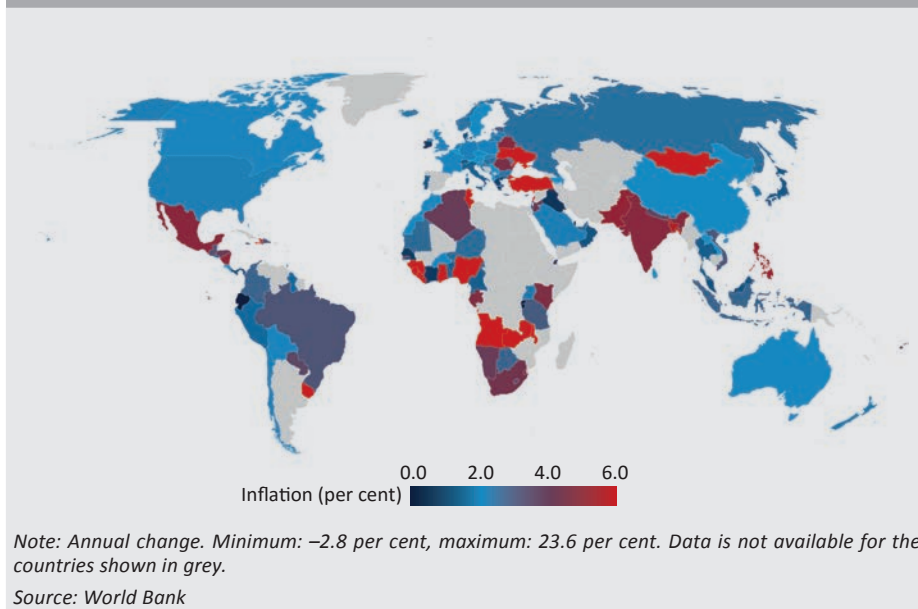
The role of cyclical factors in determining inflation (i.e. the slope of the Phillips curve) was an important component of the so-called 'divine coincidence' principle (*Blanchard – Galí 2005*), according to which stabilising inflation results in stability in the real economy. Also, according to the economic thought of the time, inflation expectations served the purpose of capturing changes in inflation in the longer term, beyond the real economic cycle. Central banks declared inflation targets in order to anchor expectations at the desired level and, in addition, used the standard tools of central bank interest rate policy to smooth the fluctuation of inflation and real economic indicators.

2.3. What is happening to inflation nowadays?

There have been several periods in the history of inflation over the past fifty years or so when global inflation rates were relatively high in advanced as well as emerging economies. This was due mostly to a substantive rise in commodity prices, primarily crude oil, as a result of geopolitical reasons. The gradual introduction of inflation

targeting, first in New Zealand, in January 1990, contributed to the fact that global inflation rates stabilised at a moderate level near the declared inflation targets in the period from the mid-1990s until the crisis of 2008.² Nowadays, however, developed countries live in an age of low inflation, with rates below central banks' targets. As Federal Reserve Chair Jerome Powell said at a FOMC press conference in March 2019, globally low inflation is 'one of the major challenges of our time' (*Figure 1*).

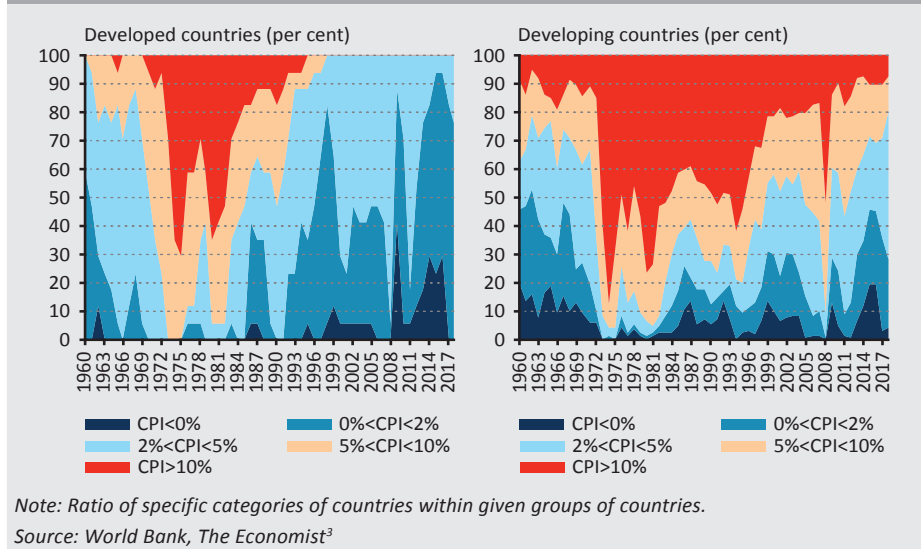
Figure 1
Consumer inflation in the world in 2018



Although favourable global economic processes and a mild increase in commodity prices pushed inflation rates out of their former range around 0 per cent, inflation still remained below central banks' targets (*Figure 2*). The percentage of advanced countries with a rate of inflation between 0 and 2 per cent has risen to nearly 80 per cent since 2012. The trend is similar in emerging countries, which makes the problem of low inflation a global phenomenon. Where has inflation gone and how do we explain the way prices are changing nowadays? Below we seek answers to these questions.

² The process is clearly illustrated by the diagrams in the Annex. While many countries in the world were characterised by high inflation in 1990, falling inflation rates were observed in an increasing number of economies by 2000.

Figure 2
Distribution of inflation rates in developed (left panel) and developing (right panel) countries (1960–2018)



3. Changed relationships

Factors that used to provide an important compass for our understanding of inflation processes have been significantly weakened in the current global economic environment of low inflation. To fix our broken compass, we need to understand where the traditional economic models are broken.

3.1. The shrinking importance of the quantity theory of money

Doubts about the practical application of the quantity theory of money were first raised in the 1980s and 1990s, and it has lost much of its relevance since then. This is partly attributable to the fact that the velocity of money is not actually constant. The M1 nominal money supply is not an appropriate measure of liquidity as it does not capture loans and it disregards alternative forms of savings such as equities and government securities.

When the stock markets perform well, market participants choose to buy shares to achieve higher yields, which reduces the velocity of money. If people enjoy a substantive improvement in their wealth due to higher yields from equities, they will increase demand in the economy and this in turn will raise output. In such situations, asset price bubbles can easily emerge and pose a risk to the economy as a whole.

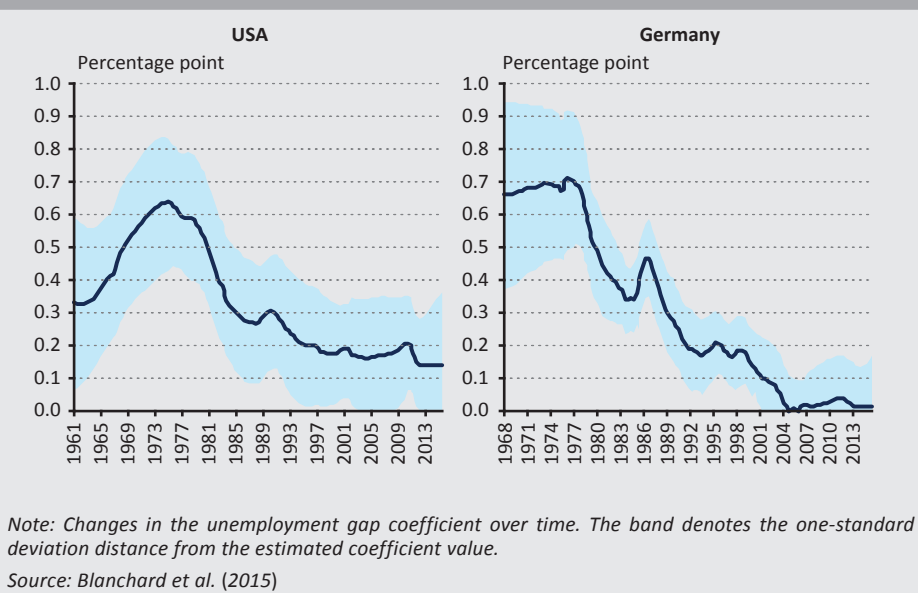
³ *The Economist: Special Report: The end of inflation?* 10 October 2019, Vol. 433 (9164)

Later, Friedman himself questioned the functioning of the quantity theory of money, telling the *Financial Times* in June 2003 that: ‘*The use of quantity of money as a target has not been a success. I’m not sure I would as of today push it as hard as I once did.*’⁴

3.2. The Phillips curve is mostly flat today

Since the economic crisis, the Phillips curve has performed badly in the school of economic life: the high unemployment prevailing overall should have had a significant disinflationary impact, but this did not happen in the advanced countries. In the period of ‘missing disinflation’, the *IMF (2013)* called the Phillips curve ‘the dog that didn’t bark’. Today, the central banks of the world are increasingly faced with the problem of ‘missing inflation’. To understand this phenomenon better, *Blanchard et al. (2015)* conducted a comprehensive study and estimated the slope of the Phillips curve over time in the United States and Germany (*Figure 3*). Whereas in the mid-1970s a change in the unemployment rate by one percentage point would (with a given ‘equilibrium’ unemployment rate) alter the rate of inflation to approximately the same degree, that impact shrank to 0.1 percentage point by the 2010s. A similar pattern can be observed in other advanced countries as well; this is referred to in literature as ‘the flattening of the Phillips curve’.

Figure 3
Changes in the slope of the Phillips curve in the United States (left panel) and Germany (right panel)



⁴ London, S. (2003): *Lunch with the FT: Milton Friedman*. *Financial Times*, 7 July 2003

What could be behind the flattening of the curve? The most widely offered explanation is globalisation, since it is estimated that the role of global factors in determining the rate of inflation has intensified since the crisis (*Ciccarelli – Mojon 2010; Forbes 2019*). *Nagy – Tengely (2018)* arrived at the same conclusion using data from Hungary. This trend may fundamentally alter everything we have thought about inflation in the last 20 to 30 years and highlights the need for identifying new correlations if we are to understand inflation processes better.

Another approach to the Phillips curve is to analyse the relationship between prices and wages. Since the crisis, the strength of the link between wages and inflation may have changed in advanced countries, including the Member States of the EU (*Nickel et al. 2019*). The changes in wages have an impact on inflation via household demand, corporate costs and inflation expectations. Inflation expectations since the crisis have been anchored at low levels. If inflation expectations are lower, employees have less of an incentive to push for higher nominal wages at wage negotiations as they expect lower inflation, which contributes to a change in the relationship between wages and inflation. Corporate costs are dependent on the corporate tax rates, the cost environment and gross wages. In Hungary, corporate wage costs have risen less than gross wages because of the cut in taxes on labour. Household demand is shaped primarily by income trends: rising wages increase the available income of households, and when such extra income is spent, consumption rises along with demand-side inflation. It is worth taking into consideration at what average and marginal savings rates wages will rise, i.e. what additional demand will appear on the market of consumer products.

3.3. Exchange rate pass-through in open economies is now moderate

The question of exchange rate changes and pass-through is an important one in open economies. The changes in exchange rate can influence inflation through various channels: directly through the rising prices of imported goods and indirectly through the impact on expectations and the business cycle. The consensus in literature is that the impact of the exchange rate on prices decreases along the progress in the production chain and there is only limited pass-through to consumer prices (*An – Wang 2011*).

Since the crisis, the relationship between exchange rate and inflation has changed mainly in the emerging countries (*Forbes et al. 2017*). *Hajnal et al. (2015)* divided the reasons underlying the changed nature of exchange rate pass-through into cyclical and structural factors. They found that, as a result of the significant fall in aggregate demand during the crisis, companies were less able to pass exchange rate changes through into their prices. The relationship was also influenced by the decrease in inflation rates in general and the fact that expectations became more anchored. In addition, market participants respond less to a volatile exchange rate

because they may consider rate movements to be temporary. Finally, another significant factor for exchange rate pass-through is what part of the consumer basket is subject to government regulation: the greater that part is, the lower the impact of the exchange rate channel will be.

3.4. Where is the Balassa–Samuelson effect?

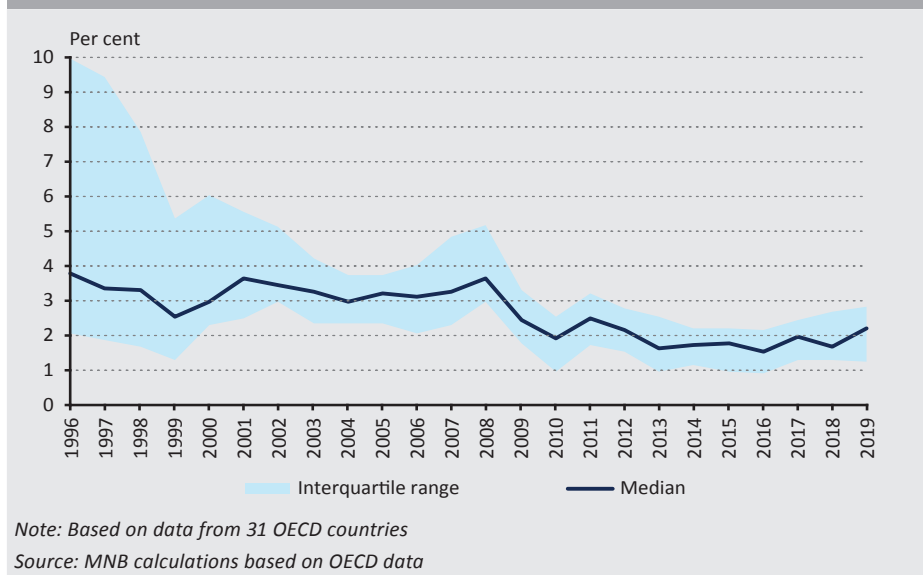
A traditional correlation well known in international economics is the close correlation between the development of an economy and the level of prices. The Balassa–Samuelson effect — a correlation with Hungarian relevance developed in the 1960s — states that the convergence of price levels is achieved through higher inflation in services.

For the theory to apply, the sector of tradable goods must be separated from the sector of non-tradable services. The assumptions are that it is less feasible to increase productivity in the services sector (the productivity of a haircut or dental treatment will be the same everywhere), labour cannot move freely across countries and trade is free. If all these apply, then prices will be lower in the more productive manufacturing sector and higher in the less productive services sector.

Does the Balassa–Samuelson effect still apply in today’s highly accelerated and globalised world? The changes taking place in recent decades suggest that these assumptions formulated half a century ago are unlikely to be applicable still and that the current wave of innovation in technology is reshaping the productivity of the services sector. As a result of globalisation, trade among countries is free not only in theory but also in practice. The free movement of labour is almost obvious nowadays.

Contradicting the theory, the global rate of inflation in services has been falling for more than two decades (*Figure 4*). This highlights the fact that the role of services has changed as a result of globalisation, digital technological development and the transformation of the trading of services, and that the resulting inflation effects must be seen from a different viewpoint.

Figure 4
Development of global inflation in services

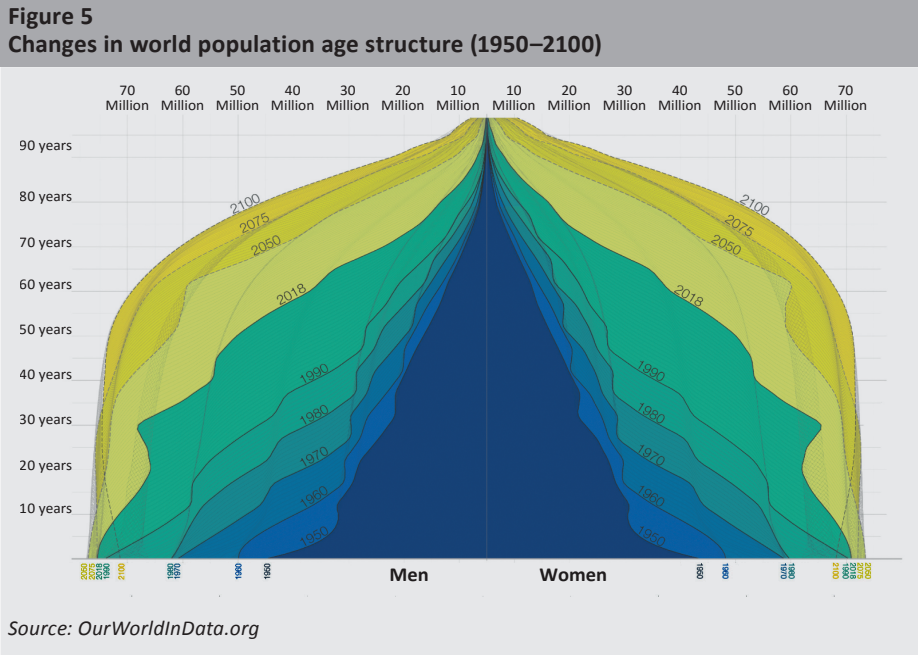


4. Five new megatrends with an increasing impact on inflation

The inflation theories of the past 50 years (the quantity theory of money, the Phillips curve, exchange rate pass-through, the Balassa–Samuelson effect) are unable to explain the current processes well, which means that we are witnessing a paradigm shift in respect of the determinant factors of inflation. We must focus our attention on the new trends of the post-crisis period, namely digitalisation and technology, demographics, globalisation and climate change.

4.1. Demographics

Examining the inflation impact of demographic trends is a priority in today's literature as well; after all, with the rise in life expectancy in most advanced countries, the age composition of the population is undergoing a substantive transformation (*Figure 5*). The proportion of young and old people is rising the number of working-age people is decreasing, which can have an effect on inflation as much as the real economy. A clear consensus is still lacking, although the view has started to prevail that demographic processes have a significant impact on today's environment of globally low inflation and that this disinflationary effect will continue into the future. It is especially hard to answer this question due to the fact that demographic transformations tend to exert their influence over decades rather than the time horizon of a business cycle.

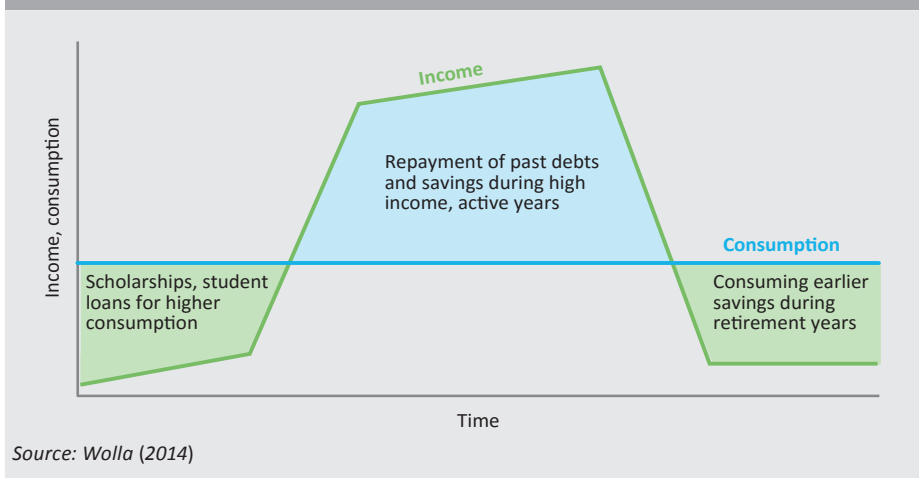


Demographic processes are shaped by three trends overall: firstly, while the world population is continually rising, advanced countries are faced with a decrease in their populations in the longer term. Secondly, as the proportion of the elderly rises, the number of working-age people decreases within the population. And finally, a further increase in life expectancy is expected in most advanced countries as healthcare provision and living standards improve.

The three main demographic trends have contradictory effects on inflation. The change in age composition and higher life expectancy have contributed to an environment of more moderate inflation in recent decades. *Yoon et al. (2014)*, *Anderson et al. (2014)*, *Vlandas (2016)* and *Bobeira et al. (2017)* attribute the negative inflation impact of an aging society to the behaviour of the elderly age group, whose consumption and savings habits and inflation expectations are different from those held by the active population. The elderly also need different fiscal policy behaviours (transfers to the elderly, regulated prices, etc.). And while the proportion of seniors was already rising back in 1970, the inflationary effects were offset then by the high proportion of working-age people and the increase in life expectancy. This may be reversed in the next few decades as the decrease of the working-age population accelerates.

An aging population may contribute positively to inflation. Research by *Lindh – Malmberg (1998, 2000)*, *Goodhart – Pradhan (2017)* and *Aksoy et al. (2015)* suggests that this is due to the fact that as the number of active persons decreases, employees have a better bargaining position at wage negotiations, which results in higher wages and this, in turn, contributes to the rise in available income and internal demand. An inflationary impact also follows from the life-cycle hypothesis proposed by *Ando – Modigliani (1963)*. According to this hypothesis, young individuals have a lower income, which rises continually during their active years up to a certain point, and then decreases after retirement. This would imply that the elderly and the young consume less than the working-age population, whereas most people tend to smooth their consumption over their lives (*Figure 6*). When young individuals can increase their consumption to the desired level by relying on various scholarships and student loans. In their active period, even as their higher income would justify more consumption, it makes sense for them to curb their consumption and repay their old loans or increase their savings. During the years of retirement, income once more falls below the desired consumption level, but this can be offset with savings previously accumulated. *Ceteris paribus*, inflation impacts will intensify in the countries where the group of net savers (active people) is limited, because the dominant effect is that of the larger group, that of net consumers (young and elderly people), driving up inflation.

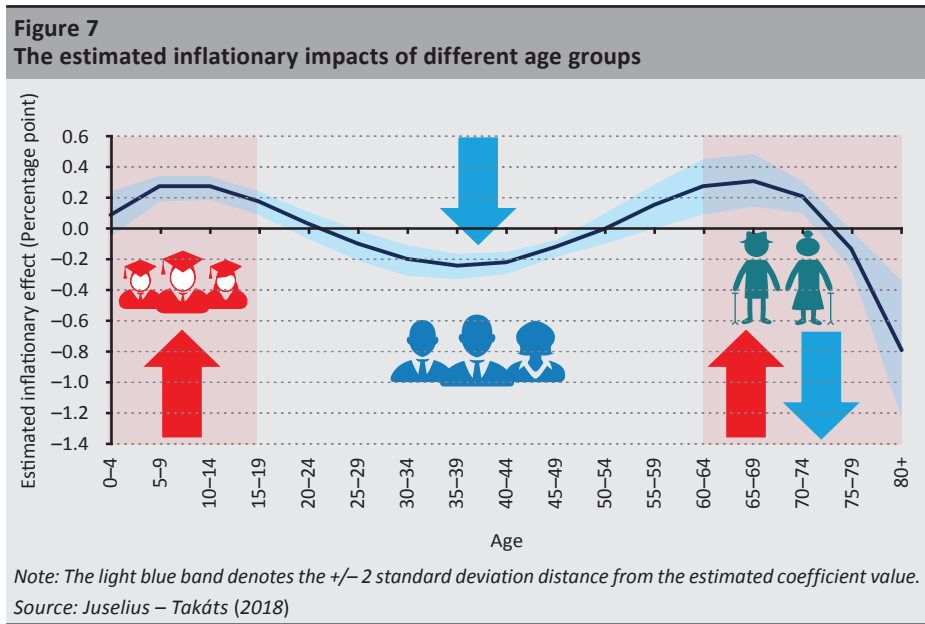
Figure 6
A stylised diagram of the Ando–Modigliani life-cycle model



This is not always coupled with an environment of permanently higher inflation in the advanced countries: if the inflationary effect of an aging population is offset by the decrease in demand due to a shrinking population and the increase in non-labour-intensive supply thanks to robotisation, a lower inflationary impact may

be expected in the longer term. This is confirmed by *Juselius – Takáts (2018)* in their analysis of 22 advanced countries, according to which there is a U-shaped relationship between the age composition of the population and inflation (*Figure 7*), in agreement with the life-cycle hypothesis. In the case of the over 65s though, the inflationary impact is mixed, and there is greater uncertainty regarding estimated outcomes.

The aging of a population changes the composition of the median consumer basket. Foods and services, especially healthcare services, represent a greater weight within the consumer basket of the older age groups. In the case of healthcare services, the inflationary impact depends on whether the given representative consumer prefers public or private healthcare services: prices are regulated in the former, whereas prices in the latter are determined by demand.

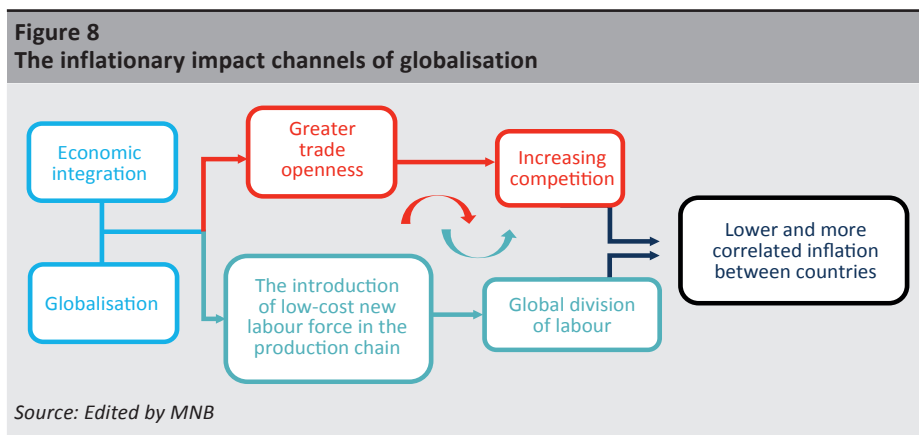


4.2. Globalisation

The weakened ability of traditional hypotheses to explain inflation processes has left economists with a puzzle they are still trying to solve in order to get a more precise and consistent understanding of the processes taking place in the economy. One important element is globalisation, which means the cross-border movement of goods, services, money and production factors, which binds economies together with ever closer ties.

Globalisation has also brought inflation rates closer together all over the world. This process was accelerated by the inflation targeting regimes first introduced in the 1990s. Prices were no longer determined by the situation on the local market but by an international environment expanded with the rise of global value chains.

Guerrieri et al. (2010) believe that globalisation and economic integration can affect inflation processes in multiple ways, so that greater trade openness, intensifying competition, a global division of labour and the low-cost new labour appearing in the production chains all contribute to a lower price dynamic and a greater synchronisation of inflation rates (*Figure 8*).



The integration of product markets causes inflation to respond to internal capacity constraints less sensitively: a sudden increase in demand can drive imports up without resulting in higher prices. Globalisation exerts an influence on inflation through international trade as well; this is closely associated with the rise in the importance of global value chains. According to the global value chain theory, global production processes — which are increasingly dispersed geographically — have enabled the spread of new technologies and reduced trade barriers. In economies that are more open, price and wage dynamics are much more sensitive to the effects of the external environment and, at the same time, inflation's sensitivity to internal factors is increasingly small (*Forbes 2019; Nagy – Tengely 2018*).

Going forward, globalisation may have a substantive impact on inflation. Yet the globalisation process is undergoing a change at the moment: the further expansion of the global value chains built in the early 2000s appears to be slowing; in fact, the process may have reversed already. This is due to the efforts made in emerging countries such as China to develop local value chains, either within their own borders or together with their neighbouring countries, in order to reduce their dependency on global trade (*McKinsey 2019*). In addition, the global world is keeping an eye on

the trade war between the USA and China. In that light, it will be worth monitoring the process of borderless price developments in the (near) future too.

4.3. Digitalisation and technological progress

The progress of digitalisation and the spread of robot technologies is one of the most important megatrends of the 21st century, with a number of impacts on society and the economy. One of the most important questions for central banks is to what extent the technological revolution can explain the current, globally moderate inflation processes.

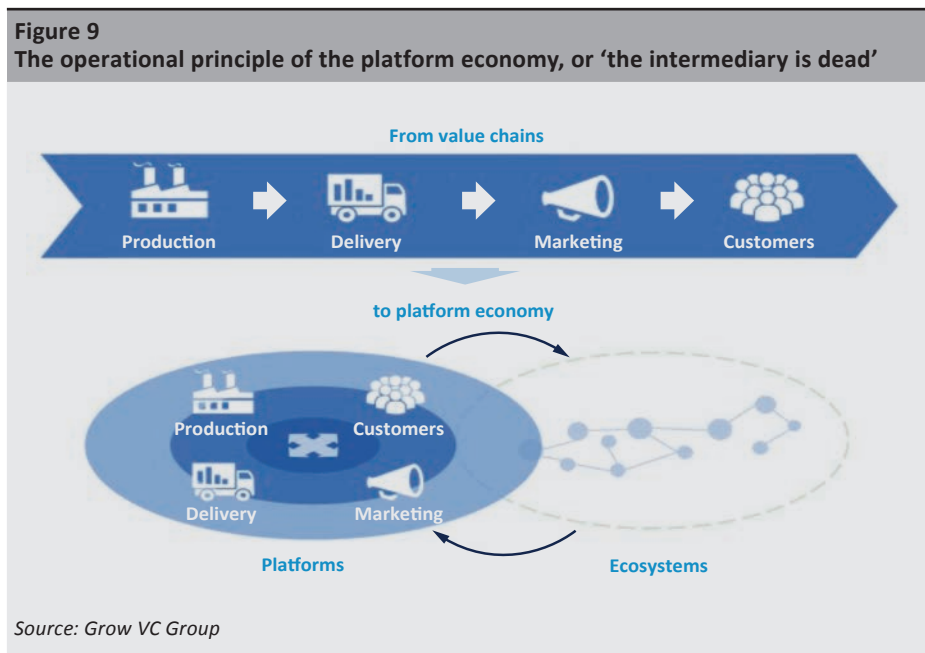
Today's digitalisation technologies—mobile technology, big data analyses, cloud computing, sensors, digital platforms and automation—may significantly change the way companies have traditionally operated and how they work with their suppliers and serve their consumers. The question is what pricing strategies companies will follow in an environment of fast-evolving technologies and how the digital transformation will affect the related supply chains. Although the quantitative results are still uncertain and difficult to isolate from other factors (for instance globalisation), a survey of Canadian corporates on the subject shows that the disinflationary effects of digitalisation may also stem from decreasing costs and downward competitive pressure on prices (*Dong et al. 2017*).

Traditional corporate operations are facing a revolutionary change in a process taking place right before our eyes, which is best encapsulated in the expression 'the middleman is dead'. New digital technologies are completely transforming the traditional value chains from producers through wholesalers and retailers to consumers, and the so-called platform economy is redefining this operational process (*Lyall et al. 2018*).

The platform economy was created by the dramatic recent rise in the role of the internet. Besides the radical changes it has brought to our daily lives, the online world has also transformed the way some markets operate. Whereas the first industrial revolution centred on factories, the drivers behind the changes today are digital platforms in the wider sense of the word. Relying on the internet and online platforms, the platform economy is an umbrella term covering the digital companies operating online and performing a variety of commercial, social and other activities (*Kenney – Zysman 2016; OECD 2019a; MNB 2019*). There is no single universal definition of digital platforms. Following literature, based on the terms used by the European Commission or the OECD, we can summarise their main features as follows:

1. they use information and communication technologies to create interaction between users,
2. they collect and use the data of these interactions, and
3. they exploit the network effects.

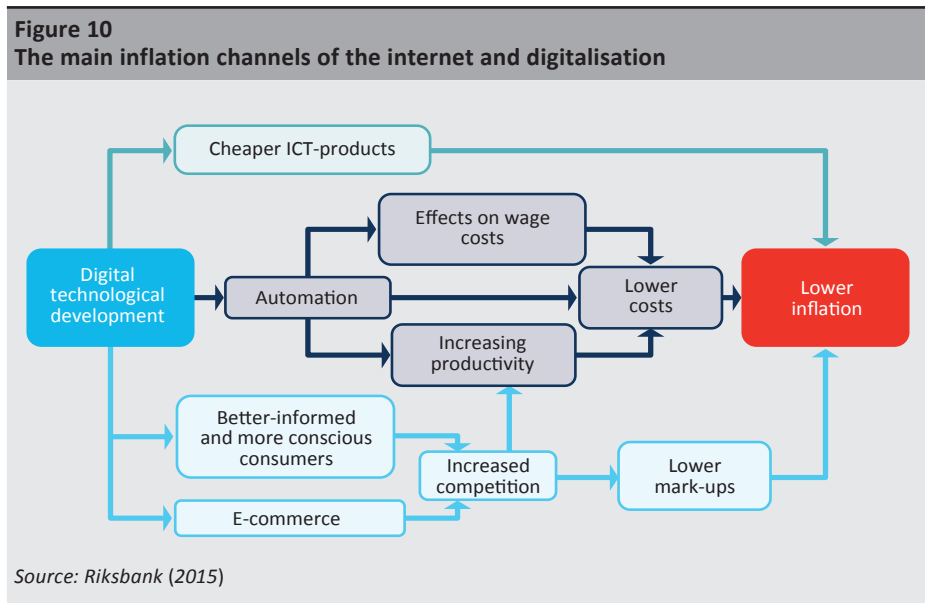
Online platforms are becoming an engine of innovation. Operating on internet-based platforms there are various on-line marketplaces (Amazon, Alibaba), search engines (Google), social media networks (Facebook), communication services (WhatsApp), payment solutions (Revolut), music and video sharing portals (Spotify, YouTube) and many others, which would have been unimaginable just a few years or a decade ago. In the platform economy, the conventional relationship between market players has changed; a pattern of everyone connected to everyone is much more typical. Ecosystems also play an important role; typically, these play a sort of supporting role rather than being controlled by the platform operator. *Figure 9* presents the operational principle of the platform economy.



The advantage of the platform economy is in its speed: to create fast, change fast and innovate fast. All this is closely related to creative destruction, where a platform company has the ability to cause dramatic change on existing markets or to create entirely new ones. One example is that of the US-based Blockbuster video rental chain, which was established in the 1990s and grew into a genuine international company by 2004 but went bankrupt in 2010 as a result of the emergence and spread of Netflix. Change is continual as new sales platforms and channels are being created and result in intensified competition which has downward pressure on consumer prices.

The pricing and economic effects of the platforms are closely connected to digitalisation, which is an important and dominant trend today. The internet and digitalisation exert their effects on inflation via four main channels (*Figure 10*), which are:

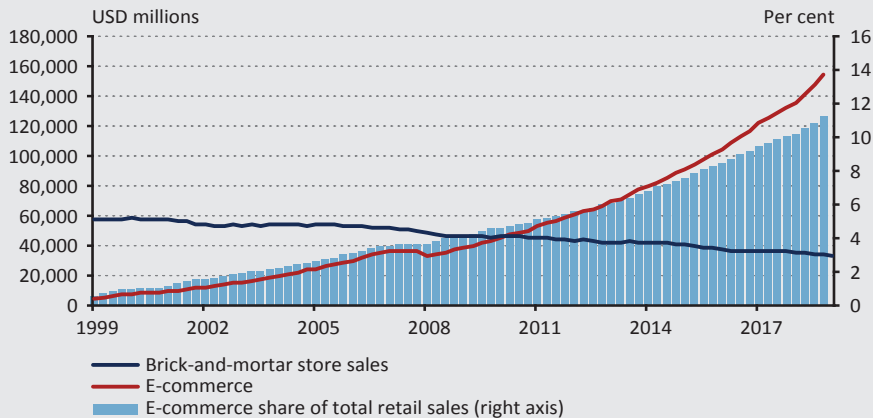
1. e-commerce,
2. more conscious and better-informed consumers,
3. automation, and
4. the development of IT (ICT devices).



E-commerce, which would be hard to separate from globalisation, can reduce prices fundamentally by increasing the competition among companies and changing the traditional business model. Online selling can reduce the costs (wage and rental costs) incurred in retail and wholesale trade. Low marginal costs then contribute to the reduction in the prices of goods and services.

In the US economy, e-commerce sales are growing exponentially, while store sales have been falling since the crisis (*Figure 11*). E-commerce may soon find a challenger in m-commerce (mobile commerce), as sales move from computers to mobile telephone screens and into a variety of apps.

Figure 11
Store and online sales in the USA



Note: Seasonally adjusted data until 2019 Q3; for commodity sales, until the end of 2019.

Source: Federal Reserve Bank of St. Louis, US Commerce Dept.

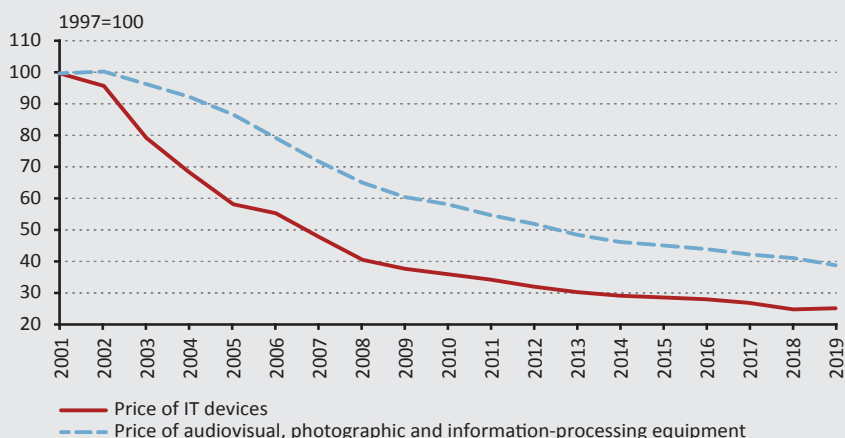
Increased consumer awareness has been an impact of e-commerce that is difficult to measure. With internet usage growing, consumers are increasingly aware and better informed, which drives competition on price. Consider how we almost all have a smartphone in our pockets or a smartwatch on our wrists, giving us instant access to all the information we need at any given moment. Since we can compare the prices of the products and services we want with a single click, companies must be on the alert if they want to attract potential customers; they compete against other sellers by offering ever lower prices and various discounts.

Automation, robotisation, the increased complexity of production processes and the spread of artificial intelligence are changing how companies operate and transforming the production chains. As a result, efficiency and labour productivity are rising on the supply side, and the reduction of the marginal costs of production may both increase profits and be reflected in consumer prices. On the demand side, automation is causing a polarisation of incomes. However, the increase in the proportion of high-income groups is not resulting in a substantive rise of consumption because these households tend to put their additional income into savings; it is therefore less clear whether there is an inflationary impact on the demand side.

The fall in the prices of information and communication technology (ICT) products and services over recent decade(s) has reduced inflation directly. There may be additional second-round effects such as, for example, the incorporation of products

with increasing digital technology content into production processes (Industry 4.0), which increases productivity and reduces costs. The products most affected by digitalisation are information technology devices and audiovisual, photography and information processing equipment. The most significant fall in prices over the last two decades has been in information technology devices (*Figure 12*).

Figure 12
Changes in the prices of products most affected by digitalisation in Hungary



Source: Eurostat, MNB

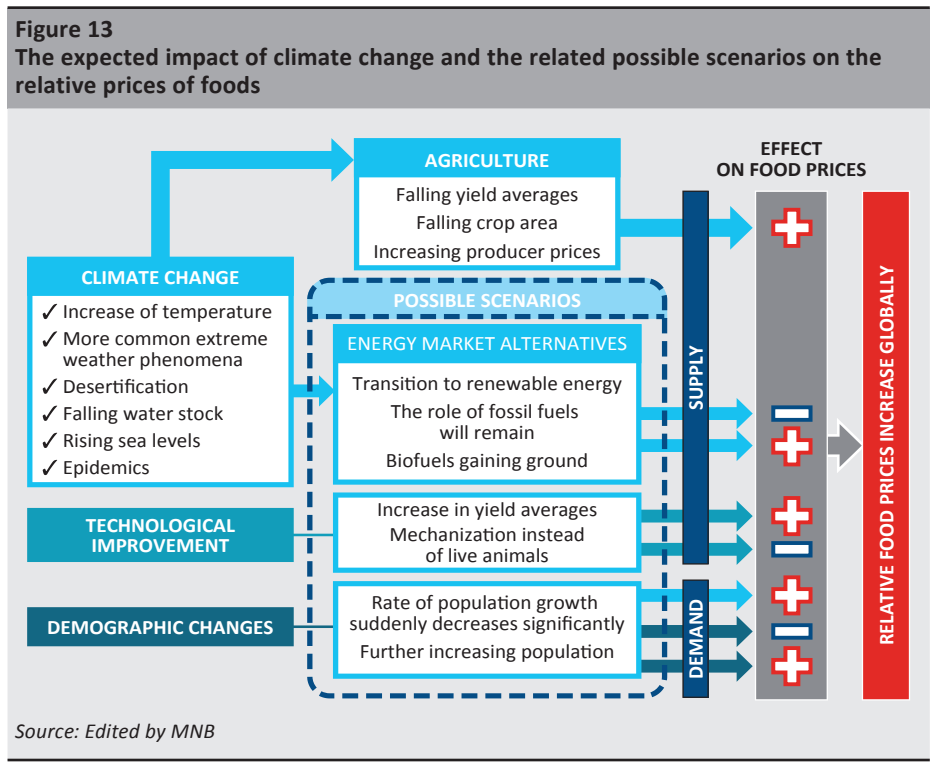
4.4. Climate change

The climate change phenomenon is unavoidable when analysing global trends. Although an increasing number of studies are examining the economic impacts of climate change, there is genuine uncertainty surrounding the estimates. The pace of global warming, the ability of technological progress to adapt or the impact of climate change on global activity are difficult to model or measure with precision.

In his talk on “Monetary policy and climate change”, ECB Executive Board member Benoît Cœuré (2018) pointed out that central banks should be ready for regular and even persistent supply shocks. He emphasised that the changes in relative prices were highly dependent on the extent to which the economy shifted from carbon-based energy production to renewable sources of energy. He called it a responsibility of central banks to make sure that they are prepared for the various scenarios and that they anchor the inflation expectations correctly.

Increasingly frequent extreme weather phenomena, rising temperatures or desertification caused by climate change affect agricultural output directly, resulting

in lower average yields, a smaller total cultivated area and rising production prices (Figure 13). In addition to the climatic changes, technological progress and demographic changes must also be taken into account, as they too have an impact on food prices. A rising population will also need access to freshwater supplies and the use of free lands. Climate change will limit the availability of both of these resources, driving up the prices of foods.



Automotive industry trends also have a substantial impact on food prices due to the spread of biofuels. If these were to be used increasingly widely, food prices could rise permanently. Planting land with ‘energy crops’ used as raw material for biofuel, such as sugar beet or sugar cane, would take land away from the cultivation of food crops.

The food industry is highly oil- and energy-intensive, and this is likely to intensify with the mechanisation under way in the developing countries. Globalisation increases the distance between the production and consumption of food, and the fuel demand of transportation is also high. In food sales, large quantities of energy are used for packaging and storage (cooling, freezing). As a result of all of the

above, the changes of relative prices will be highly dependent on energy market processes.

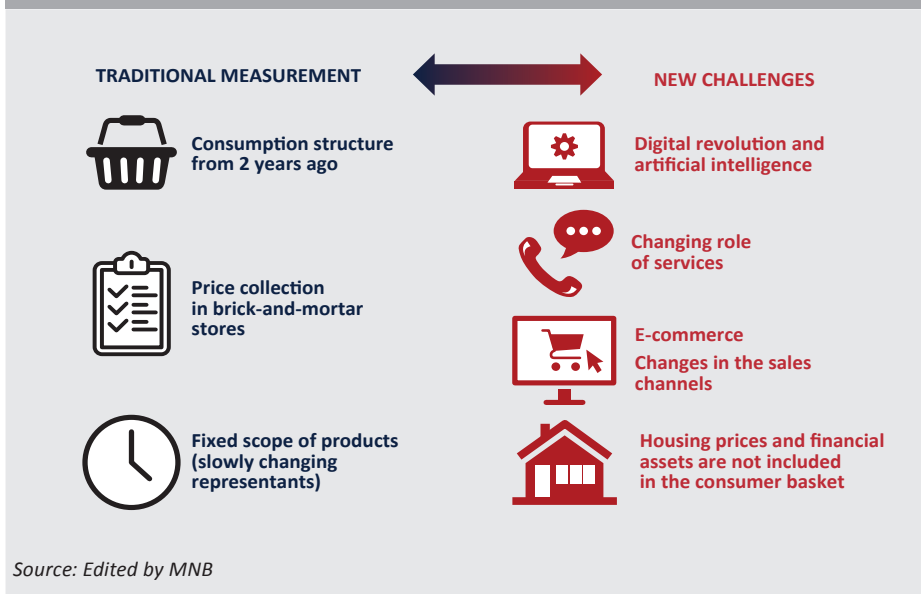
The overall effects of climate change increase relative food prices globally and thus contribute to rising rates of inflation. The climate change phenomenon is not new, but its earlier inflationary impacts were mitigated by the fact that large corporations in advanced countries outsourced much of their production process—and thus the associated polluting activities—to developing countries such as China or India, where costs were cheaper. The process was greatly accelerated when China became member of the WTO in 2001. Today we are witnessing a turning point; as the climate change affects emerging countries most, they have adopted measures in the interest of sustainability. As a first step, China regulated the quality of reusable plastics in 2013 and declared that it would only accept cleaned waste from other countries. In 2018, China introduced import limits on 24 types of reusable waste as part of its overall environmental reform, thus ending a process that had lasted for a quarter of a century.

5. Inflation measurement biases in the 21st century

Inflation is one of the most important and most monitored macroeconomic indicators for central banks. When speaking of inflation, we normally refer to the changes in consumer prices. The purpose of the consumer price index is traditionally twofold: it serves as a compass for monetary policy and also plays an important role as an index of the cost of living.

This methodology, which is still used in Hungary today and was developed in the early 1970s to measure consumer price change, is facing new challenges in the 21st century. Complemented with big data, the digital revolution and artificial intelligence are making unprecedented quantities of data available, which can provide a much more accurate picture of the development of prices. The economic role of services is also changing, and besides, e-commerce is gaining ground in the platform economy, while the changing sales channels are exerting impacts that differ from the customary impacts of the past. The task is therefore to bring traditional statistics closer to the trends of the 21st century (*Figure 14*).

Figure 14
New challenges of the 21st century versus traditional measurement



According to the latest knowledge and general statistical practice, inflation is a relatively accurate and high quality indicator for the measurement of price change. We must remember, however, that its relative accuracy implies it actually has (many) shortcomings. Attention was drawn to these shortcomings and inaccuracies already in the 1990s, for instance in the report of the *Boskin Commission (1996)*, which named the following four most frequent biases in measurement:

- 1) substitution between products,
- 2) changes in sales outlets,
- 3) emergence of new products,
- 4) changes in quality.

Nowadays a new technological revolution is happening right before our eyes. Ever more products and services are emerging thanks to digitalisation, while the opportunities available to consumers are also widening; moreover, the consequences are hard to quantify. As Raymund Kurzweil (2001), an internationally recognised expert on the subject said: ‘*We won’t experience 100 years of progress in the 21st century—it will be more like 20,000 years of progress.*’

This process has already started and exerts a significant impact on consumer prices as well as multiple areas of the measurement of economic progress. The computing capacity of our machines is growing exponentially, an ever larger slice of our economic transactions and social interactions is shifting to cyberspace, value no longer means the possession of physical objects but experiences or perhaps access to a variety of platforms instead, and, with increasing frequency, we are paying for these with information rather than money. Accordingly, we can add the following 6 items to the above list, based on the results of research published and the technological changes since then:

- 1) emergence of digital products;
- 2) traditional sales and online platforms;
- 3) statistics not properly reflecting the life-cycle of products;
- 4) 'pricing' of free content;
- 5) 'bundling';
- 6) omitted products and services.

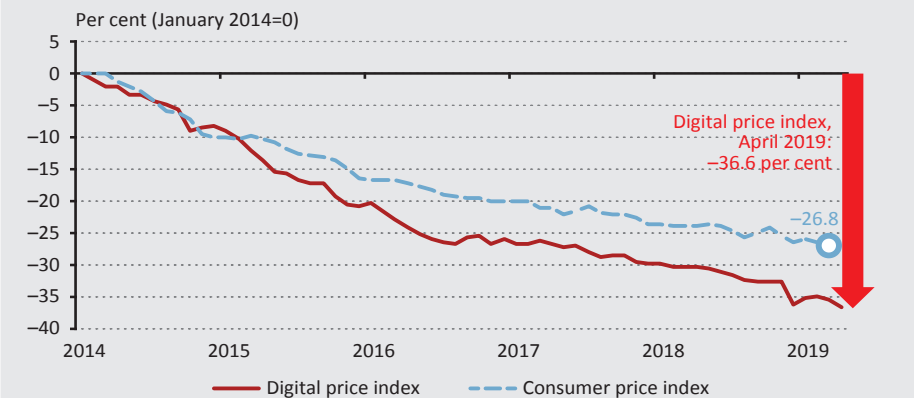
Substitution among products means consumers responding to product price changes on the basis of how their relative prices have changed. Yet the composition of the consumer basket will reflect this change only with a delay.

The change in sales outlets, in the traditional sense, means consumers start to shop in new stores, finding lower prices and a wider choice in a supermarket than in a small shop. However, 'cheapness' is not the only possible reason for such a switch: if they want to buy healthier or higher-quality foods, they will start going to organic food stores, where prices may be higher but they will feel better in the knowledge that they are contributing to a healthy lifestyle.

The change in sales outlets is closely linked with the growing role of online platforms. As commerce moves from the physical space to cyberspace, this may impact on consumer behaviour too. Choice increases, and online price comparisons force intensified competition and therefore prices are closer to the marginal costs. It is difficult to measure the inflationary impacts of digital platforms because any such assessment would need to take account of the decrease in consumers' own costs. Just think about how, if we wanted to buy a car in the past, we had to travel to other towns, assess what was on offer and make lots of telephone calls. Nowadays we can find out about offers and prices in just a few minutes by using a smart device. To what extent is the convenience of e-commerce reducing our costs? Finding the answer to this important question will take us a step closer to identifying and understanding inflation biases.

The next set of issues concerns how to treat new products and the qualitative changes they have introduced; after all, waves of innovation over the past decade have resulted in substantial improvements in product quality. The price of digital devices (especially as calculated per unit of computing) is falling sharply, but statistical measurements are unable to capture this accurately (*MNB 2017*). Examining the inflationary impacts of digitalisation and digital products has been increasingly popular because the internet has provided analysts with big data as a tool: simply sitting in front of their computers, analysts can gather huge amounts of (price) information from the numerous online stores of the world. There are currently two major projects focusing on the calculation of online inflation: the Billion Prices Project (BPP) launched in 2008 as a cooperation between MIT and Harvard Business School (*Cavallo – Rigobon 2016*), and the Adobe Digital Price Index, which was started in 2014 as a part of the Adobe Digital Economy Project (*Goolsbee – Klenow 2018*). These could revolutionise the measurement of prices. Research has shown (*Goolsbee – Klenow 2018*) that the digital price index could be as much as 2.5 percentage points lower than the inflation measured in official statistics. Their results show that the difference between online and official statistics is the greatest (approximately 10 percentage points) in the price of computers (*Figure 15*).

Figure 15
Computer price inflation in the USA as measured based on official vs online data



Source: Adobe Digital Price Index, Goolsbee – Klenow (2018)

Another problem is that new digital devices are added to the statistics with some delay, so the steep price fall observed in the early stages of the life-cycles of these products is not captured, which results in a downward distortion of the price index (*OECD 2019b*). This is augmented by the fact that new products are appearing with ever increasing frequency in today's digital age.

The empirical results of examining conventional biases primarily cover the United States and the developed countries. Literature is dealing with the newer types of biases only in a qualitative way so far; only the differences between online and offline price indices are quantifiable (*Table 1*). Estimates suggest that the inflation biases may be significant, potentially as high as 2.5 percentage points.

Table 1					
Estimated extent of consumer price index bias					
<i>(percentage points)</i>					
	<i>Boskin Commission (1996)</i>	<i>Gordon (2006)</i>	<i>Yörükoglu (2010)</i>	<i>Kurzweil (2005)</i>	<i>Goolsbee – Klenow (2018)</i>
	USA	USA	Advanced economies	USA	USA
Substitution between products	0.15	0.4*	0.1		
Substitution within products	0.25		0.1		
Sales outlet changes	0.1	0.1	0.1		1.3
New products and changes in quality	0.6	0.3	0.5	1.0–1.5	1.5–2.5
Total	1.1	0.8	0.8		
Estimated band	0.8–1.6		0.5–2.0	1.0–1.5	1.3–2.5

*Note: *The total of substitutions within products and between products. The bias calculated in the Boskin Report relates to 1995–1996, whereas Gordon's estimate applies to 2000–2006. Yörükoglu (2010) includes the United States as well as Japan, Germany, the United Kingdom and Canada in the developed countries' average. The estimate period of Goolsbee – Klenow (2018) is 2014–2017.*

Source: Boskin Commission (1996), Gordon (2006), Yörükoglu (2010), Kurzweil (2005), Goolsbee – Klenow (2018)

In the digital world of the 21st century, the role of 'bundling' is not insignificant either. Digital devices have ever more functions, replacing what had previously been separate products. Think of your mobile telephone: a single 'smart' device incorporates a camera, a video camera, books for your entertainment and all the motoring maps of the world plus up-to-date navigation and a database of related information. It would take quite a statistician to devise a consumer basket and a price index that reflects, without bias, all the price cuts, substitutions and quality improvements originating from such bundling!

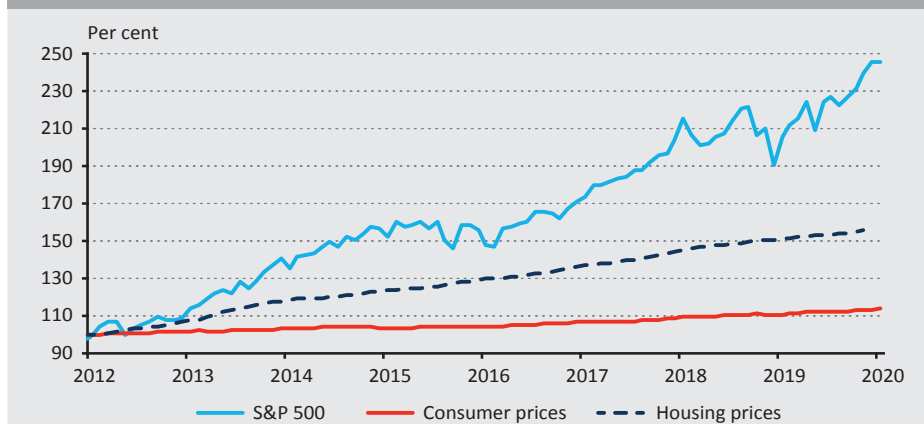
The 'pricing' and appearance of free content primarily affects the prices of services. Free content is closely linked to digital products and some of its fundamental characteristics are that

- 1) it is not competitive: its consumption does not exclude others from consumption and, due to the network effect, its value rises as the number of users increases,
- 2) it can be multiplied at marginal cost, and
- 3) it is not tied to location and, mostly, is not tangible (MNB 2017).

Today we are increasingly using services that are practically available for free. Examples include the Google search engine, the videos available on YouTube and the Facebook social media platform. Their impacts are currently not measured yet, or are significantly under-measured.

And finally, mention should be made of the products omitted in the official statistics of prices, such as housing prices and financial instruments. By purchasing a home, you buy a long-term service, namely the ability to live somewhere. While most countries do not include these assets in their official statistics (or not with standard methodology), taking a look at the development of their prices reveals something of interest in itself. When consumer prices rise moderately, the price of homes and money market instruments will rise continually and significantly. *Figure 16* captures information relating to the United States, but a similar phenomenon may be seen in most regions of the world. The diagram suggests that the ultra-loose monetary policy of central banks in the developed world has driven asset prices up, meanwhile its impact on the real economy has remained subdued.

Figure 16
Changes in consumer, housing and equity prices in the USA (January 2012 = 100)



Source: Federal Reserve Bank of St. Louis

Overall, inflation biases originate from two sources: one is the omission of products, whereas the other group includes the fundamental biases that have been with us for a long time. If these biases could be eliminated, we would observe a lower rate of inflation, which could then result in higher growth in real GDP. The discussion of that matter would be the subject of another paper, it is not addressed here.

6. Summary and conclusions

In a highly timely move, several major central banks have announced a thorough review of their inflation targeting systems in recent months. Official statistics show that consumer inflation in the developed world has remained consistently below central banks' target rates for almost a decade, in spite of the extraordinary efforts of these central banks. If central banks miss targets permanently, they may incur credibility problems and, over time, this could erode the social acceptance of their decisions. One first step in the reconsideration of inflation targeting frameworks is correctly identifying new types of bias in the measurement of inflation and understanding the new patterns determining the changes in consumer prices.

From time to time, economists and economic policy would monitor different factors, which underlay their understanding of the changing of prices. In the pre-crisis period, the two pillars of inflation thought and theory were the quantity theory of money and the Phillips curve, which lost some of their relevance following 2008/2009. In addition, the role of the traditional factors explaining inflation also decreased: exchange rate pass-through to inflation decreased in the developed countries, the link between prices and wages weakened, and the Balassa–Samuelson effect no longer functions in today's globalised world.

The new trends of the post-crisis period are digitalisation and technology, demographics, globalisation and climate change; these also shape current economic thinking. As life expectancy rises in most advanced countries and the age composition of the population is transformed, these demographic processes are also changing inflationary impacts. The current consensus among analysts is that globalisation and digitalisation, and the technological progress achieved parallel to this, all point towards a decrease in inflation. The results published regarding the economic impacts of climate change are still uncertain, but the phenomenon and its effects are connected to demographic processes and technological innovation as well.

In the 21st century, when a large number of new developments and trends are shaping inflation and macroeconomic processes, it is crucial that the traditional measurement methodologies face these new challenges and integrate them. Besides the legacy problems in measurement such as product substitution or quality changes, the age of big data is bringing in new challenges such as the

emergence of digital products, the shift of commerce from traditional venues to platforms, the ‘pricing’ of free content and the inclusion in the statistics of currently omitted products and services, for instance housing prices and financial instruments. These measurement challenges may impact not only on inflation but on other macroeconomic indicators too.

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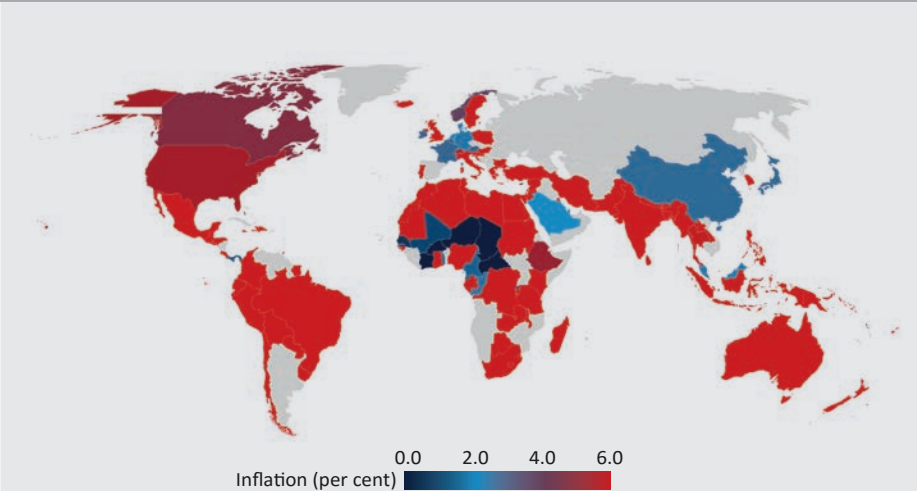
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Annex

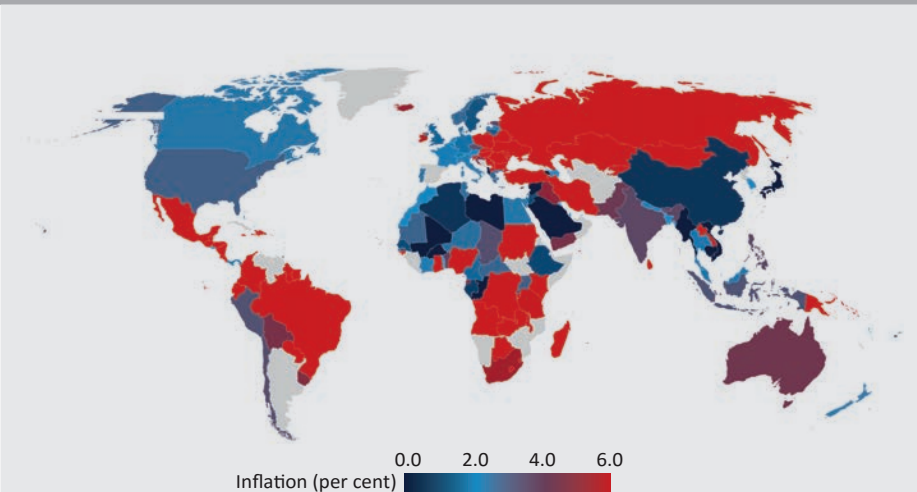
Figure 17
Consumer inflation in the world in 1990



Note: Annual change. Minimum: -0.8 per cent, maximum: 7,481.7 per cent. Data is not available for the countries shown in grey.

Source: World Bank

Figure 18
Consumer inflation in the world in 2000



Note: Annual change. Minimum: -3.8 per cent, maximum: 513.9 per cent. Data is not available for the countries shown in grey.

Source: World Bank

Coordination(?) between Branches of Economic Policy across Euro Area*

Kristóf Lehmann – Olivér Nagy – Zoltán Szalai – Balázs H. Váradi

In our study we present the coordination between the two main pillars of economic policy – monetary policy and fiscal policy – across the euro area. Growth in the euro area has noticeably decelerated in the past three decades, meaning the economy of the euro area has departed significantly from the logic of the Maastricht criteria. In addition, the lack of a common budget at euro area level and the fact that the oft-conflicting rules overlook sectoral interrelationships also point to the existence of a systemic problem. The difficulties have become increasingly evident in recent years as even the ultra-loose monetary policy has failed to stimulate economic growth significantly. This adverse process was intensified further by fiscal policy, which was intended to be consistent with the fiscal rules formulated in line with Maastricht criteria and can be considered tight, overall, at the euro area level. In recent months, even the policymakers of the European Central Bank have embarked on an open debate with regard to the role of policy branches. In the current political and legal framework, the ECB may be left with limited leeway for easing monetary conditions. In light of all these factors, there may be a need for a more active fiscal policy to stimulate the euro area economy, which, however, may sharpen the debate between the policymakers of individual Member States.

Journal of Economic Literature (JEL) codes: E52, E62, E63, F45

Keywords: monetary policy, fiscal policy, economic policy coordination, Maastricht criteria

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

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1. Introduction

Growth in the euro area has decelerated perceptibly in the past three decades, with inflation also stabilising at a low level. As a result, the euro area economy has deviated sharply from the logic of the Maastricht criteria approved in 1992. While this suggests a systemic problem, it was concealed by the existing institutional system for a long time. In light of vastly diverging convergence experiences the question rightfully arises: how did the fiscal rules – which were formulated in accordance with the Maastricht criteria (the pre-condition for euro area accession) and the fiscal conditions thereof – fail to ensure long-term economic growth? One of the shortcomings of the criteria is that, by nature, they do not directly measure the level of harmonisation between financial and economic cycles, the convergence of the real economy and the similarities between economic structures, the significance of which was underpinned by the experiences of the protracted euro area crisis (*Nagy – Virág 2017*).

The difficulties have become increasingly evident in recent years as even the ultra-loose monetary policy failed to stimulate private sector investment notably. The process was intensified further by fiscal policy, which became tighter than necessary in the euro area as a whole. This is leading to growing conflicts, strengthening the tensions between “northern” and “southern” European countries. In an unprecedented development, even the policymakers of the European Central Bank (ECB) have embarked on an open debate in recent months with regard to the optimal allocation of tasks between monetary policy and fiscal policy. The comprehensive monetary easing package adopted by the Governing Council of the European Central Bank in September 2019 in response to the deteriorating business climate indicators and inflation outlook was a sign of this dissent. The step was not supported by all policymakers; in fact, several members of the Governing Council sharply criticised the adopted measures in the media (*Weidmann 2019; Knot 2019a*). In the current environment, the additional stimulating effect on the economy of the ECB’s step can only be moderate; moreover, looking forward, in the event of a further deterioration in the outlook it may leave the euro area’s central bank with limited ease monetary conditions further in the current political and legal framework. In light of all these developments, there may be a need for a more active role of fiscal policy to stimulate the euro area economy, which, however, may sharpen the debate between the policymakers of individual Member States.

The monetary policy measures of recent years and the diminishing leeway suggest that, in the current legislative and political framework, monetary policy has come close to exhausting its potential. Accordingly, an increasing number of the European Central Bank’s policymakers have underlined in recent months that due

to the limitations of monetary policy, euro area countries with sufficient leeway should contemplate adopting fiscal stimulus measures to spur economic growth. Some policymakers consider the creation of an euro area-level fiscal framework desirable in order to stabilise the economy of the area over the long term. Those voicing this opinion include Mario Draghi, serving as President of the ECB until the end of October 2019, and his successor, Christine Lagarde. In our study we examine potential developments in the coordination between economic policy branches across the euro area and the extent to which there is room and willingness for closer coordination and the adoption of a more active fiscal policy. Parallel to this we also attempt to cast light on the problems stemming from the existing fiscal rules.

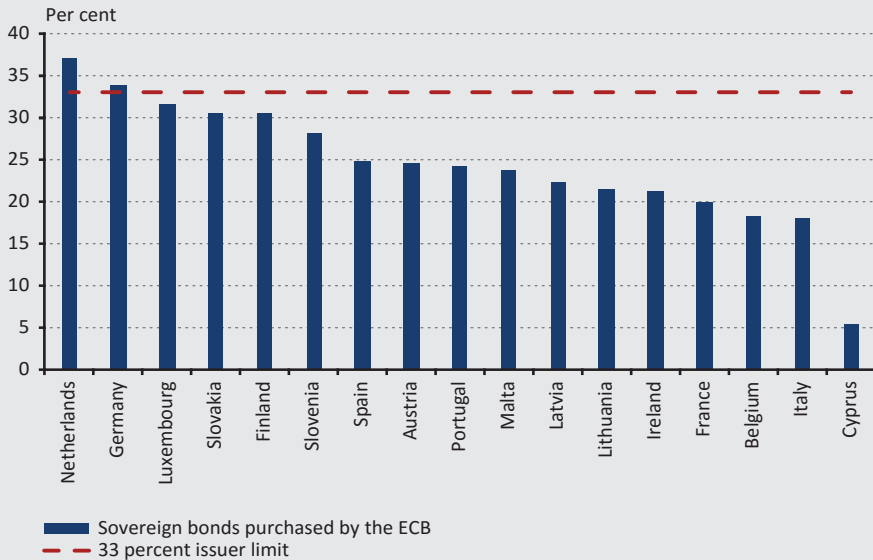
2. Limited monetary policy leeway

As a result of the remarkable easing of the monetary stance in post-crisis years, the policymakers of the ECB cut the key policy rate to extremely low levels before adopting – somewhat later than other central banks – significant quantitative easing measures. Although the net asset purchases of the central bank came to a close in December 2018, in view of the deceleration observed in the euro area and the renewed intensification of downside risks, in September 2019 the Governing Council of the ECB adopted yet another comprehensive monetary easing package. Looking forward the central bank’s accommodative monetary policy stance may persist in the long run, but it is questionable how much leeway policymakers will be left with if further monetary policy easing becomes necessary.

According to the ECB’s September 2019 decision, the interest rate on the deposit facility was lowered to –0.5 per cent; therefore, the room for further interest rate cuts is limited. In parallel with this, the Governing Council decided to introduce a two-tier system for reserve remuneration¹ and to restart net purchases under its asset purchase programme (APP). In the framework of its existing, open-ended asset purchase programme, the ECB purchases assets at a monthly pace of EUR 20 billion as from 1 November 2019. However, the fact that issuer limits may become effective in the future, hindering further purchases, may pose a problem. As a result of the large-scale asset purchases that commenced in 2015, in the case of several countries – mainly the core countries – the bond portfolio held by the ECB has approached the 33 per cent issuer limit defined by the central bank (*Figure 1*).

¹ In the former system, the interest on the total free reserve holdings deposited with the central bank equalled the deposit facility rate (currently –0.5 per cent), whereas in the new system, banks can achieve a more favourable interest rate at the ECB (currently 0 per cent) on their reserve holdings depending on their minimum reserve.

Figure 1
ECB's share in total bond portfolios of individual Member States

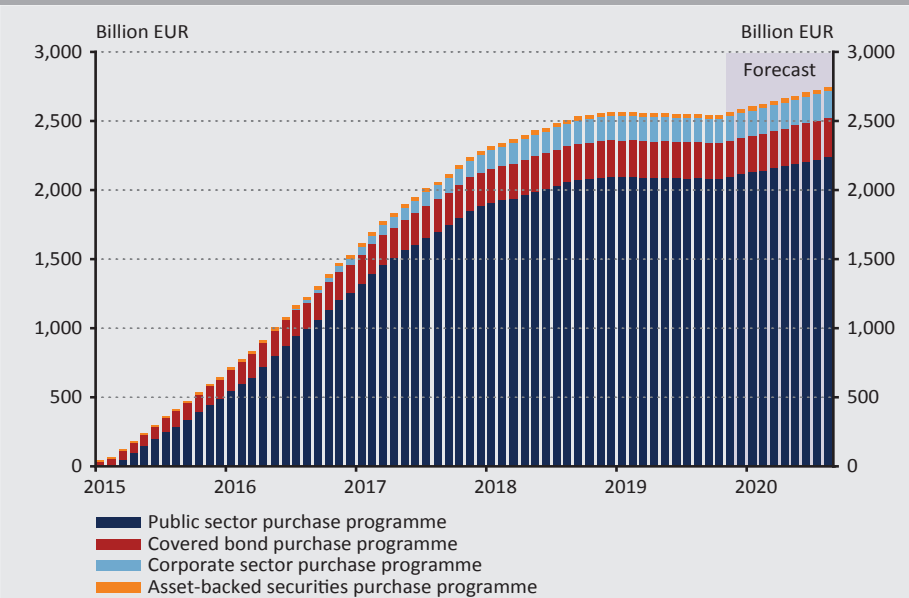


Note: Analyst calculations on the proportions of the ECB's bond holdings vary over a relatively wide range as data on the available bond portfolios of individual sovereigns are also required for the calculations, but the estimates available in this regard diverge. As a result, the difference between the calculation results of individual analysts may amount to several percentage points.

Source: Calculated based on ECB and Eurostat data

The central bank did not provide specific guidance on the composition of the securities purchased under the restarted asset purchase programme, but upon the announcement Mario Draghi indicated that the ECB would purchase securities in similar proportions to before. Based on historical data, government securities accounted for about 80 per cent of the purchases (*Figure 2*). Data on the first month of the restarted purchases indicate that the central bank purchases government securities to a lesser degree now, while increasing the share of corporate and covered bonds, which – owing to the smaller share of government paper and the greater share of covered and corporate bond purchases – enables the ECB to run the asset purchase programme for a longer period in its current form.

Figure 2
Stock of assets acquired under the APP and future expectations broken down by individual purchase programmes



Note: The forecast assumes the same EUR 20 billion monthly purchase rate announced in September 2019 and the same proportion of securities purchases as before. However, data on the first month of the restarted purchases indicate that the central bank reduced its government securities purchases while significantly increasing the share of corporate and covered bonds.

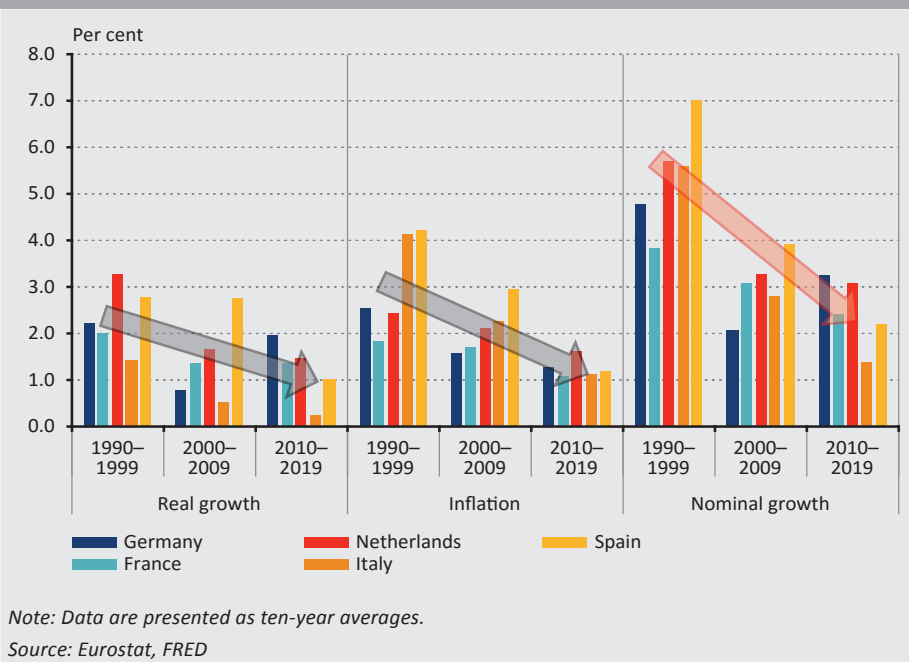
Source: ECB, author's projection

The TLTRO-III programme previously announced was also launched in September 2019. Through the targeted longer-term refinancing operation the European Central Bank provides inexpensive long-term financing (liquidity) to credit institutions incorporated in euro area Member States.

3. Deteriorating economic trends in the euro area

In the 1990s the current Member States of the euro area grew by 2–3 per cent on average, while inflation hovered around 2 per cent or above. As a result, the nominal GDP growth rate typically moved in the range of 4 to 6 per cent in individual states (*Figure 3*). With such growth and inflation dynamics, meeting the Maastricht criteria and the relevant fiscal rules left more room for manoeuvre for the fiscal policies of Member States as even a higher budget deficit may not necessarily increase the debt ratio amidst the higher nominal growth rates.

Figure 3
Macroeconomic performance of selected euro area Member States, 1990–2019



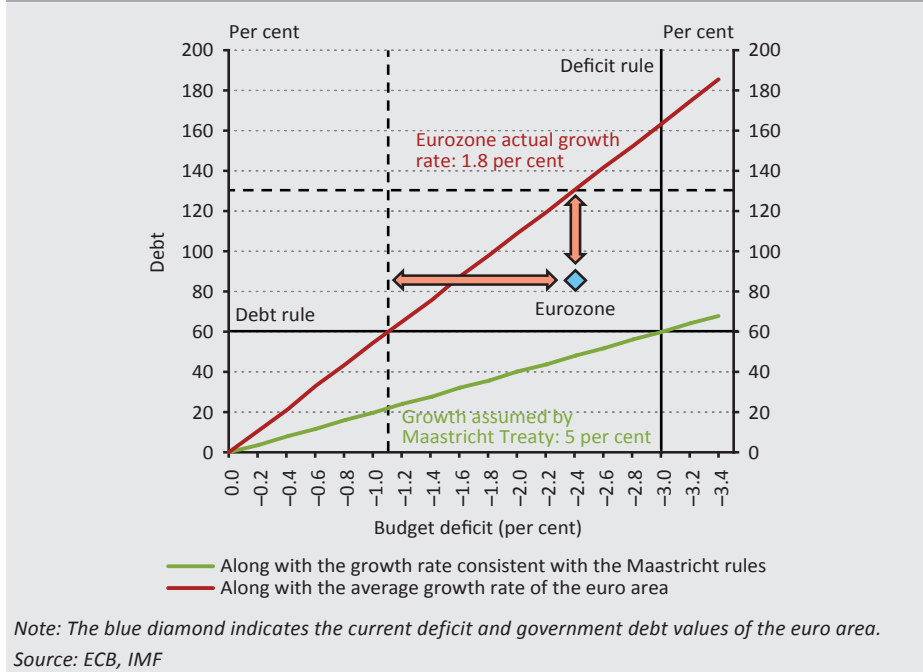
Based on macroeconomic figures, the economy of the euro area continued to prosper in the 2000s as well: Member States grew by 1.5–2 per cent on average, while inflation dropped close to the ECB’s inflation target in most Member States. The favourable performance of the euro area, however, was accompanied by a build-up of significant imbalances. As a result of the 2007/2008 crisis and the subsequent debt crisis, euro area growth decelerated considerably along with a material decline in inflation. Lower inflation and decelerating real growth led to a far lower nominal growth rate than before.

It is evident that the macroeconomic performance of the euro area has changed considerably since the 1990s, while the Maastricht criteria adopted in 1992 have remained unchanged to date and, due to the validity of the fiscal rules their principle lived on across the Member States. Besides the fact that the crisis undoubtedly highlighted the deficiencies of these criteria and rules, the changed macroeconomic environment may also warrant a thorough re-think of these conditions. Indeed, the Maastricht criteria were founded on an economic environment where, owing to a higher real growth rate and inflation, nominal growth was also higher. In the current environment, where the nominal growth rate is well below the average of the past two decades, in order to reach – or merely to converge to – the 60 per cent debt ratio a far tighter fiscal policy would be needed than before. Without sufficient fiscal stimulus, however, growth may

remain restrained, leading to further increases in the debt ratio, which may prompt – mistakenly under the current criteria system – further tightening.

Figure 4 clearly demonstrates that the government debt rule is inconsistent with the deficit rule in the current macroeconomic environment, and therefore the two rules cannot be properly applied together in practice (Lehmann – Palotai 2019 based on Pasinetti² and Buiters³). The inconsistency between the debt rule and the deficit rule stems from the fact that the 3 per cent deficit prescribed by the Maastricht criteria can only stabilise public debt at 60 per cent when nominal GDP grows by 5 per cent (for more detail about the fiscal rules, see Footnote 7). However, the two rules are inflexible and disregard the changes observed in recent years in macroeconomic trends. In the period between 1998 and 2017, the average nominal growth of the euro area was only 3.1 per cent instead of 5 per cent, which can stabilise government debt at a debt level corresponding to around 100 per cent of GDP if the deficit rule (3 per cent/GDP) is observed. Conversely, given the growth trends of the past 10 years (1.8 per cent), which is even lower than before, a deficit of approximately 1.1 per cent would stabilise debt at 60 per cent (Nagy et al. 2020).

Figure 4
Debt-deficit combinations along various growth paths



² Pasinetti, L. (1998): *The myth (or folly) of the 3 % deficit/GDP parameter*. Cambridge Journal of Economics, 22(1): 103–116. <https://doi.org/10.1093/oxfordjournals.cje.a013701>

³ Buiters, W. H. (1992): *Should we worry about the fiscal numerology of Maastricht?* CEPR discussion papers no. 668. https://cepr.org/active/publications/discussion_papers/dp.php?dpno=668

4. Still room for boosting the economy on the side of fiscal policy

Besides the legitimacy and suitability of the single currency, debates on the euro area have focused on a single dilemma from the start: is it possible for a monetary union to succeed without a common budget? The 2007/2008 economic crisis brought to the surface the problems stemming from the deficiencies of the euro area's institutional system, but long-term, adequate solutions are yet to be found.

4.1. Initiative for a common fiscal capacity across the euro area

The idea of creating a single fiscal capacity at euro area level has been actively discussed but no specific steps have been taken so far. In this regard, we should take note of the Five Presidents' Report⁴ of 2015 (European Commission, European Council, European Parliament, Eurogroup and ECB), and the June 2018 agreement between Angela Merkel and Emmanuel Macron, known as the Meseberg Declaration, which outline a plan for creating a single, euro area level budget from the start of the next seven-year EU budget cycle, i.e. from 2021 (*Bagdy et al. 2020*).

Finally, the European Commission published the document entitled "Budgetary Instrument for Convergence and Competitiveness" (BICC) on 23 July 2019.⁵ The purpose of the draft is to create a central fund for the countries using the euro, which would enhance the Member States' resilience and competitiveness, and – by supporting structural reforms – foster the convergence of the economies.⁶ While these are important objectives from the perspective of long-term growth and cohesion, optimal monetary and fiscal policy harmonisation and cyclical stabilisation at the euro area level – as discussed in this article – are similarly relevant goals from the same respects. However, during the Eurogroup-level debates of the past few months, the focus was primarily on the support of structural reforms, not on the creation of a genuine cyclical stabilisation instrument, which would be supported primarily by France (*Fleming – Khan 2019*). For the time being, no agreement has been reached on the exact size of the single budget of the euro area, but it appears likely that – despite Emmanuel Macron's ambitious plans (which amount to several per cent of euro area GDP) – it may only be a negligible amount relative to the size of the currency area; i.e. merely EUR 15–20 billion in 7 years (*Bagdy et al. 2020*).

According to the proposal, the single budget would be financed from the EU's multiannual financial framework, which may also be supplemented by individual Member States. The exact amount would form part of the negotiations on the entire EU budget. Another debated question of the discourse is whether the single

⁴ *Five Presidents' Report*. Plan for strengthening Europe's Economic and Monetary Union as of 1 July 2015. https://europa.eu/rapid/press-release_IP-15-5240_en.htm. Downloaded: 9 December 2019.

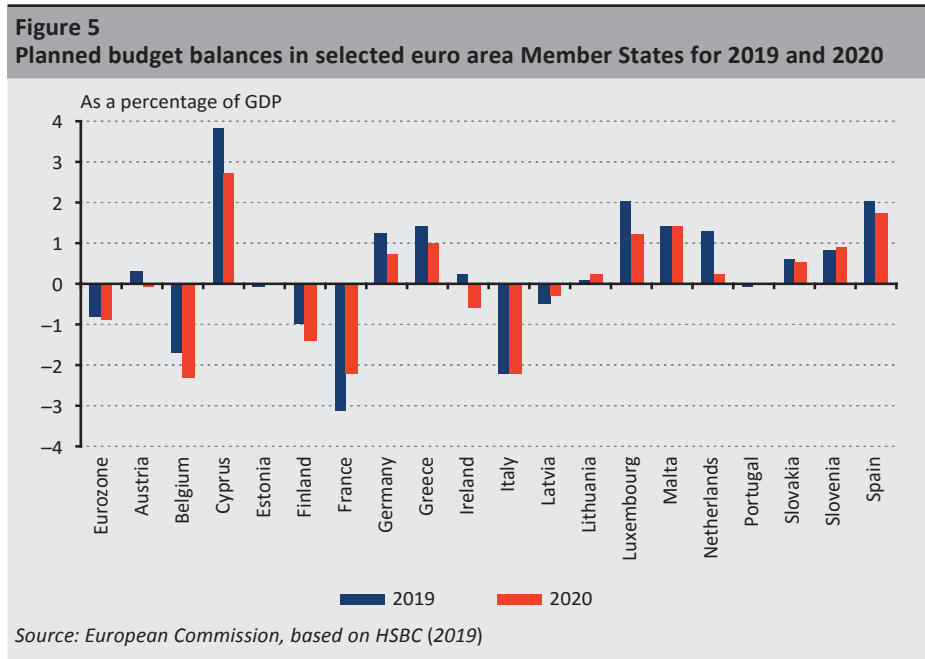
⁵ *Budgetary Instrument for Convergence and Competitiveness*. Commission proposes a governance framework for the Budgetary Instrument for Convergence and Competitiveness. https://ec.europa.eu/commission/presscorner/detail/en/ip_19_4372. Downloaded: 9 December 2019.

⁶ In some cases, appropriate structural and competitiveness reforms and policy measures aimed at restructuring the budget might support growth even parallel to reducing the budget deficit.

budget should have independent revenues as well, but according to the current status this appears to be unlikely. Pressured by net contributors – primarily north European countries –, Mario Centeno, President of the Eurogroup, declared that euro area Member States could expect to get back at least 70 per cent of their contributions (*Bagdy et al. 2020*). This, however, would call into question the point of creation of the single budget, as a significant part of the fiscal capacity would not be redistributed; consequently, the implementation of substantive structural reforms does not appear to be a realistic scenario.

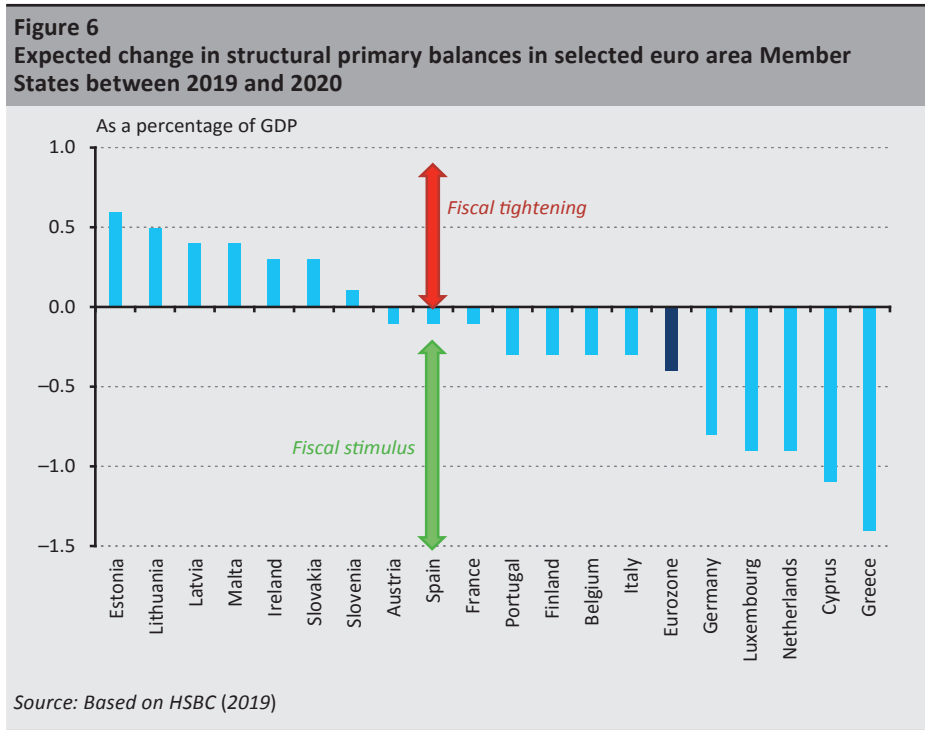
4.2. Budget proposals submitted by individual Member States for the coming year

At the September 2019 press conference where the comprehensive easing package of the ECB was announced, Mario Draghi emphasised that the repeated easing of monetary conditions will not be able to stimulate the euro area economy appropriately without an expansionary fiscal stance. As a result of the ECB’s easing measures adopted after the crisis, the interest expenditures of individual Member States on government debt declined sharply; thus Member States should be able to loosen their respective fiscal policies with lower funding costs than before. According to Eurostat, in 2012 government interest expenditures still amounted to 3.0 per cent of GDP in the euro area, whereas this ratio dropped to 1.8 per cent of GDP by 2019, and the September announcement of the ECB’s new quantitative easing package also points to further declines in interest expenses. That notwithstanding, based on Member States’ draft budgetary plans for the coming year, no substantive fiscal stimulus can be expected (*Figure 5*). This can be attributed in part to the fact that government debt is higher than before the crisis in certain Member States.



The fiscal policy stance can be better captured by the structural primary balance of the budget which, as opposed to the total balance, excludes interest expenses and business cycle effects, and thus it can provide a more accurate view of government spending. However, even the structural primary balance indicates that only minor easing can be expected compared to 2019; the additional fiscal impact expected for 2020 amounts to only 0.4 per cent of GDP in the euro area as a whole (Figure 6). In recent years, fiscal policies have been criticised mainly in those countries that have been accumulating substantial surpluses for years but are nevertheless reluctant to ease their fiscal stance.

The Netherlands shows some openness in this regard: the Dutch government envisages setting up a fund aimed at supporting infrastructure investment and research. At the same time, no substantive change can be expected in Germany; Germany’s Minister of Finance, Olaf Scholz declared that the financial position of the German economy is stable, and the government is not expected to provide considerable fiscal stimulus unless a significant economic downturn materialises. Although the German government has recently announced a climate protection fund with a budget of EUR 54 billion, it is planned to be financed through tax levies and the sale of carbon dioxide quotas; therefore no perceivable change is expected in the fiscal policy stance. As regards countries with deficits planned for next year or those recording debt ratios in excess of the desired level – such as Italy, Spain or France –, there is limited space for fiscal stimulus due to the constraints of the Maastricht debt rules.



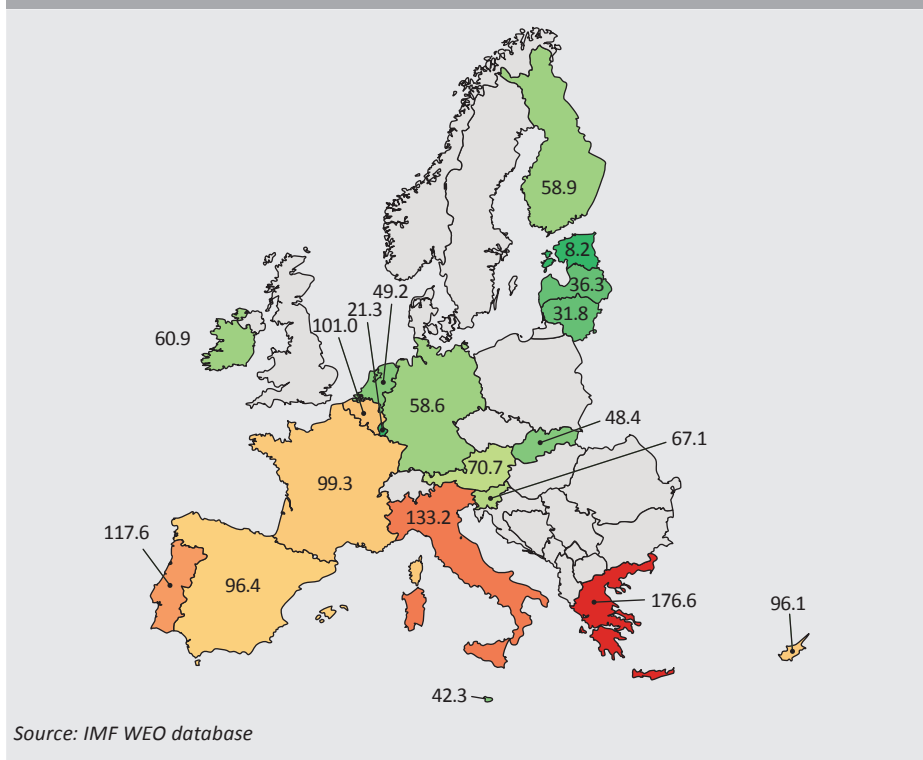
4.3. Fiscal policy space in the euro area

There has been an increased need for fiscal and monetary policy harmonisation in recent periods. With the restart of the European Central Bank's asset purchase programme and the unprecedentedly low interest rate on the deposit facility, the question arises increasingly often both on the part of market participants and policymakers: how long can monetary policy continue to stimulate the economy of the euro area? Numerous prominent policymakers and decision-makers expressed that fiscal policy should be given a greater role in stimulating the economy, and tighter coordination is needed between the two economic policy branches.

The possibility of coordinated fiscal expansion, however, may be constrained both by fiscal rules defined on the basis of the Maastricht criteria and the rules clarifying these criteria. Whereas the Maastricht convergence criteria quantify values that the deficit and debt ratios can only exceed temporarily and in exceptional cases, the clarifications define numeric values that can be quantified and sanctioned even during normal periods.⁷ These rules have become increasingly complex over time, and remain independent of the changes in aggregate demand and the net position of economic sectors; consequently, they disregard the requirements of optimal economic policy coordination even at the national level, and much less at the level of the euro area. It is the net result of several, country-specific effects as to why euro area Member States fail to pursue coordinated fiscal policies which could put the economies concerned on a higher growth path and enable them to approach the inflation target. A key factor is that the expansion would need to start from diverse debt levels, but this is hindered by the Maastricht regulation as for the time being, the debt levels of southern countries significantly exceed the 60 per cent limit (*Figure 7*).

⁷ Essentially, the clarifications are intended to ensure that fiscal policy is neutral with regard to the cyclical movement of the economy, that is, the deficit should be close to zero in the cyclical average. The rules enable the budget deficit to stabilise in a weak cyclical position, preferably only through automatic fiscal stabilisers (e.g. unemployment benefit), and to cool the economy if it grows above the trend through the budget surplus (e.g. automatically increasing tax revenues) and minimal "discretionary" measures. In addition to neutral cyclical stance, the rules take into account future spending growth such as growing payments due to population ageing, and expect retirement savings in the form of a fiscal surplus. Accordingly, the complex rules consider economic growth to be completely independent; in fact, they intend to separate it from the fiscal policy, and suggest pre-savings using the analogy of households. As we will indicate later, in our opinion these considerations are inadequate. The enforcement of the rules is asymmetric because it does not regard – and accordingly, does not sanction – positive deviations (e.g. overly tight fiscal policies) as errors. Consequently, countries with fiscal space according to the rules cannot be accounted at euro area level to ease their fiscal policies in order to substitute for the missing leeway of countries with more limited means in this regard.

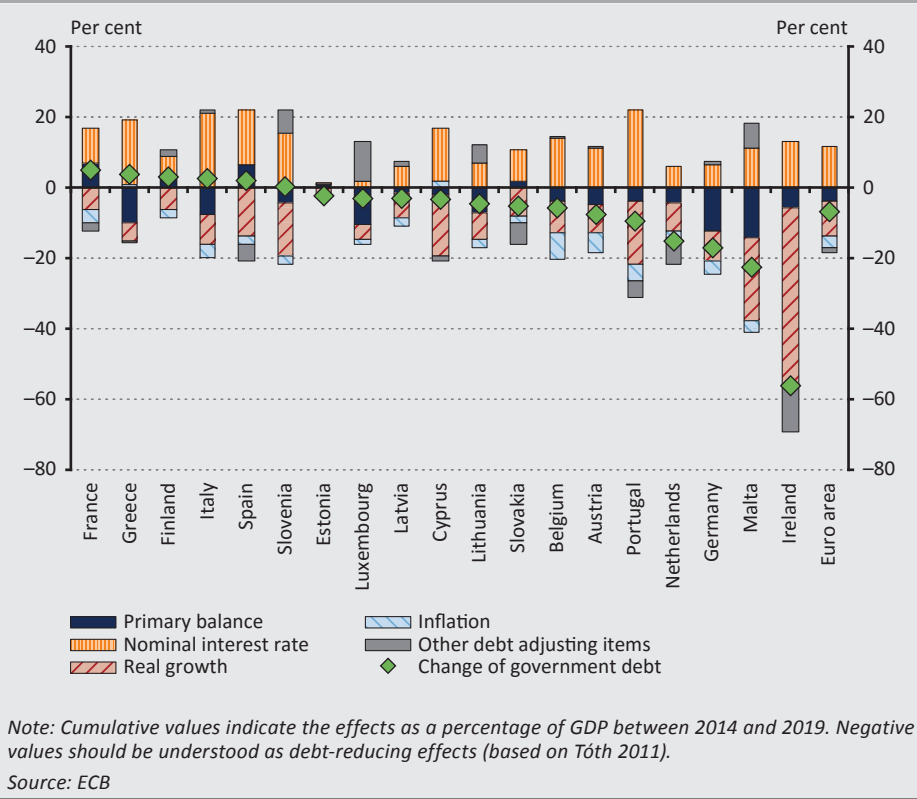
Figure 7
Expected level of debt-to-GDP ratios in euro area countries at end-2019



Looking at the level of debt-to-GDP ratios we find that the gap between north and south is still considerable in the euro area. Since debt convergence was not achieved in the past decade even under tight fiscal policies, southern European countries – which would need the economic stimulus afforded by a looser fiscal policy – do not currently have sufficient leeway, whereas northern countries – which would be capable of providing stimulus – do not wish to use this option.

The tighter fiscal space permitted by the debt level is in part the consequence of the interest burden on outstanding debt and the subdued inflation processes. The moderate debt dynamics typical of euro area countries indicate that the fiscal space was not increased sufficiently after the financial and sovereign crisis. Even though the European Central Bank ensured a low interest rate level, the interest burden on previously accumulated debt exerted significant pressure on euro area budgets (*Figure 8*). Another difficulty is that even the introduction of various non-conventional instruments failed to boost the economy to such an extent that would have accelerated the reduction of the debt ratio.

Figure 8
Cumulative effect of debt-to-GDP ratio drivers in the euro area between 2014 and 2019



According to *Figure 8*, real growth wielded the greatest impact on the reduction of government debt: it was capable of offsetting the opposing effect of high debt-service commitments in several countries. In addition, the budget surplus marginally reduced the debt ratio in most Member States, while it may have reduced both potential and actual growth in the Member States concerned. Such crowding-out of growth had a significant adverse effect on Greece and Italy, where public debt rose amidst below-average growth and primary balance surpluses.

According to the (Brussels–Frankfurt–Washington) consensus before the crisis, discretionary fiscal policy is generally not conducive to cyclical stabilisation because its decision and implementation mechanism is slow and the removal of the stimulus after the necessary period is often unpopular from a political perspective. Otherwise, policymakers assumed that the cyclical deceleration does not cause a persistent drop in GDP growth. The slow recovery and the USA–EU comparison altered this majority opinion. More recent fiscal multiplier forecasts emphasise

the state-contingency of the results measured: while the multipliers assumed prior to the crisis were around 0.5 (European Commission, IMF, OECD), after the crisis the values were typically – and at times substantially – above 1 (*Blanchard – Leigh 2013*). Fiscal multipliers show the extent to which GDP grows as a result of an increase in budget expenditures. If the value is above 1, GDP grows faster than the expenditures; in other words, after the unfolding of the spending effects, the debt ratio may decline depending on the initial debt level (it remains unchanged in the case of multiplier is equal to 1). If the multiplier is below 1, the deficit growth (or surplus decrease) may need to be accompanied by other expenditure cuts or tax increases down the road to prevent a debt ratio increase.

This notwithstanding, numerous European policymakers are reluctant to decide on increased spending – which entails an initial increase in deficit or a decrease in the existing surplus –; instead, with a view to reducing the debt ratio, they opt for a stringent fiscal policy. This, however, may also have its disadvantages: if the value of the multiplier is indeed greater than or equal to 1, the debt ratio may well increase in such a scenario. Another factor to consider is that the market reception of a deficit increase may be unfavourable even if the multiplier is greater than or equal to 1: participants may expect higher interest rates or may attempt to offload government securities, throwing a spanner into debt financing. This consideration raises the problem of the sustainability of debt and the interest rates on government securities.

De Grauwe and Ji (2019) performed calculations to measure the fiscal space available to euro area Member States for increasing deficits in the current interest environment. Using the traditional calculation procedure and based on the difference between interest rates and the growth rate of the economy, they defined the extent to which deficit could be increased with the debt ratio remaining constant. They found that with the exception of Greece and Italy, in 2018 GDP growth exceeded the interest rates on government securities in all euro area countries. Based on this, the budget balances of the Member States could change by as much as minus 3 to 4 per cent compared to the initial, often positive primary balance, without a change in the debt ratio; in other words, they

could engage in fiscal stimulus of this amount (Table 1). This leeway is particularly important in a period when growth prospects deteriorate.

Table 1
Fiscal space for stimulus in selected euro area Member States with a constant debt-to-GDP ratio

Country (2019)	Debt-to-GDP	r-g	$(r-g)/(1+g)$ * Debt	Primary balance	Fiscal stimulus
Austria	69.7	-3.3%	-2.3%	1.8%	4.1%
Belgium	101.3	-2.4%	-2.5%	0.8%	3.3%
Finland	58.3	-2.9%	-1.7%	0.5%	2.2%
France	99	-1.6%	-1.6%	-1.5%	0.1%
Greece	174.9	4.8%	8.4%	4.0%	-4.3%
Netherlands	49.1	-3.4%	-1.7%	2.2%	3.9%
Ireland	61.3	-6.4%	-3.9%	1.4%	5.4%
Germany	58.4	-3.1%	-1.8%	1.8%	3.6%
Italy	133.7	0.0%	0.0%	1.2%	1.2%
Portugal	119.5	-1.2%	-1.4%	2.9%	4.3%
Spain	96.3	-2.3%	-2.2%	0.0%	2.2%

Source: De Grauwe – Ji (2019)

4.4. Fiscal policy in a sectoral analytical framework

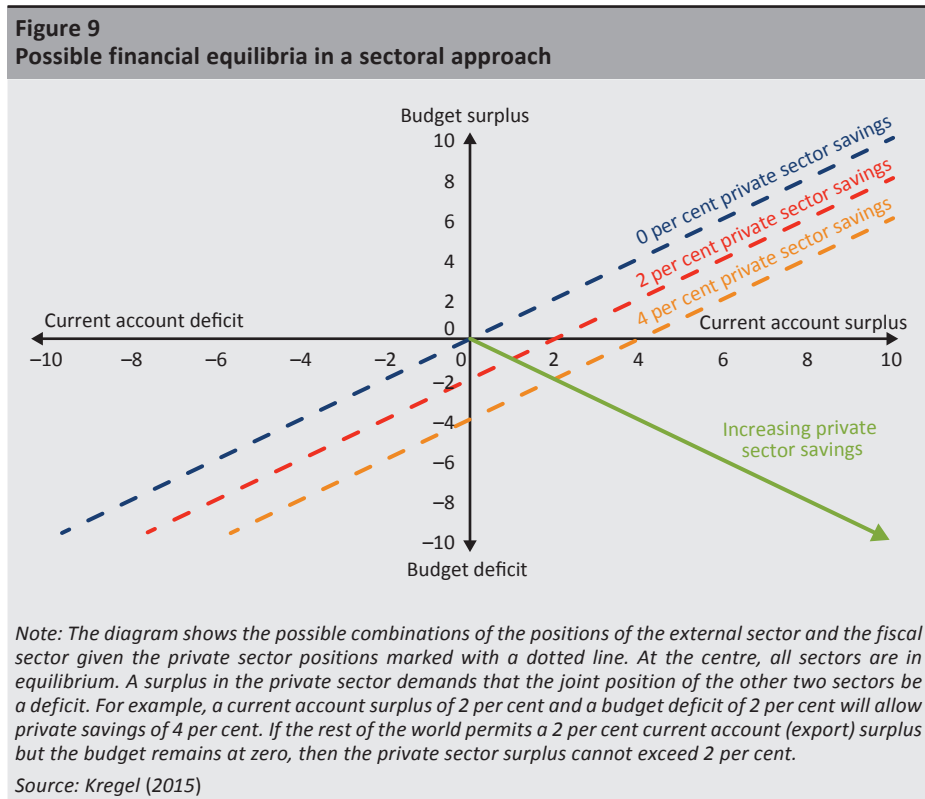
Beyond the traditional analytical framework discussed above, the more active role of fiscal policy can be confirmed even more clearly in an analytical framework that takes into account the financial position of main economic sectors and their relations.⁸ The basic concept is fairly simple: the positions of individual sectors are closely related and as such, they must be mutually compatible by necessity. The analogy of a simple market transaction where a seller always needs to find a buyer also holds true at the level of economic sectors: a sector cannot have a surplus without another sector having a deficit,⁹ and a sector can have a zero position only if the total position of all other sectors is zero. In the simplest case, three sectors can be distinguished: non-banking private sector (i.e. households plus corporates), government and rest of the world¹⁰. At the macro level, the

⁸ A summary of sectoral interrelationships is also included in *Balázs et al. (2020)*. This section is intended to supplement and provide a more in-depth analysis of this topic.

⁹ This necessity, which arises from the principle of accounting correspondence, is often overlooked in modern macroeconomic theories, which tend to attribute macro level outputs to the decisions of individual participants. Even the appearance of behavioural models – which are intended to describe the real behaviour patterns of participants more realistically – could not change this fundamentally. At the same time, the popular, contemporary agent-based models wish to remedy this shortcoming. Kregel and Parenteau, however, base their theories of the long-standing stock-flow consistent models introduced by Godley. A Bank of England study (*Barwell – Burrows 2011*) connects the results of these two trends. See also *Caiani et al. (2016)*.

¹⁰ *Kregel (2015), Parenteau (2010) and Godley – Lavoie (2007)*.

private sector is typically a net saver, where savings exceed investments ($S > I$). Although the government sector's taxes and expenditures balance ($T - G$) and the export–import balance of non-residents ($X - M$) are more volatile, their net balance necessarily equals the private sector's balance: $(S - I) = (G - T) + (X - M)$. In the typical case, the private sector can only be a net saver if the government or the rest of the world is willing to get indebted to it (Figure 9). If the rest of the world is unwilling to do so, running its own deficit the government will have to remain the “ultimate debtor” (Balázs et al. 2020).



The main problem with euro area fiscal rules is that they disregard the relationship between sectoral balances. Similar fiscal rules are applicable to all member countries. Almost all of the countries were forced to make adjustments due to their increased indebtedness and fiscal deficits driven by the financial crisis, even as the private sectors are increasingly net savers as a result of deleveraging. Even disregarding post-crisis deleveraging, it is true in general that fiscal rules prescribe a neutral stance in normal periods or in cyclical average: the deficit cannot exceed 3 per cent and the medium-term fiscal target demands a zero deficit on average (or some surplus, depending on the country concerned, in line with the population

ageing rate). Thus, if it is true that the private sector is typically a net saver in the euro area, then the economy lacks its own internal dynamics or its own growth model. Therefore, the euro area continues to be export-oriented: it follows the typical strategy of “small, open economies”.

As a result, the aggregate demand required for growth can only come from the rest of the world. In a growing global economy where some regions are willing to get indebted, this export-led growth model can actually work, as indeed it worked before the crisis. In the global economy the United States provided the final demand, partly through the budget deficit and partly through private sector indebtedness.¹¹ As a result of the crisis, however, growth is weak in the global economy too, and non-resident sectors are also trying to reduce debts accumulated before the crisis. It is therefore doubtful whether the euro area can achieve sufficient growth. Any further increase in net exports demands constraints on wages and investment to such a degree that it hinders domestic growth even more. In this case, without an increase in the fiscal deficit, the measures permitted by EU rules all but hamper growth (*Balázs et al. 2020*). This phenomenon, called the paradox of thrift by Keynes, could result in stagnation and instability of the euro area.¹²

Leaning towards stagnation, this public governance may be costlier than previously assumed, when economic growth was considered to be a self-sustaining process that does not require any systematic economic stimulus. The supply side was deemed exogenous, i.e. independent of aggregate demand. Besides demographic growth and technological progress, recent research took other factors into account as well that can be influenced by the government (e.g. education, human capital, social capital, research & development), but typically, these elements did not call for the management of aggregate demand either. This left no role for aggregate demand in the growth models, not even in the endogenous growth models.

In the wake of the crisis, however, more and more recognition is given to the notion – which is already familiar for the generation of economists inspired mainly by Keynes – that without managing aggregate demand an economy is prone to stagnation. Attaining a satisfactory growth rate and the full employment target requires stimulus.¹³ Otherwise, the slow growth rate may endure, meaning investment activity remains restrained and unemployment stabilises at high levels.

¹¹ The wording of *Bibow and Terzi (2007)* is even stronger: they refer to this growth model as free-riding.

¹² It should be noted that the export-led growth model fails to work in larger regions and much less in the global economy as a whole. As *Kregel (2010)* pointed out, sooner or later it gives rise to Ponzi-scheme situations in net-deficit running partner countries serving as the markets of export-led economies: they must continue to increase their foreign borrowing in order to meet their FX debt-service commitments (interests) and their trade deficits, which corresponds to the speculative position referred to by Minsky as a Ponzi scheme.

¹³ Obviously, the goal is not to increase the budget deficit continuously; instead, the budgetary response should consider the position of the real economy, external demand, the respective positions of individual sectors and the potential afforded by other policy instruments.

Consequently, in response to the poor aggregate demand the supply side becomes endogenously and persistently impaired, and the phenomenon referred to as hysteresis takes hold (for more detail, see *Lehmann et al. 2017*). If this mechanism is disregarded in the spirit of the pre-crisis consensus and viewed as a trait that is independent of aggregate demand, economic policy will identify it with the maximum growth potential (potential output) of the economy and – in view of the accelerated growth and in fear of inflation – it will put the brakes on the economy. Thus, what started out as a temporary slowdown caused by insufficient demand will become a real, permanent fixture as a result of policy measures (fiscal restraint, central bank interest rate policy).¹⁴ Experiences of recent years highlighted that analysing the unemployment rate is not enough in itself to determine total capacity utilisation. This is because the unemployment rate may drop below the level previously considered equilibrium if there is a parallel decline in the natural rate of unemployment. In this case, this does not necessarily mean that the economy has attained full capacity utilisation, as also pointed out in a speech by *Jerome Powell (2018)*, in which the current Fed Chairman emphasised that the estimation of the natural rate of unemployment is surrounded by high uncertainty, as indicated by several studies (for example, *Orphanides – Williams 2005*).

The endogeneity of potential output is hard to confirm empirically because the data reflect the impact exerted on it by the reaction of economic participants.¹⁵ Before the crisis, the dilemma of policymakers was the assumption that an above-target inflation level – even if temporary – poses a direct risk of increasing inflation expectations and excessively high inflation, which were to be avoided. This was also supported by the belief that a potential policy mistake – premature tightening – did not cost anything, as policymakers did not think that potential output would be undermined for a sustained period. After the crisis, however, this assessment was flipped around: while inflation does not return to the target in most countries despite significant central bank stimulus packages and historically low unemployment rates, slow growth leads to persistently low potential growth rates.

Looking at the balances of the sectors we find that the private sector as a whole and non-financial corporations at the euro area level are almost constantly in a net saving position (*Figure 10*). Although fiscal policy temporarily operated under

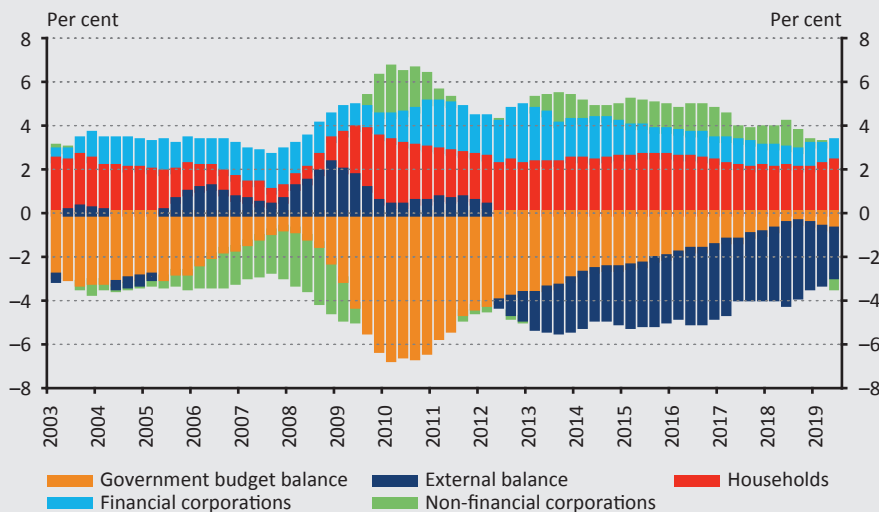
¹⁴ Most analysts agree that, similar to the estimates of the natural rate of unemployment, the estimates of simultaneous potential output are also surrounded by uncertainty and tend to follow actual growth and unemployment. *Ex post* revisions, therefore, are extremely frequent: in the light of recent data, the “past” changes continuously. Similarly, the stance of such estimate-based policies may subsequently be assessed in a new light: an economic policy previously considered stimulating may appear neutral or even restrictive later on, and vice versa.

¹⁵ A classical reference is an article by *Okun (1973)*, in which the author proposes a high-pressure economic policy to reverse stagnation and growing unemployment. After the financial crisis, this concept was reiterated by *Ball (2015)*. See also *Blanchard – Summers (1986)*. In Europe, the concept had always been present, after *Kaldor*, in Keynesian and post-Keynesian literature, e.g. *Ledesma – Thirlwall (2000)*, *Fatas – Summers (2018)*, *Heimberger – Kapeller (2017)*, *Heimberger (2019)*.

greater deficits after the crisis, it is now nearly in equilibrium at the level of the euro area. Private sector savings, therefore, can only be offset by the increased deficit of the rest of the world. Obviously, there are significant differences in the sectoral breakdown between individual countries. The cross-country variation observed between north and south is particularly prominent: while in Germany and the Netherlands, for example, both the private sector and the government

Figure 10

Sector balances in the euro area



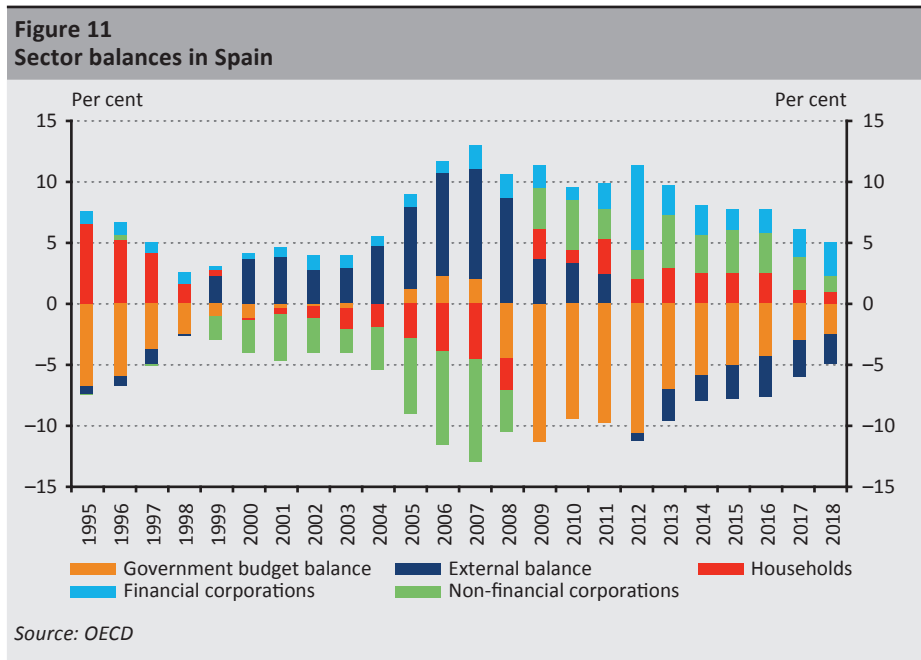
Note: Four-quarter rolling average. In the case of the external balance, negative values indicate the indebtedness of non-residents; i.e. the surplus of euro area financial accounts.

Source: ECB

sector have a surplus, in Italy and Spain private sector savings are partly offset – in addition to non-residents – by the budget deficit.

Before the crisis, investment activity was buoyant in the Spanish economy; a substantial part of the capital required was provided by non-residents. Non-financial corporations implemented major investments in the pre-crisis period (30 per cent of GDP in 2007), while households reduced their savings concurrently (Figure 11). As a result of the private sector's net deficit position, the Spanish economy recorded a current account deficit approaching 10 per cent of GDP, which was a consequence of substantial capital and goods imports.

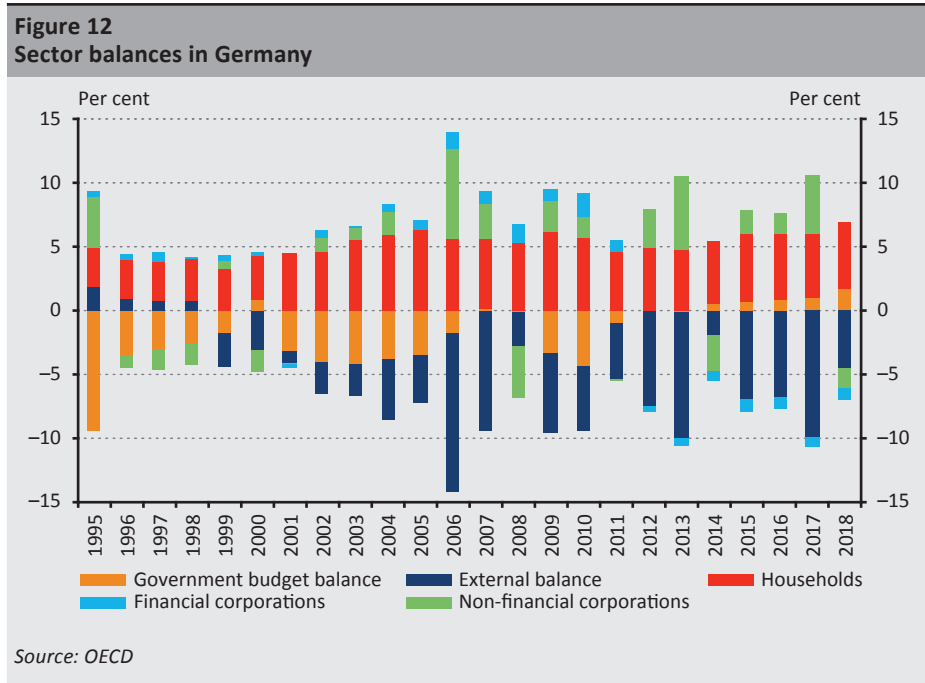
During the crisis, in order to smooth the negative effects of the downturn, the Spanish economy temporarily ran a significant budget deficit. After the crisis, however, a complete reconfiguration took place in the sectoral balances of Spain: both the sector of non-financial corporations and households became net savers. As a result, there was a sharp decline in investment as a percentage of GDP;



compared to the average of the previous decade, the investment ratio was 3–4 percentage points lower. Parallel to this, the previous deficit of the balance of payments turned into a surplus, while the level of the budget deficit was gradually reduced.

In Germany, the private sector took a net saving position before 2008. In the period preceding the crisis, all sub-sectors of the private sector were in a net saving position, which was accompanied by a high surplus in net exports (Figure 12). This structure of the sectoral balances accurately reflects the emerging view of the German economy; namely, in the context of a substantial trade surplus, the savings of German households expand by 5 per cent of GDP. The maintenance of the net saving position of non-financial corporations was permitted by the investment ratio relative to GDP, which had been on a continuous decline since the 1990s, thereby contributing to the deceleration in potential output growth.

In the period following the financial crisis, the German financial system was engaged in financing and/or investment. After 2012, a significant change was also observed in sector balances, with an impact on the euro area as a whole. First and



foremost, we should note the setting up of stringent, surplus budgets, which are significant even as a percentage of GDP. As a result, exports remained the most important driver of the economy, which is also supplemented by the net output of German financial enterprises. Since non-financial enterprises typically remain net savers even after the crisis, GDP-proportionate investment continues to fall short of the average of the 1980s and 1990s.

Owing to the fiscal rules that are based on the strict Maastricht criteria and the decelerating global economy, perceivable growth can only be maintained through substantial private indebtedness. Due to the accounting interrelationship between sectoral balances, any economic policy or regulatory measure can inevitably only be implemented at the price of a trade-off between the sectors. Given the Maastricht debt and deficit rules, the structure of the euro area’s economic governance does not enable the pursuit of growth-conducive fiscal policies under the current economic conditions. This necessarily implies that only export-led growth can be an alternative growth model without the build-up of severe financial stability risks in the private sector. This model worked fairly well in the past both in Germany and

the Netherlands, but its sustainability is called into question by the protectionist economic policy of the United States and the decelerating Chinese economy.

Adherence to the current fiscal rules exerts a negative impact on aggregate demand. The substantial trade surplus also affects the competitiveness of enterprises, as the financing provided by non-residents can only be maintained with subdued wage growth in an environment of fiscal austerity. As a result, domestic demand will be increasingly deficient, leading to weaker growth and prompting corporations to invest even less which, owing to the subdued growth, calls for even more fiscal tightening if the debt ratio is to be maintained.

5. Position of EU policymakers on coordination between economic policy branches

Mario Draghi, whose presidency of European Central Bank ended at the end of October 2019, had regularly emphasised the significance of fiscal policy in his speeches even before. At the regular annual forum of central bankers and academicians held in Sintra in June 2019, however, Mario Draghi stressed the importance of fiscal policy even more decisively. The then ECB President underlined that while monetary and fiscal policy cooperated in the first phase of the crisis to decelerate and reverse the economic downturn, thereafter the stance of monetary and fiscal policy decoupled in the euro area and, as opposed to the United States, the euro area fiscal stance turned contractionary. At the moment, added Mario Draghi, monetary and fiscal policy are not in balance, which contributes to disinflation. Therefore, a common fiscal framework should be established, which allows for sufficient fiscal stabilisation across the euro area. This is all the more needed because while there are countries which would have sufficient fiscal space even under the current rules, fiscal expansion spillovers in the countries without such fiscal space may be overly limited.¹⁶

In one of his later speeches Draghi emphasised that the absence of a clear, common lender of last resort (backstop) behind the European Stability Mechanism (ESM) with respect to the government securities market poses a problem in the smoothing of the geographical differences in the cycles within the euro area; moreover, there is no European deposit insurance scheme in place and for the time being, there has been little meaningful progress on fiscal policy coordination. With respect to cyclical stabilisation at the euro area level Mario Draghi pointed out that equilibrium real interest rates have trended downwards in recent years. In such an environment the proportions of the cooperation between fiscal and

¹⁶ *Twenty Years of the ECB's monetary policy*. Speech by Mario Draghi, President of the ECB, ECB Forum on Central Banking, Sintra, 18 June 2019. <https://www.ecb.europa.eu/press/key/date/2019/html/ecb.sp190618~ec4cd2443b.en.html>. Downloaded: 9 December 2019.

monetary policy change. A more active fiscal policy may ease the stabilisation burden on monetary policy, and adverse side effects may also moderate. However, in Draghi's opinion this has not been recognised at all in the euro area, as is clearly evident from the data: between 2009 and 2019 the average primary balance was –5.7 per cent for Japan and –3.6 per cent for the US, but 0.5 per cent for the euro area. According to Draghi, central banks have an obligation to speak up if other policies may help achieve their goals faster.¹⁷

In Draghi's assessment, the euro area has a mildly expansionary fiscal stance at present, but in view of the weakening economic outlook and downside risks, countries with fiscal space should act in a more effective and timely manner. In addition, he pointed out that all successful monetary unions have a central fiscal capacity. This is why it is very important for the euro area to have sufficient capacity that could be used as a kind of countercyclical stabiliser. At present the complex nature of the adequate coordination of decentralised fiscal policies poses a significant problem¹⁸.

In his farewell remarks closing his ECB Presidency, Mario Draghi noted that the euro area was built on the principle of monetary dominance, which requires monetary policy to focus primarily on price stability and never to be subordinate to fiscal policy. However, this does not preclude communicating with governments when it is clear that mutually aligned policies would deliver a faster return to price stability. The building of a capital market union would reduce the stabilisation tasks that need to be addressed by the central fiscal capacity¹⁹.

In her opening statement to the Economic and Monetary Affairs Committee of the European Parliament in September 2019 Christine Lagarde, the later President of the European Central Bank emphasised that cooperation with fiscal policy would make an important contribution to the cyclical stabilisation of the euro area economy and that the creation of a centralised fiscal capacity would be useful²⁰. She also stressed that current fiscal rules should be simplified and become more effective. In a later statement she stressed, similarly to her predecessor, that economies with fiscal space should pursue more active fiscal policies. As opposed to Draghi who had always been reluctant to name specific countries, she openly

¹⁷ *Stabilisation policies in a monetary union*. Speech by Mario Draghi, President of the ECB, at the Academy of Athens, Athens, 1 October 2019. https://www.ecb.europa.eu/press/key/date/2019/html/ecb.sp191001_1~5d7713fcd1.en.html. Downloaded: 9 December 2019.

¹⁸ *Introductory Statement, Press Conference*. Mario Draghi, President of the ECB, Frankfurt am Main, 24 October 2019. <https://www.ecb.europa.eu/press/pressconf/2019/html/ecb.is191024~78a5550bc1.en.html>. Downloaded: 9 December 2019.

¹⁹ *Remarks by Mario Draghi, at the farewell event in his honour*. Frankfurt am Main, 28 October 2019. <https://www.ecb.europa.eu/press/key/date/2019/html/ecb.sp191028~7e8b444d6f.en.html>. Downloaded: 9 December 2019.

²⁰ *Draft Report on the Council recommendation on the appointment of the President of the European Central Bank*. European Parliament, Committee on Economic and Monetary Affairs, 29 August 2019. http://www.europarl.europa.eu/doceo/document/ECON-PR-639816_EN.pdf. Downloaded: 9 December 2019.

referred to Germany and the Netherlands as economies that should adopt fiscal easing in order to stimulate investment. As a critical remark she noted that there is insufficient solidarity in the euro area: despite sharing a currency, there is no common budgetary policy (*Lagarde 2019*).

Similarly, among the policymakers of the ECB the Dutch Klaas Knot also mentioned in October 2019 that there is a need to strengthen the Economic and Monetary Union (EMU) as without additional action, growth stimulating monetary policy measures may become constrained. In his opinion, monetary and fiscal policy should move in the same direction as there is mounting evidence that monetary policy can reach its goals faster and with fewer side effects if it is aligned with fiscal policies (*Knot 2019b*). Luis de Guindos, Vice-President of the European Central Bank is also of the opinion that the euro area needs a centralised and independent fiscal instrument as the existing framework is ineffective and not complementary to the ECB's monetary policy. He argues that a centralised instrument would also provide support to national fiscal policies (*Guindos 2019*).

Several policymakers have criticised the monetary easing package announced by the European Central Bank in September 2019 and some of them emphasised that fiscal policies should provide stronger support to monetary policy. In addition, a number of policymakers pressed the case for the creation of a substantive fiscal capacity at the euro area level, which would be capable of smoothing the cycles across the euro area and hence, stabilising the euro area economy over the long term. For the time being, however, the economic policy discourse has not yielded any agreement or support on the part of countries where such capacity is actually available. Moreover, the debate between the branches of economic policy is expected to drag on. Since a more active role of fiscal policy or a common fiscal capacity would result in the redefinition of current rules, we cannot expect a fast reform or support to monetary policy.²¹

6. Summary

In recent decades, there has been a considerable moderation in the euro area both in terms of economic growth and inflation processes. As a result, some of the quantified values specified in the Maastricht criteria and incorporated into the fiscal rules have become practically invalid today, which causes tensions in economic

²¹ This outlook is supported by the November 2019 response of Marco Buti and his colleagues of the Commission to the criticisms raised in relation to the Commission's estimate on potential output, which suggests that, in their opinion, a considerable modification of the methodology is neither possible nor really necessary (*Buti et al. 2019*). Although Buti's mandate as Director General of the Commission ended at the end of last year, we assume that – for the time being – the article cited continues to reflect the professional consensus within the institution. However, after his resignation *Buti (2020)* admits that, because of Greece's fiscal crisis, they also viewed the other countries through “fiscal lenses”, which Buti refers to as a mistake. He also calls for a more active role for fiscal policy in addition to monetary policy.

policy decision-making. Despite the ultra-loose monetary policy stance following the crisis, in several regions monetary policy failed to provide sufficient support to private sector investment and aggregate demand, which has cast an even sharper light on the difficulties in recent years. Growing conflicts have recently come to the surface even among the policymakers of the ECB in respect of the optimal allocation of tasks between the branches of economic policy. Several policymakers have criticised the latest monetary easing package announced by the European Central Bank in September 2019 stressing that monetary policy has reached its boundaries, and in the current environment any further steps can provide little stimulus to the economy. Parallel to this, more and more policymakers emphasised that fiscal policy should provide stronger support to monetary policy and hence, economic growth. In addition, an increasing number of policymakers are pressing the case for the creation of a substantive fiscal capacity at the euro area level, which would be capable of smoothing the cycles across the euro area and hence, stabilising the euro area economy over the long term.

Although the fiscal rules have been revised and there is some progress in institutional reforms, for the time being no real willingness has been shown by economic policy to implement any of the measures. The budget proposals submitted by individual Member States for the coming year indicate that no substantial fiscal stimulus can be expected in the euro area in the near future either. In addition to the resistance of some Member States, fiscal rules founded on the Maastricht principle also limit the possibility of coordinated fiscal expansion. Moreover, the fact that euro area fiscal rules disregard the interrelationships between individual economic sectors also poses a problem. At present, the pro-cyclical economic policy of southern euro area countries does not provide the means to prevent and manage a future crisis. By contrast, while the economic conditions of northern states would be able to support a coordinated fiscal expansion, the Member States concerned have no such intentions, even though some analyses pointed out that the budget balance of most Member States would provide sufficient space for significant easing without changing the debt ratio. Looking ahead, it may be expedient to rethink the Maastricht criteria – which are still in effect –, the fiscal rules and, concurrently, the allocation of tasks between the branches of economic policy.

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Regional Features of Card Payments in Hungary*

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In retail trade, card payments currently represent the most important alternative to cash, which is less favourable from a social perspective in the long run. Earlier studies typically focused on the development opportunities of Hungarian electronic payments at the country level only. This study uses previously unavailable data to examine the regional features of card payments in Hungary, identifying the factors influencing their infrastructure and use. The results show that in smaller settlements the acceptor network is less developed and card ownership is lower, while in terms of regions, the situation looks bleaker in Northern Hungary and Central Transdanubia with respect to the POS network, and in the counties of the Great Plain this is the case in relation to card ownership. Card use is significantly influenced by the level of development of the acceptor network as well as the labour market situation. The results reaffirm the necessity of developing the card acquiring network, for example with state-led programmes, and highlight the fact that in smaller settlements and less developed regions, card payments are still not sophisticated enough.

Journal of Economic Literature (JEL) codes: G20, D12, R11

Keywords: payments, card acceptance, regional features

1. Introduction

Several studies have already extolled the benefits of the spread of electronic payments and the reduction of cash use, both in Hungary and internationally. As shown, for example, in *Benedek et al. (2013)*, macro-level cash demand data are often employed in indirect indicators and assessments used to measure the shadow economy, where transactions typically involve this means of payment. Reducing cash use may curb tax evasion, as confirmed by numerous international papers (e.g. *Braithwaite et al. 2002; Rogoff 2017*), but other studies concluded that the correlation was not straightforward. According to *Seitz et al. (2018)*, the relationship can only be identified with medium-denomination banknotes

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

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and smaller, euro-area countries, while a paper by *Deutsche Bundesbank (2019)* points out that other forms of payment are also used in the shadow economy, and in the case of large denominations the store of value function is much more dominant than various illegal uses. The central bank studies that focused on the high social costs of cash use (*Turján et al. 2011; Schmiedel et al. 2012*) approached the drawbacks of using cash from a different angle. In the short run, the costs of cash payments are presumably also low, but after a certain critical level their social costs are higher in the long run than in the case of electronic payments.

These factors push government and central bank decision-makers in several countries, including Hungary, towards incentivising the use of electronic payments instead of cash and ensuring the freedom of choice between the forms of payment in all payment situations. It is important to note, however, that in certain countries with low cash use (e.g. Sweden), the latter also means that merchants and banks are required to provide the option for cash payments. As *Ilyés – Varga (2015)* showed in their study, more than three quarters of retail payment transactions are conducted in cash, which is not substantially different from the experience in most European countries (*Esselink – Hernandez 2017*), but it indicates that there is still ample room for improvement in this respect. The introduction of instant payments could strongly boost electronic payments in most countries, but currently the biggest rivals to cash in retail transactions are payment cards. The factors influencing their use and acceptance, such as interchange rates and the issue of surcharging have been examined in countless studies in Hungary and abroad (*Greene – Stavins 2018; Ilyés – Varga 2018; Jonker et al. 2018; Rochet – Tirole 2003*).

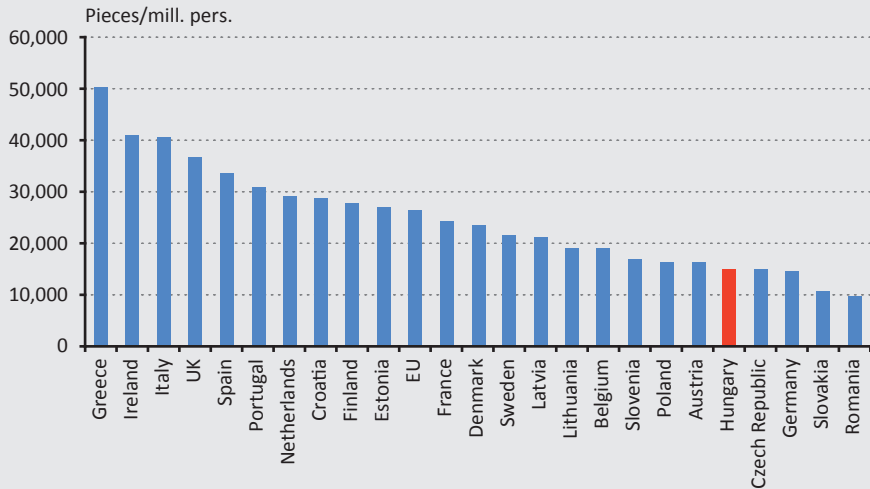
However, due to a lack of data, until now only a few analyses concentrated on the regional differences in retail payments. *Helmecki (2010)* mainly focused on the characteristics of the regional distribution of credit transfers and direct debits as well as the infrastructure (ATMs, POS terminals, bank branches). The availability of bank branches is the lowest in counties Vas, Veszprém and Nógrád, while in Budapest branches are mainly clustered in the central districts. In terms of another service used often by retail customers, ATMs, their share per 1,000 inhabitants is low in the counties Pest and Borsod-Abaúj-Zemplén as well as the Great Plain region, and the coverage of merchants' POS terminals is similar, in which besides the above-mentioned Great Plain region, the counties Nógrád and Szabolcs fare the worst. With respect to credit transfers and direct debit transactions, only interbank transactions carried out through the Hungarian automated clearing house (ACH), GIRO Zrt. were analysed, which obviously provides an incomplete picture, as Hungarian banks' internal items are not included. Other studies (*Pál 2014; Kuttor – Pál 2019*) also looked at interbank credit transfers and direct debits, but from a network perspective. Based on this, roughly 40 per cent of interbank

transactions are conducted within settlements, and Budapest plays a special role in the Hungarian payment network, although regional centres can also be identified. In his study, *Kovács (2017)* analysed the availability and accessibility of branches and also noted the differences between cities and cities with county rights on the one hand and smaller settlements on the other hand. *Ilyés – Varga (2015)* and *Végső et al. (2018)* examined households' account and card ownership as well as payment habits by settlement type. Both of surveys concluded that card coverage and the use of electronic payments was higher in Budapest. The analysis by *Ilyés – Varga (2018)* of online cash register data also highlighted the dominance of the capital in terms of card acceptance.

In the approximately ten years that passed since the publication of the study by *Helmecki (2010)*, the Hungarian payment infrastructure has improved considerably, which entailed a substantial growth in turnover as well, mainly related to payment cards. According to the Magyar Nemzeti Bank (*MNB 2019*), this was not reflected very strongly in connection with the payment accounts held by natural persons, because the number of accounts was already high at the end of 2010 (at 9.4 million), and therefore only a moderate increase of 3.3 per cent was observed between 2010 and the end of 2018. The situation is similar when it comes to the number of cards held by households, which amounted to 8.7 million retail cards on 31 December 2018, representing growth of 3.9 per cent. With respect to devices, the Hungarian ATM network expanded by 5 per cent, but the number of POS terminals surged sharply, with a more than twofold (117 per cent) increase in the period under review. This also means that card use became much more widespread among households, as the number of card purchases grew by 20–25 per cent annually, and compared to the 198 million purchases in 2010, the 765 million registered in 2018 represent a roughly fourfold expansion.

By European standards, there is still room for improvement in the electronic acquiring network in retail trade. Since currently card payments are basically the only electronic payment method used at physical acceptance points, this can be analysed well using the POS terminal coverage in the different countries. According to European Central Bank data (*Figure 1*), Hungary ranks in the bottom third in this respect, which presents a tremendous business opportunity for payment service providers.

Figure 1
Number of POS terminals per 1 million inhabitants, 2017



Note: The latest available data for Finland was from 2015.

Source: Based on ECB data

The massive progress in recent years is largely due to the centrally initiated and coordinated programmes, such as the MNB's trial POS terminal deployment programme and the country-wide POS deployment programme of the Ministry of Finance.¹ On 2 March 2020, major progress was made in the spread of electronic payments in Hungary by the introduction of instant payments under the auspices of the MNB. Since instant payment services may offer an alternative to cash payments in virtually all situations, this could potentially entail a massive expansion of electronic acceptance in retail purchases and the financial settlement of services. This could be driven by market participants that provide acquiring services to merchants, and the development could be considerably supported by further state-run and central bank programmes. However, development activities will only be efficient if the players have a clear picture about payments in Hungary. This also involves taking into account the regional features of Hungarian payments.

The study seeks to assist in this, and present the current situation of the Hungarian payment card infrastructure and turnover from a regional perspective. The novelty of the paper is that no settlement-level data were previously available to analyse the POS network and card turnover as well as the related income of payment service providers. The authors endeavour to use this previously unavailable data

¹ Decree No. 47/2016 (XII. 6.) of the Ministry for National Economy on the support provided for increasing the number of bank card terminals

set and paint an broad picture of the regional features of the Hungarian card system, and to identify the factors that impact the development of card payments in Hungary, in particular the acceptor network, card ownership and card turnover, thereby promoting the further development of the Hungarian card system. After presenting the data used, first the characteristics of acquirers and then those of issuers are described along with the explanatory factors of their development, followed by a chapter on card turnover. The study ends with a separate chapter on the summary of the relevant conclusions.

2. Data used and methodology

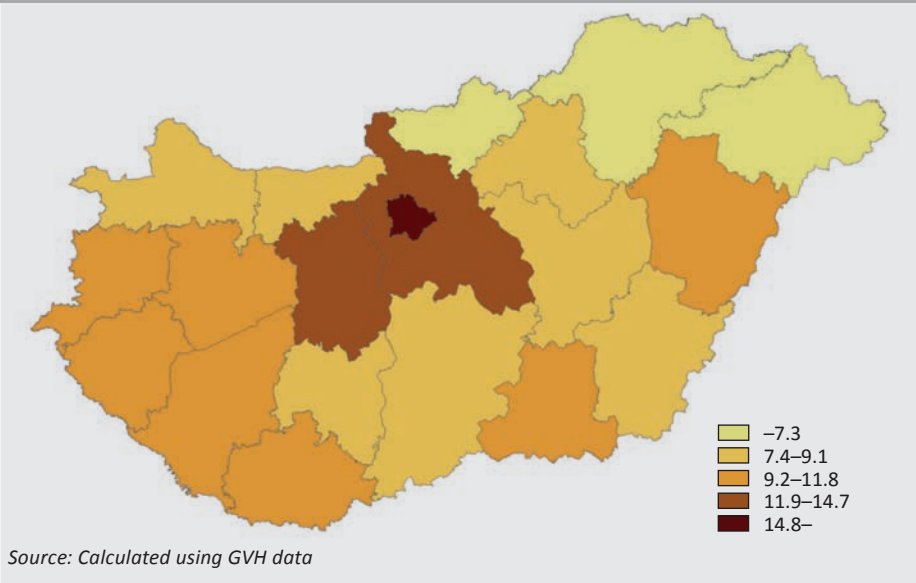
Three main sources of data were used for preparing the analysis. The Hungarian Competition Authority (GVH) began a sector-wide inspection on the bank card acceptance market, requesting settlement-level data from payment service providers offering card acquiring services on POS terminals, specifically the transactions conducted on them and the resulting revenue. This was received by the MNB within the framework of domestic legal assistance, for analysis purposes. The information on the acceptor network is for the reference date of February 2018, while the turnover and revenue data cover the period between 2013 Q1 and the end of 2017. To avoid examining payments in Hungary only from the perspective of the acquirer side and to involve consumers, in other words account holders and cardholders, the region-level data from “What do we live from?”, a survey conducted in 2014 by the Hungarian Central Statistical Office (HCSO) commissioned by the MNB, were used. The data are detailed in *Simon – Valentiny (2016)*. These sources of data were complemented with the regional (county- and settlement-level) data of the HCSO (Dissemination database; Counties in focus [Fókuszban a megyék]).

Besides the descriptive analysis of the data, the research questions were examined by linear regression, logistic regression and panel regression, and these models are presented in detail in the next chapters. Due to their detailed information on the regions, the GVH data provide an unprecedented opportunity to meticulously analyse the Hungarian card system, because the MNB’s regular payment surveys only contain country-level data. Nevertheless, as noted in the relevant subchapters, the availability of data with the appropriate breakdown (settlement-level, quarterly) is very limited in other parts of the economy and society, and therefore the low number of explanatory variables may also influence the models where they are incorporated.

3. Card acquirer network

The coverage of the card acquirer network was examined using the number of POS terminals based on GVH data. This was slightly different from the number of places where cards are accepted (typically retailers, accommodation providers and catering establishments), because there can be several terminals at the same acceptance point. Nevertheless, this is an adequate approximation of the regional differences in the acquirer network's coverage. As expected, Budapest fares exceptionally well among the counties in terms of coverage: there are 26 terminals for 1,000 inhabitants, as more than one-third of all the terminals were deployed here (*Figure 2*). The counties Fejér and Pest also show high values with respect to the number of terminals per 1,000 inhabitants (in the latter, this is mainly attributable to the Budakeszi district, which also includes Budaörs, where a large number of retail establishments are clustered due to the easy access provided by the motorways), while the poorest results came from the counties Borsod-Abaúj-Zemplén, Nógrád and Szabolcs-Szatmár-Bereg, where there are hardly over 7 terminals per 1,000 inhabitants.

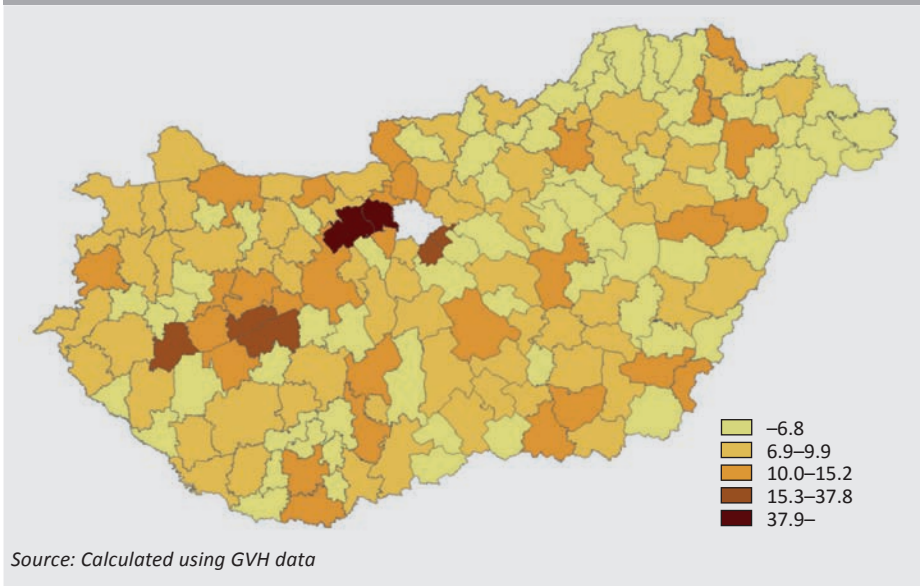
Figure 2
Number of POS terminals per 1,000 inhabitants by counties (February 2018)



The picture is further nuanced if district-level data are analysed as well (*Figure 3*). The card payment infrastructure is poorly developed in many districts of the Great Plain. Outside the capital, coverage is the highest in the Budapest metropolitan area and near Lake Balaton, but in line with expectations, the card acceptance

infrastructure is basically concentrated around cities (Figure 2). Similar regional differences can be identified if the number of POS terminals is compared to the number of companies registered in a region. The number of POS terminals per 1,000 inhabitants was also examined by settlement type. In accordance with the expectations, the ratio was the lowest in villages (4.9) and towns (6.2), while cities (10.2) and cities with county rights (19.3) had somewhat better coverage, which, however, still lagged behind the capital.

Figure 3
Number of POS terminals per 1,000 inhabitants by districts (February 2018)



To identify the factors that influence the development of the card acquirer network, linear regression was used to analyse which variables have a significant impact on the number of these devices in the settlements where POS terminals are available. The following variables were taken into account in the regression:

$$\log(\text{POS}) = \beta_0 + \beta_1 \text{legcode} + \beta_2 \text{regcode} + \beta_3 \text{compshare} + \beta_4 \log(\text{pop}) + \beta_5 \log(\text{rev}) + \mu,$$

where

- the dependent variable is:
 - $\log(\text{POS})$: the logarithm of the number of POS terminals in the given settlement
- the explanatory variables are:

- legcode: the legal status of the given settlement (Budapest and cities with county rights; cities; villages)
- region code
- compshare: the share of companies registered in the accommodation and food service activities and trade sectors of the national economy within all firms
- log(pop): logarithm of the population of the given settlement
- log(rev): logarithm of the revenues from POS terminals in the given settlement (in other words the profitability of the devices, how much is it worth to deploy them)

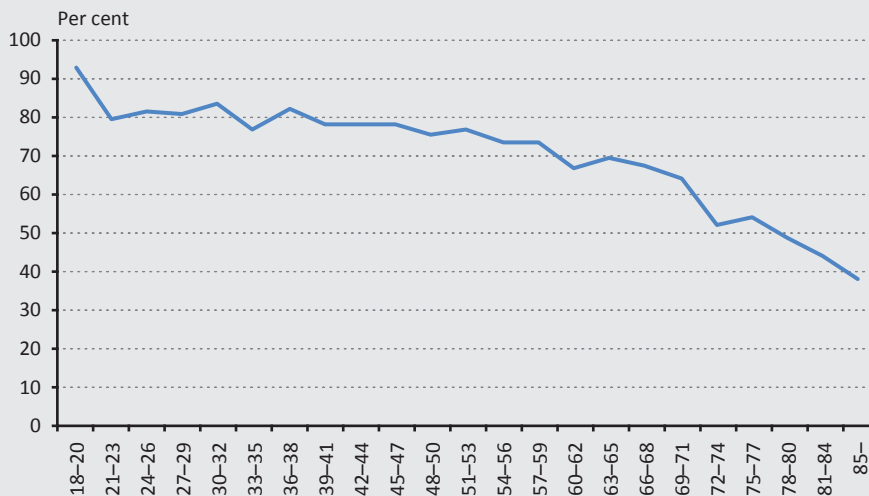
Table 1	
Estimated coefficients of the regression explaining the development of the card acquirer network, 2018 Q1	
Variables	Number of POS terminals (log)
Legal status (Budapest and county seats)	
Cities	-0.86* (-7.12)
Towns	-1.37* (-10.35)
Villages	-1.58* (-11.99)
Regions (Central Hungary including Budapest)	
Central Transdanubia	-0.10* (-1.96)
Western Transdanubia	-0.09 (-1.82)
Southern Transdanubia	-0.04 (-0.83)
Northern Hungary	-0.13* (-2.57)
Northern Great Plain	-0.03 (-0.67)
Southern Great Plain	0.00 (0.02)
Share of companies	2.17* (12.82)
Population (log)	0.55* (29.76)
Revenues (log)	0.20* (26.29)
Constant	-1.70* (-7.60)
R²	0.86
N	2,254
<i>Note: * Coefficients significant at a 95 per cent confidence level, with the values of the t-test in brackets.</i>	
<i>Source: Calculated using GVH and HCSO data</i>	

The results in *Table 1* show that as the settlement size diminishes, the number of terminals becomes significantly lower relative to cities; in other words when all other variables are controlled for, the coverage of the acquirer network is lower in smaller settlements. From a regional perspective, terminal coverage is significantly lower, albeit only slightly lower, in Central Transdanubia and Northern Hungary than in the most developed region, Central Hungary, which in this model also includes Budapest. The growing share of companies in retail trade and catering services within all registered firms has a positive impact on the size of the card acquirer network in a given settlement. A similar positive and significant correlation can be observed between population size and the revenues from the terminals. Thus a 1 per cent rise in population numbers boosts the number of POS terminals by 0.55 per cent in a settlement, while a 1 per cent increase in financial service providers' revenue lifts the number of terminals by 0.2 per cent. It should be noted that the model controls for settlement type and settlement size as well, which may be the reason behind the small differences across the regions. The analysis is inhibited by the lack of settlement-level data on retail establishments, so the share of them that accept cards in a given settlement could not be examined. This is especially important because if there is no competition, for example in a smaller settlement with only one retailer, that merchant has less of an incentive to offer card payment.

4. Household card ownership

Households' card coverage, in other words the characteristics of card issuers were examined with the data from the first wave of the "What do we live from?" survey. The 72.5 per cent card coverage tallies with the country-level results of *Ilyés – Varga (2015)*, just like the distribution of card ownership by age (*Figure 4*). It can be stated that in older groups, the ratio of card ownership falls considerably. There are also significant differences in the breakdown by the educational attainment of the head of household: while less than half of those with primary education have a card, the same ratio is 72 and 85 per cent in the case of those with secondary and tertiary education, respectively. When examining coverage by the economic activity of the head of household, the highest ratio (79 per cent) can be found in the case of employees, followed closely by students and housewives with around 75 per cent, whereas the same value for pensioners and the unemployed is much lower (at around 60 per cent). Among students, there are a large number of 25-year-olds, who do not necessarily take part in university education, which can explain that while in the case of those under 20 coverage is approximately 90 per cent, it is lower in the group of all students.

Figure 4
Card ownership by age



Source: Calculations based on the "What do we live from?" survey

It can be seen, however, that there are major differences across the regions in this respect, with the regions in the Great Plains bringing up the rear, while the situation is the best in Central Hungary. Based on this, there is a roughly 20 percentage point difference in terms of card ownership between the most advanced regions and those that are in the worst shape (Table 2).

Table 2
Account and card ownership of Hungarian households by regions, 2014

Region	Card coverage (%)*
Central Hungary**	80.3
Central Transdanubia	71.8
Western Transdanubia	75.0
Southern Transdanubia	70.7
Northern Hungary	72.0
Northern Great Plain	61.0
Southern Great Plain	68.1
Country average	72.5

Note: * Coverage means that at least one person in the household has an account or payment card.
** The data for Budapest were taken into account among those for Central Hungary.

Source: Calculations based on the "What do we live from?" survey

Households' payment card coverage was also analysed with logistic regression to identify the factors that influence it. The regression's dependent variable is 1 if there is a bank card in the household, and 0 if there is none. The regression's explanatory variables include regional characteristics, variables describing households' income and social situation as well as the characteristics of the head of household. As can be seen in *Figure 4*, in the case of heads of household, the share of card ownership declines somewhat more steeply above the age of 60, and therefore age groups were used to handle this not exactly linear effect. *Table 3* shows the odds of the logistic regression, based on which if the odds of the given explanatory variable is under 1, the probability of card ownership declines, while if it is over 1, the probability increases. In the model, all explanatory variables had a significant effect at the 95 per cent confidence level examined. The logistic regression is as follows:

$$y = \beta_0 + \beta_1 \text{regcode} + \beta_2 \text{settype} + \beta_3 \text{income} + \beta_4 \text{socbenef} + \beta_5 \log(\text{consum}) \\ + \beta_6 \text{foodconsum} + \beta_7 \text{utilities} + \beta_8 \text{comp} + \beta_9 \text{gender} + \beta_{10} \text{age} + \beta_{11} \text{educ} \\ + \beta_{12} \text{econact} + \mu,$$

where

- the dependent variable is:
 - y: Whether the household in question owns a bank card (0 or 1)
- the explanatory variables are:
 - region code
 - settype: type of settlement (Budapest, county seat, town, village)
 - income: annual household income per person (under HUF 3 million, HUF 3–5 million, over HUF 5 million)
 - socbenef: social benefits in the past 12 months (yes, no)
 - log(consum): logarithm of all consumption expenses
 - foodconsum: share of food consumption in total expenses
 - utilities: share of utilities spending in total expenses
 - comp: Do they have a private enterprise, partnership or other company? (yes, no)
 - gender: male, female
 - age: 0–29, 30–39, 40–49, 50–59, over 60
 - educ: primary, secondary, tertiary educational attainment
 - econact: unemployed, student, pensioner, other (gyes, gyed [childcare benefits], sick leave, housewife, disabled)

Table 3	
Factors shaping the card coverage of households	
Variable	Card ownership
Regions (Central Hungary)	
Central Transdanubia	0.73*
Western Transdanubia	0.85*
Southern Transdanubia	0.79*
Northern Hungary	0.78*
Northern Great Plain	0.52*
Southern Great Plain	0.75*
Settlement type (Budapest)	
County seat	1.39*
City	0.88*
Village	0.90*
Income and social situation	
Total annual household income per person (under HUF 3 million)	
HUF 3–5 million	1.06*
over HUF 5 million	1.46*
Social benefits in the past 12 months (yes)	0.75*
Logarithm of all consumption expenses (HUF) (log)	1.71*
Share of food consumption in total expenses	1.20*
Share of utilities spending in total expenses	1.37*
Do they have a private enterprise, partnership or other company? (no)	0.74*
Characteristics of the head of household	
Gender (female)	1.05*
Age (0–29)	
30–39	0.90*
40–49	1.11*
50–59	0.92*
over 60	0.50*
Educational attainment (primary)	
Secondary	2.04*
Tertiary	3.53*
Economic activity (employee)	
Unemployed	0.78*
Student	4.31*
Pensioner	0.96*
Other (gyes, gyed [childcare benefits], sick leave, housewife, disabled)	0.66*
Cons	0.22*
N	6,049

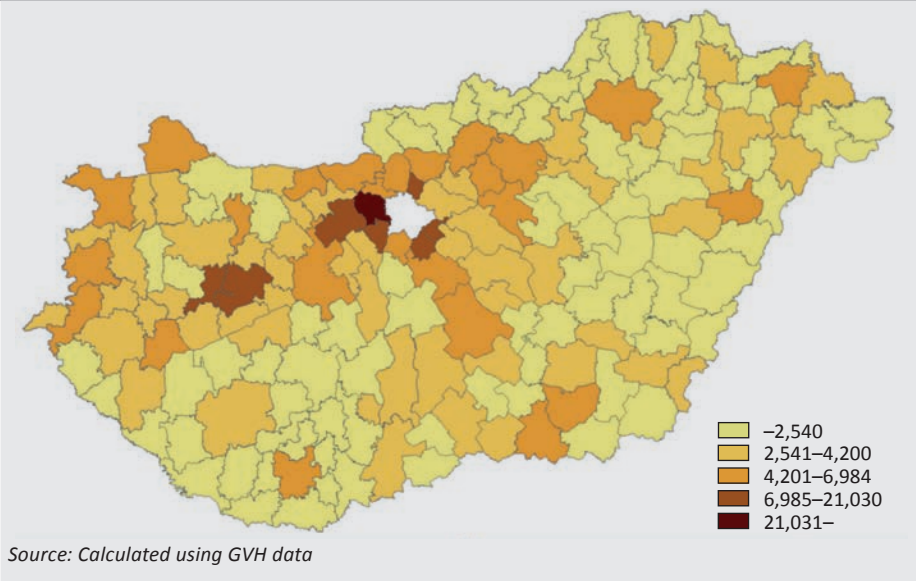
*Note: * Significant at a confidence level of 95 per cent.*
Source: Calculations based on the “What do we live from?” survey

From a regional perspective, the probability of card ownership is lower in all regions than in Central Hungary, with the situation the worst in the Northern Great Plain, which confirms the descriptive data. *Kuttor – Pál (2019)* examined the regional distribution of bank branches. According to their results, card ownership and the distribution of branches show a similar pattern, which might be worth examining in the future. As regards settlement types, compared to Budapest, card ownership is significantly more likely in county seats and less likely in other cities and villages. This may be attributable to the fact that the payment infrastructure is typically less developed in these latter settlement types, as shown in the previous chapter, and therefore cards can be used in fewer places, which has a negative impact on ownership as well. Categories were used in the per capita income of households, and based on that the probability of card ownership increases in tandem with income. The results also show that card ownership is slightly lower in the households that receive social benefits (e.g. family allowance, gyes, gyes [childcare benefits], other benefits and allowances). With respect to consumption, card coverage is higher in households in a better financial situation, even if examining the share of spending on food and utilities within total consumption. The gender of the head of household influences card ownership at the household level only to a very limited degree. In the case of female heads of household, the ratio is somewhat higher. As regards age, compared to young adults (under 30), the likelihood of card ownership was lower in all other age groups, except for those aged 40–49. Card coverage is especially low in the age cohort of pensioners. This is consistent with the results of *Ilyés – Varga (2015)* regarding individual-level surveys, which also showed the largest drop in card coverage among those aged over 60. Educational attainment produces similar results: card ownership is significantly higher among graduates (according to the model, this variable exerts the greatest impact), and this confirms the conclusions of the earlier study. This also ties in with the fact that according to *Végső et al. (2018)*, there is a negative correlation between cash payment and educational attainment. In the case of those receiving gyes [childcare benefit], on sick leave, the disabled, the unemployed and pensioners, the probability of card ownership is significantly lower than in the case of employees, whereas it is higher in the case of students. The latter is probably attributable to the fact that this age group prefers electronic payment methods to cash. Moreover, most students over 18 take part in tertiary education, where having a bank account and bank card is essential, which may also explain the exceptionally high card ownership figures.

5. Card use

The regional distribution of card turnover should be analysed with transactions per POS terminal, taking into account the spatial differences in the acceptor infrastructure, in other words basically examining how actively cardholders use the established card acceptance network. Data are only available on the value of transactions rather than their number, which slightly distorts the regional comparison. This is because card payments are mostly widespread in retail trade and services, and there can be differences across the different districts in their price levels (Figure 5). Based on the descriptive data, the regional distribution of transactions is much more concentrated than that of the acquirer network, and intensive card use is mostly seen in cities and the northwestern part of the country, attributable to the level of economic development in the Budapest metropolitan area, tourism in the Balaton Uplands and the industrial centres near the western border. At the same time, turnover in the territories near the eastern border is low despite the relatively well-developed POS network.²

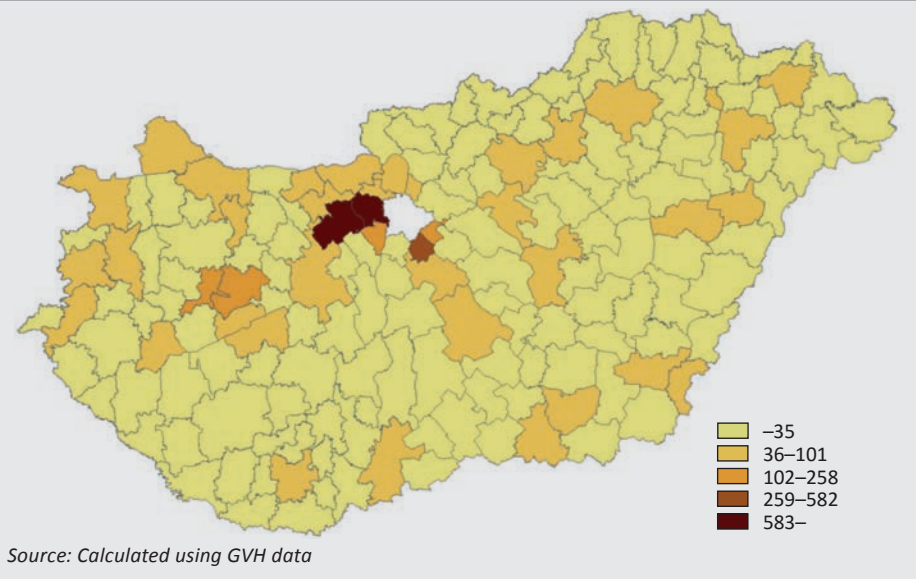
Figure 5
Turnover value of card purchases per POS terminal by districts (HUF thousand, 2017 Q4)



² The outstanding value for District Budaörs may be explained by the large turnover generated by the retail stores near the motorways leading into the capital, while in the case of District Bicske, the data is probably distorted due to the centre of a large retail chain.

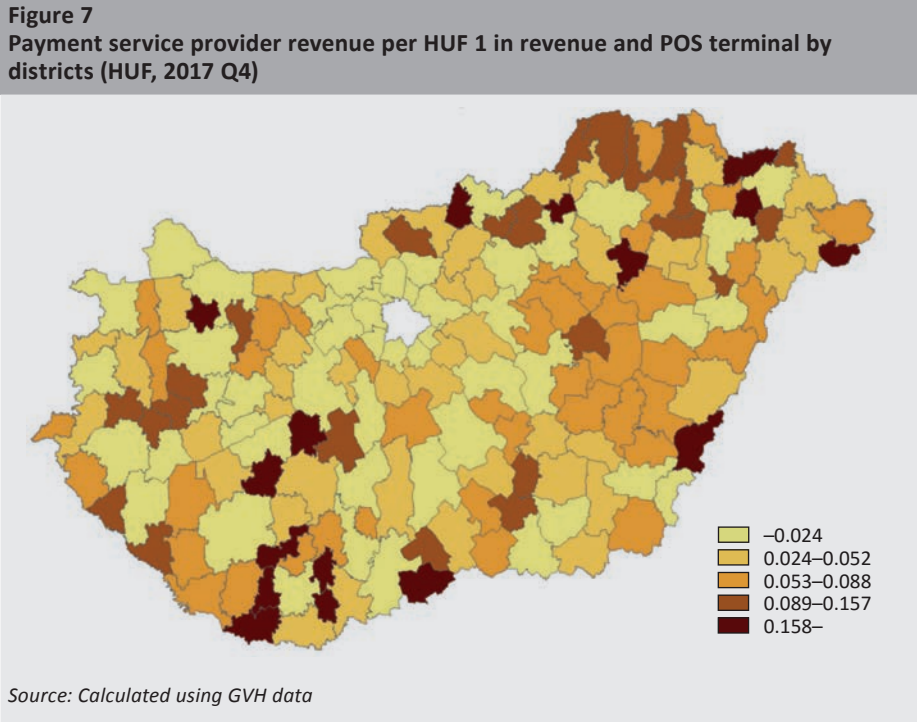
It should be noted that card transactions are influenced by several factors, for example the size of the retail trade and catering sector in the given area or the level of development of the acquirer network. Another important factor is the role of cardholders (issuers), in other words the share of card ownership within the population (which was presented in the previous chapter) and how actively cardholders use their existing cards for payments. Comparing card turnover to the population of the given area can provide a detailed picture about this (Figure 6). The comparison shows that card payments are used more actively by those living in cities (which, of course, may be connected to the level of development of the acquirer side).

Figure 6
Turnover of card purchases per person by districts (HUF thousand, 2017 Q4)



The analysis of the profitability of the deployed POS terminals, i.e. the revenue of payment service providers per terminal (which merchants see as a cost) yields similar results (Figure 7). This is mainly related to the fact that most payment service provider fees are value-based: more turnover means more revenues. When adjusting for turnover data as well by dividing revenue figures with them, it can be seen that in Eastern Hungary and Southern Transdanubia, which are less developed from the perspective of the card infrastructure, providing card acceptance services is generally much more expensive for merchants. However, this is presumably not due to the different price setting of payment service providers but rather to the fact that the retail trade sector has a different structure in these areas, and the share of larger merchants who have more bargaining power and consequently use cheaper card acceptance services is much lower. And in the case of smaller

merchants, payment service provider fee costs are recovered much slower on account of the lower turnover.



The factors influencing card use were analysed with several methods, because just as in the case of the acceptor network, the limited number of the available settlement-level explanatory variables is a problem in the case of turnover, too. Three main factors can influence card turnover:

- *The development level of the acquirer network.* Whether there are enough terminals so that card payment is available to those who want to use it (the characteristics of this were investigated in *Chapter 1*).
- *Features of the card issuer or cardholder side.* The number of customers who are potential card users and their socio-demographic composition; the share of card ownership in the population; customer preferences (the characteristics of this were investigated in *Chapter 2*). In their paper, *Végső et al. (2018)* studied the reasons behind customers' choice between electronic and cash payments. Further research should be conducted based on this. The results may serve as another yardstick for the measures aimed at expanding card acceptance, possibly even differentiated by regions. According to the study, the volume

of card and electronic payments can be increased not only by broadening the acceptor network but also by other promotional measures. This may be especially effective in the case of instant payments, which will be launched on 2 March 2020.

- *The overall level of economic development and profile of the region.* The development of retail sales, the role of the retail trade and catering services sector (the role of tourism), where card acceptance is the most typical, in the economy of the region. The limitation of the models is that no data with the necessary level of detail were available on the overall development of retail sales, and therefore this factor could not be incorporated.

First, linear regression was used for 2018 Q1 to examine card turnover at the settlement level, because POS network data are only available for one date (February 2018). Besides the data on the acquirer network, the HCSO's settlement-level data were employed. The following model was analysed, stripped from the explanatory variables without a significant effect:³

$$\log(\text{turnov}) = \beta_0 + \beta_1 \log(\text{POS}) + \beta_2 \log(\text{net}) + \beta_3 \text{compshare} + \beta_4 \text{legcode} + \beta_5 \text{unempshare} + \mu,$$

where

- the dependent variable is:

$\log(\text{turnov})$: the logarithm of the total card turnover (value) in the given settlement

- the explanatory variables are:

- the features of the acceptor network:

- $\log(\text{POS})$: the logarithm of the number of POS terminals in the given settlement

- indicators of the overall level of economic development:

- $\log(\text{net})$: the logarithm of the number of Internet subscriptions in the given settlement

- compshare: the share of companies registered in the accommodation and food service activities and trade sectors of the national economy within all firms

- regional characteristics:

- legcode: the legal status of the given settlement (Budapest and cities with county rights; cities; villages)

- characteristics of the cardholder side:

- unempshare: the share of the unemployed (relative to 15–64-year-olds) in the given settlement.

³ Such variables include the regional variable or the share of those aged over 65 within the total population.

Table 4	
Estimated coefficients of the regression explaining card turnover, 2018 Q1	
Variables	Card turnover value (log)
Number of POS terminals (log)	1.62* (2.57)
Ratio of internet subscriptions to total population	6.23* (8.45)
Share of companies	20.60* (12.14)
Legal status (Budapest and county seats)	
Cities	0.92* (2.34)
Villages	0.41 (0.96)
Ratio of the unemployed	-7.20* (-7.15)
Constant	-2.67* (3.98)
R²	0.62
N	2,260
<i>Note: * Coefficients significant at a 95 per cent confidence level, with the values of the t-test in brackets.</i>	
<i>Source: Calculated using GVH and HCSO data</i>	

The results show that a more developed acceptor network does significantly contribute to the expansion in card turnover, and so the development of infrastructure should be supported to reduce the use of cash. From the perspective of infrastructure, increasing Internet penetration also has a positive effect, although this is rather a general economic indicator in the present model. The effect of the acquirer network and the overall economic situation of a region is shown by the fact that the larger the number of companies registered in the retail trade, accommodation and catering services sectors, the more active the card use. Card use is lower in towns and villages than in cities, which is consistent with the descriptive results described above (Figure 4–5) and the studies by Ilyés – Varga (2015) and Végső et al. (2018). On the cardholder side, an increase in the number of unemployed can negatively influence card turnover, which corresponds with the result presented in Chapter 4 that card ownership is lower among those with a more disadvantaged social background.

The factors influencing card turnover were examined not only with linear regressions but also with panel regressions, as turnover data are available from 2013 Q1 until 2017 Q4, making 20 periods in total. The panel regressions were run at the county level, because there are more explanatory variables available for this territorial level than for settlements. The explanatory variables used in the linear regression (Table 4) were complemented (while keeping the dependent variable,

the logarithm of card turnover, constant) with the examination of the effect of the educational attainment of registered jobseekers, i.e. the share of those with primary, secondary and tertiary education among all jobseekers.

Variables	Card turnover (log)
Ratio of employees to total population	6.06* (6.06)
Net average monthly wage (log)	1.46* (12.87)
Ratio of the unemployed to total population	-6.81* (-5.99)
Number of overnight stays in commercial accommodation establishments (log)	0.16* (9.69)
Constant	-4.32* (-3.44)
R ²	0.85

*Note: * Coefficients significant at a 95 per cent confidence level, with the values of the t-test in brackets*
Source: Calculated using GVH and HCSO data

The results of the panel analysis (*Table 5*) bear out the conclusions of the cross-sectional analysis, namely that the labour market conditions of a region significantly influence the development of card turnover. Furthermore, a significantly positive correlation was demonstrated with income and overnight stays, and thus higher wages and a greater number of guests boost card payments.

6. Cluster analysis

The point of cluster analysis is to classify the data based on the available variables to gain additional information. The algorithm groups together settlements that are the closest to the same mean based on the available data. In this case, more information is sought on how to classify the settlements based on the characteristics of card payments, using card turnover and the number of POS terminals. Clustering was performed for 2–6 groups, and it was found that the optimal number of clusters is 4. The results of this analysis are presented below. The characteristics of certain settlements differ markedly from the others, producing outliers, and therefore they were excluded from the analysis. Examples of this include Budapest and settlements with no POS terminals. The remaining settlements can be classified into four distinct groups.

After the outliers are managed, *k*-means clustering divides the remaining 2,439 data points (settlements) into four stable and distinct clusters. The smallest of

the four stands wide apart from the others. Containing eight elements, this group is distinct from the other data points even if fewer clusters are used. This fourth group contains the largest cities: Székesfehérvár, Debrecen, Nyíregyháza, Győr, Pécs, Kecskemét, Miskolc and Szeged. It is characterised by relatively large card turnover coupled with an extensive acceptor network. *Kuttor – Pál (2019)* reached a similar conclusion examining 2017 data. Their paper, which created clusters based on total turnover, showed that the same eight county seats stood out from the settlements under review. Group 3 is also characterised by large turnover, but the number of POS terminals is much lower (585 on average) than in Group 4. It includes the county seats that did not make it into Group 4 and larger, more developed cities.⁴ Group 1 comprises the less developed larger cities that are missing from the previous two groups, and the developed towns. This group is characterised by an average number of POS terminals (around 163) and average turnover. Group 2, consisting of small towns and the smallest settlements, is also markedly distinct. Since the settlements with zero POS terminals were filtered out in advance, this group includes the small settlements where POS terminals are present, albeit in low numbers (nine on average), and turnover is also substantially lower than in the other groups (*Table 6*).

Cluster number	Size of group	Number of POS terminals deployed	Logarithm of card turnover
1	118	163.5	14.4
2	2,284	9.5	8.7
3	29	585.8	16.2
4	8	1,852.6	17.6

Source: Calculated using GVH data

The analysis showed that the settlements can be classified into distinct groups based on the chosen variables. Settlements of the same size and level of development were grouped together based on the number of POS terminals and card turnover, which means that they have roughly the same number of POS terminals and card turnover. The clusters are distinct, so the settlements in the different groups vary based on the variables under review (*Annex, Figure 8*). Using the approach described above, a cluster analysis based on prorated variables should also be conducted to facilitate the identification of the smaller but more developed settlements. Settlements without a POS terminal were excluded here

⁴ Szombathely, Veszprém, Szolnok, Eger, Békéscsaba, Siófok, Kaposvár, Sopron, Zalaegerszeg, Tatabánya, Budaörs, Üllő, Érd, Dunakeszi, Gödöllő, Pápa, Ajka, Dunaújváros, Nagykanizsa, Szekszárd, Gyöngyös, Salgótarján, Hajdúszoboszló, Gyula, Baja, Hódmezővásárhely.

as well. In this approach, a 4-mean cluster analysis was prepared for the following variables: number of POS terminals per 1,000 people, card turnover per person, turnover per POS terminal. This divides the sample under review into a small group, a medium group and a large group based on the number of data points.

Cluster number	Size of group	Average number of POS terminals per 1,000 people	Average card turnover per person	Average turnover per POS terminal
1	6	9.0	1,284.4	162,919.2
2	5	18.1	11,167.6	607,041.0
3	2,104	5.9	27.9	3,877.3
4	324	9.7	247.5	24,556.7

Source: Calculated using GVH data

The first two groups are easy to distinguish. Group 2 is characterised by a developed card system, i.e. a relatively high number of POS terminals, and high turnover per person and per POS terminal (see *Table 7*). In Group 1, the number of POS terminals per 1,000 people is lower, while the turnover per person and per POS terminal are high, so card use is more active than warranted by the level of development of the acceptor network. In other words, this is the group of settlements with relatively few POS terminals that generate large turnover. Group 3, the largest cluster, includes small and less developed settlements with low POS coverage and low turnover. Group 4 contains settlements with a relatively large number of POS terminals and low turnover. Despite the advanced acceptor network, the terminals are used less frequently due to other reasons, for example low retail sales, less broad shop chains or the low share of cardholders.

Group 2 includes: Törökbálint, Biatorbágy, Budaörs, Alsónémedi and Bicske. The first three are among the most developed settlements in the country, so the high POS terminal coverage and turnover come as no surprise. As noted above, Bicske and Budaörs most likely made it into this group owing to their favourable location, which tallies with the analysis by *Kuttor – Pál (2019)*. They are preferred shopping destinations for many people living in Budapest, thanks to their proximity to the capital and the abundance of shopping centres. This may explain the high number of POS terminals and the huge turnover.

7. Conclusions

The study sought to provide a detailed picture of the features of the Hungarian card network and turnover using previously unavailable data. Whereas – barring a few exceptions – until now the MNB has primarily examined the characteristics of Hungarian payments at the country level, the database used in this analysis allowed even settlement-level traits to be captured. The paper is envisaged to facilitate the continued spread of electronic payment methods in Hungary, which may even go beyond card use. The results may contribute to the further spread of future instant payment solutions, since the new, transfer-based payment method may prove to be a cheaper electronic acceptance alternative, especially for smaller firms currently less involved in card acquiring. The results on the development of the card acceptance network attest that there are large regional differences in the country, and card acceptance is particularly low in the eastern areas that are far away from cities. As proven by the MNB's data, this is attributable to the fact that this service is much more expensive relative to turnover in the case of smaller retail outlets, largely because this is how banks manage the higher risk associated with the segment of smaller merchants. This is where the appearance of instant payments could be very important, as it may contribute massively to the development of the regions in Northern Hungary and the Great Plain as well as that of smaller villages, which are less developed from a payment perspective. The continuation and expansion of the public POS deployment programme could be similarly beneficial, and the provision of an electronic payment option may be required from a predetermined and steadily growing group of commercial acceptance points.

The conclusions of this study on households' card ownership confirm the results of the latest MNB survey of this topic conducted in 2014 (*Ilyés – Varga 2015*). Households' card coverage is significantly influenced by the educational attainment, age and social situation of the head of household. However, due to the larger sample size compared to the earlier survey, the regional characteristics could be examined in more detail. The results confirm the initial expectations, namely that the Central Hungary region including Budapest is the most advanced in this regard, while those living in the Northern Great Plain fare the worst. When it comes to settlement types, households' card coverage is lower in villages and smaller towns than in Budapest, but the differences are smaller compared to the earlier analysis in that based on the database analysed here, this ratio is higher in county seats than in the capital.

The strong degree of concentration around cities and major tourist destinations in the acceptor network can also be traced in card turnover. The capital and Northwestern Hungary should be highlighted as the areas with the most active card use. The analysis showed that the expansion of the acquirer network significantly boosts card turnover, which demonstrates, among other things, the importance of the country-wide POS terminal deployment programmes launched by the Ministry of Finance.

Another aspect worth mentioning is the effect of labour market factors, because the share of unemployed and employees significantly influences card turnover. This may point on the one hand to the importance of the cardholder (issuer) side, and on the other hand to the overall level of economic development of the different areas.

As indicated above, the relatively low number of explanatory variables available in the appropriate breakdown that could be incorporated into the models inhibited the analysis. Therefore a subsequent, repeated regional analysis could greatly improve the results if the currently available data set expands, for example with settlement-level data on income, retail sales or the number of card payments. In the future, the data from online cash registers and the surveys could provide new and relevant information, which can be used to produce even more accurate results. And while this analysis allowed only a cross-sectional examination of the regional features of the card acceptor network, any new reporting could open the way to showing the changes in the features over time.

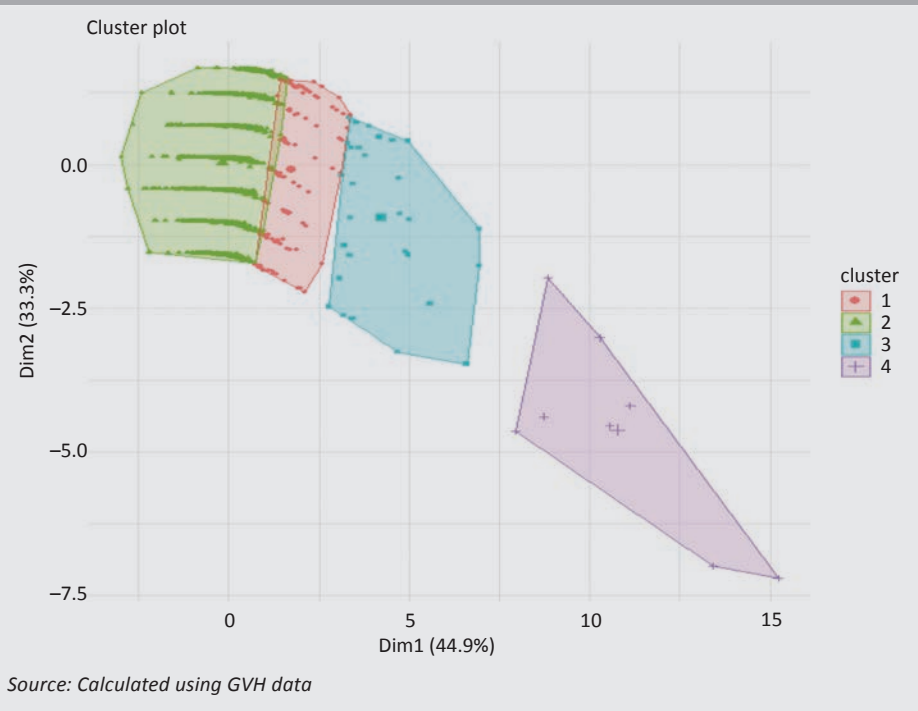
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Annex

Figure 8
Settlement clusters created based on the features of card payments



Comparative Analysis of the Changes in Cash Demand in Hungary*

Tamás Végső

The strong growth of cash in circulation in Hungary seen in recent years seemingly contradicts the changes in payment habits and can also be interpreted to show that the development of the Hungarian payment system is falling behind relative to other countries in Europe. Placing the Hungarian data in an international context, this study attempts to provide a true and accurate picture of the situation with cash usage in Hungary and uses the relevant literature to present the trends in cash demand observed globally. One important conclusion is that, in terms of their nature, transactional cash demand and cash demand for savings purposes are clearly separated, with the latter primarily responsible for the expansion of the volume of cash on a global scale. While the growth seen in Hungary may be high in European comparison, taking into consideration changes in interest rate levels and GDP it cannot be seen as extreme. Based on international trends, the realistic goal for Hungary should primarily be to decelerate the expansion, as experiences show that a nominal decrease in cash volume requires the long-term and concurrent existence of several factors.

Journal of Economic Literature (JEL) codes: D14, E41, E42, E58

Keywords: cash demand, cash-to-GDP ratio, payment habits, electronic payments, cash holdings, shadow economy, cashlessness

1. Introduction

Today, people in practically all countries around the world are experiencing a transformation of payment habits first hand. Hungary is no exception: one need only think of music festivals that have gone cashless or, for that matter, the fact that most street fairs now also accept card payments, and there are also churches where donation boxes have been replaced by card reader terminals. These phenomena are also confirmed by the Payment Systems Report (*MNB 2019a*) published by the Magyar Nemzeti Bank (MNB). In terms of the number of transactions and total value, bank card payments increased by approximately

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

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25 per cent in Hungary between 2017 and 2018, and today more than three quarters of transactions are conducted in stores that allow for electronic payment. Recent years have seen contactless cards gain ground at an explosive rate, and various mobile payment solutions are also increasingly widely available.

The public has become aware of the concept of the ‘cashless state’ through the example of Sweden, but there are also frequent reports on the Netherlands and Great Britain, showing them to be front-runners in the widespread utilisation of electronic payments. Instant cashless payment solutions are undergoing continuous development, their speed and reliability are increasing year after year and, in addition, increased attention is being directed to blockchain or ‘distributed ledger’ (DLT) technologies which may be applied in the area of payments by both companies and central banks (see for instance *Bech et al. 2017, FIS 2018*). At the same time, the expansion of cash volume in various countries is also a generally observed international phenomenon, which seemingly contradicts the development of payment systems. According to MNB data, the value of forint banknotes and coins in circulation has been increasing continuously since 2012, at an average annual rate exceeding 10 per cent, surpassing HUF 6,500 billion by December 2019. The increase in cash demand was particularly strong in 2018 with an outflow of over HUF 850 billion from the central bank in a single calendar year. But this is not just true for Hungary. Examining data from foreign central banks, we can establish that practically all states in the world were faced with similar phenomena in the past decade.

What is then the truth about cash and what can we expect in the coming years? This paper first briefly presents the growth of cash in circulation in Hungary observed in recent years, introduces and organises the relevant studies published in international literature relating to cash demand, and then, in light of these data, attempts to interpret domestic processes, while detailing certain foreign examples worthy of study. Then – again relying on international literature – it focuses on the future of cash and the opportunities for cashless economies.

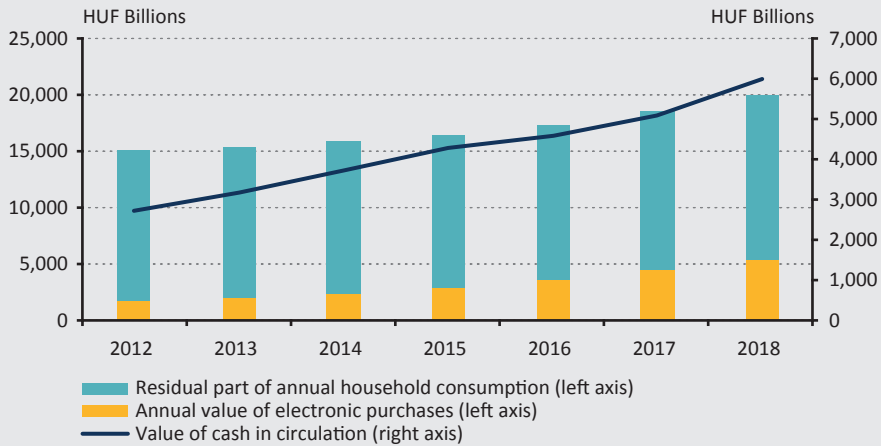
2. Changes in domestic cash demand

Based on MNB data, in terms of value, cash in circulation in Hungary has increased by 14 per cent on average each year since 2012, surpassing HUF 6,500 billion by December 2019. This is in sharp contradiction with public opinion, according to which, as a result of continuously developing electronic solutions, cash as a means of payment is now considered outdated and old-fashioned.

In the past decade, Hungary simultaneously saw both a sharp increase in cash in circulation and the swift spread of electronic payment solutions. The OCR (online cash register) database, containing the data of stores required to use online cash

registers,¹ provides an accurate picture of purchase transactions broken down by various payment methods from 2015, but in order to examine a longer time horizon, it is more expedient to rely on other estimates. One possible method – as applied, for example, by *Khiaonarong – Humphrey (2019)* – is to compare the value of annual household consumption and the annual value of purchases made by electronic payment as shown in *Figure 1*. The Figure shows that while the value of electronic purchases has more than tripled since 2012, the remaining part of annual consumption – which may be considered a nearly accurate approximation of cash purchases – essentially stagnated. This indicates that the increase of cash in circulation is not the result of a change in household payment habits.

Figure 1
Increase in the values of annual household consumption, electronic purchases and cash in circulation between 2012 and 2018



Source: HCSO, MNB

At the same time, it is important to stress that – despite the rise in the use of cashless payment solutions – cash continues to be the means of payment used most frequently and in the highest value in Hungary. According to the *Payment Systems Report* published by the MNB (2019a), in 2017, in terms of transaction numbers 85 per cent of purchases executed on online cash registers were made in cash, while in terms of value the figure was 68 per cent. The ratio of cash transactions registered decreased by more than 5 per cent between 2015 and 2017, but the total number of such transactions dropped by only 1 per cent. It is a telling research result that – according to a 2018 survey based on self-declaration

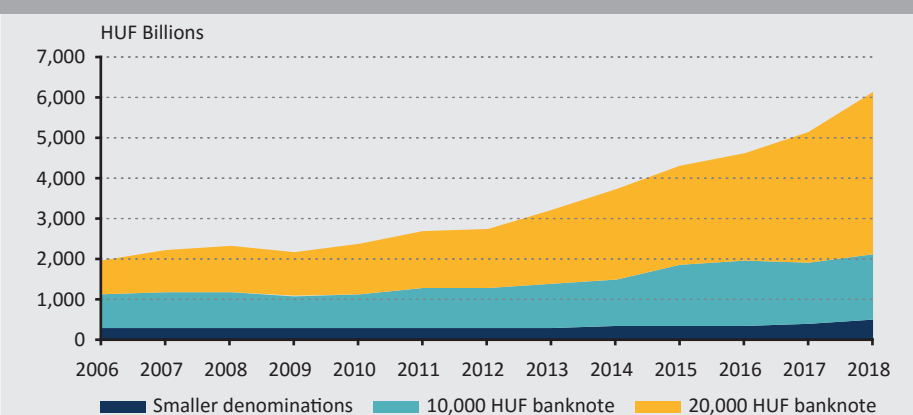
¹ Stores required to use online cash registers by the National Tax and Customs Administration primarily represent the retail sector.

– 46 per cent of the Hungarian population uses only cash to make day-to-day purchases, while 28 per cent use both cash and card payments and only 26 per cent prefer cashless solutions (Végső *et al.* 2018).

Understanding the apparent contradiction between the rising cash demand and the counter-directional change in consumer habits is facilitated by awareness of the fact that the strong growth of cash in circulation seen in recent years primarily involved the highest-denomination, 20,000 HUF banknotes. The quantity of this particular denomination in circulation almost tripled between 2012 and 2019, while the growth for 10,000 HUF notes was approximately 70 per cent, with a 25–40 per cent increase observed for smaller denominations (the distribution by value among the various denominations is shown in *Figure 2*). Although no methodologically sound, quantified estimates have been made in Hungary as yet, it can be reasonably assumed that the majority of high-denomination banknotes do not serve transactional purposes, and instead are used for medium- to long-term savings purposes. Consequently, the increase of this part of cash in circulation is independent of the spread of electronic payment solutions and is instead impacted by other factors (for example, the permanently low interest rate environment or the fear of economic instability, for more details see *Chapters 3.2. and 4.3.*).

Increased demand for high-denomination banknotes was observed to varying degrees in many other countries as well, and as such the phenomenon also drew the attention of central banks. Examining data from Great Britain, Australia and Canada, *Flannigan – Parsons (2018)*, for example, showed significant correlation between housing prices, the value of renovations and the turnover of high-denomination banknotes, while other explanatory factors included the fear of financial instability.

Figure 2
Distribution of the value of cash in circulation in Hungary by denomination between 2006 and 2018



Source: MNB

The savings-related motivation of domestic demand for cash is also supported by the fact that based on HCSO data on national accounts, the assets of Hungarian households held in cash nearly doubled between 2013 and 2018, rising from HUF 2,537 billion to HUF 4,788 billion. The change in saving habits, along with other factors impacting cash demand, is discussed in detail in *Chapter 4.3*.

3. What do we need cash for?

In order to understand the situation of cash, examined in either a domestic or international comparison, it is not enough to speak merely of general cash demand. In practically all countries in the world, transactional cash demand and cash demand for savings purposes can be clearly separated, which may simultaneously be characterised by opposing movements. In addition – although slightly overlapping with the previous two categories – separate mention must be given to demand from abroad for the currency of a given country, as well as the cash usage of the shadow economy, which is linked to illegal activities (for instance, tax avoidance, black labour, smuggling) and which, given its nature, is particularly difficult to estimate.

3.1. Transactional cash demand

Historically, the primary purpose of the creation of cash was to facilitate the exchange of various goods and services. Banknotes and coins retain this function to this date, but starting from the second half of the 20th century, numerous other solutions surfaced in this area, from the issuing of cheques through transfers between bank accounts and card payments all the way to solutions provided by mobile phones.

The spread of cashless payments naturally reduces the ratio of cash within transactional turnover, but banknotes and coins still remain the most popular and most widely used means of payment in the world (*G4S 2018*). Compared to other areas of cash use, transactional cash demand and the changes therein are relatively easy to estimate, either using commercial data services such as the Hungarian online cash register database, or representative retail surveys (that typically also contain payment diaries). Such surveys and research are regularly published by the European Central Bank (*Esselink – Hernández 2017*) and the Fed (*Greene – Stavins 2018*), as well as by other central banks, such as Switzerland (*Schweizerische Nationalbank 2018*), Germany (*Deutsche Bundesbank 2018*), the Netherlands (*Jonker et al. 2018*), Canada (*Fung et al. 2015*), Japan (*Fujiki – Tanaka 2018*) and Australia (*Doyle et al. 2017*); recent analyses based on Hungarian data are also available (*Végső et al. 2018* and *Ilyés – Varga 2015*).

One common element of the referenced studies is that – although the popularity of cash as a means of payment is considered permanent in many places, including

Hungary – they typically report a relative decrease in transactional cash usage which, however, in the specific countries is not accompanied by a drop in overall demand for cash. According to the estimates of *Fujiki – Tanaka (2018)*, during 2017 in Japan the value of transactional cash demand replaced by electronic payments represented merely 0.4 per cent of total currency in circulation. There is general consensus among economists with regard to the fact that demand for cash is now primarily defined by the need for savings (*Assenmacher et al. 2019; Bech et al. 2018; Flannigan – Parsons 2018; Jobst – Stix 2017*).

Various socio-demographic factors clearly impact the cash usage of households for transactional purposes, but the specific nature and direction of these impacts can vary greatly from nation to nation. One illustrative example concerning the results of relevant questionnaire surveys is that in Hungary, preferences for payment methods (primarily cash and bank cards) are strongly influenced by academic qualification and household income, while age in itself shows little correlation with payment habits (*Végső et al. 2018*). By contrast, examining the same issue in France (*Politronacci et al. 2018*), qualifications and income were found to be insignificant in terms of cash usage, while age was closely linked to the choice between different methods of payment.

However, the findings of *Sisak (2011)* and *Arango-Arango – Suárez-Ariza (2019)* seem to have more general validity, according to which, based on international data, the variables expressing the level of development of countries' payment systems show strong negative correlation with transactional cash demand. It has also been widely shown that the subjective perception of the various payment methods (*Khan et al. 2015*) and the related costs (*Arango et al. 2015; Stavins 2018*) also significantly influence household payment habits, and thereby transactional cash demand. These statements are also supported by the results of questionnaire surveys in Hungary (e.g. *Végső et al. 2018*). The paper by *Bech et al. (2018)* on demand for small-denomination notes also produces interesting results, namely that the average age of the population and per-capita-GDP play a significant role (the former in a positive, the latter in a negative direction).

3.2. Cash as a store of value

Most of the above referenced research projects focusing on transactional cash demand also attempted to gauge cash demand for savings purposes. But given the fact that according to households one of the biggest benefits of cash is anonymity (*Végső et al. 2018*), the self-declaration method is only moderately suitable to determine the actual size of this phenomenon.

Analyses performed using econometric tools provide a slightly more accurate picture. *Anderson (1977)*, for example, developed a method taking banknote lifecycles into consideration, based on the observation that banknotes held for

savings purposes have lower wear-and-tear than their counterparts that are involved in day-to-day cash circulation. In contrast, *Sumner (1990)* determines the volume of cash holdings through the seasonality of demand for banknotes, as he feels that this type of demand does not show significant fluctuation within a given month or year, while in transactional cash usage a significant temporary growth is observed at the start of months and during major holidays. According to the findings of *Bartzsch et al. (2011a, 2011b)*, whose analysis also uses the above-mentioned methods, a mere 10–15 per cent of euro banknotes issued in Germany at the beginning of the 2010s served transactional purposes. The ratio of cash held domestically as savings is estimated to be at an additional 10–30 per cent, while the remaining 60–70 per cent is taken abroad, presumably also for savings purposes. With regard to France, *Politronacci et al. (2017)* also determined similar ratios as far as the rate of transactional cash demand and cash demand for savings purposes are concerned, while the study by *Assenmacher et al. (2019)* using Swiss data showed that Swiss franc banknotes serve as store of value at a similar ratio of 55–70 per cent, with this proportion even greater for the highest denomination, the 1,000 CHF note,² where it can exceed 90 per cent.

According to *Fujiki – Nakashima (2019)*, savings held in cash represent a somewhat smaller part, 40–45 per cent of the total volume of Japanese yen banknotes, while the findings of *Judson (2017)* show that US dollar banknote savings in foreign hands alone could represent as much as 70 per cent. Although foreign demand is somewhat lower than the estimates for the US dollar, it may still play a significant role in the turnovers of the euro (*Lalouette – Esselink 2018*), the Swiss franc (*Assenmacher et al. 2019*), the British pound and the Canadian dollar (*Flannigan – Parsons 2018*). It should be noted that foreign demand for certain currencies can serve more than just savings purposes. For example, in Ecuador the US dollar has been legal tender since 2000, and since 2002 – based on their own unilateral decision – Kosovo and Montenegro have both been using euro banknotes and coins.

Jobst – Stix (2017) attempts to provide an explanation for the drastic rise in cash volume in the developed world in recent years, and the increase in cash holdings in particular. As part of a data analysis covering 70 countries, the authors establish that the most significant rises in the cash-to-GDP ratio can be linked to the financial crisis of 1929–1933, World War II and the financial crisis of 2007–2009, for both the US and Europe. According to the related hypothesis of the authors, the increasing cash demand for savings purposes currently observed worldwide cannot be solely explained by the low interest rate environment or the role of the shadow economy; it also requires the uncertainty generated by the socio-

² As per the exchange rate in December 2019, the value of the 1,000 CHF note was approximately HUF 300,000.

economic crisis that can impact the way of thinking of households, as well as the corporate and financial sector for many years.

The effect of the interest-rate environment on demand (for savings purposes) for high-denomination banknotes is confirmed by the analyses of both *Sisak (2011)* and *Bech et al. (2018)*, however, the latter surprisingly were unable to show significant correlation in the countries they examined between variables expressing macro-economic uncertainty and demand for high-denomination notes.

3.3. Cash in the shadow economy

A frequent criticism of cash is that the liquidity and anonymity it provides is the perfect breeding ground for various illegal activities in the shadow economy. Former IMF and Fed economist and Harvard professor *Kenneth Rogoff (2016)* is of the same opinion. One of the key statements of his book entitled *The Curse of Cash* is that since cash currently plays an important role in financing corruption, smuggling and terrorism, its discontinuation would provide major assistance in eliminating these activities.

However, confirming or refuting this statement or determining the rate of cash used in the shadow economy is made extremely difficult by the fact that, on the one hand, on account of its illegality the extent of the shadow economy itself can only be estimated inaccurately, using indirect means, and on the other, within data analyses, the cash generated by illegal activities is very difficult to separate from legal transactions and legally held savings. Accordingly, the relevant international literature also contains numerous, often contradicting research results. Using data from multiple US states, *Wright et al. (2017)* come to the conclusion that moving social welfare and allowances to an electronic basis considerably reduced the rate of break-ins, thefts and street crime, while *Immordino – Russo (2018)* show significant correlation between tax avoidance (primarily meaning VAT fraud) and bank card use. Importantly, however, according to the authors the use of cards for payment purposes is linked to the reduction of tax avoidance, while cash withdrawals from ATMs show an opposite correlation. Examining the cash turnover of the euro area, *Seitz et al. (2018)* establishes that the estimated size of the shadow economy has no significant effect on demand for cash. Demand for the highest denominations statistically shows no significant correlation with illegal activities, and even in the case of medium denominations, only data for a few countries show correlation, but these are also weaker than expected. The regression analysis by the central bank of Germany (*Deutsche Bundesbank 2019*) shows significant positive correlation in certain cases between unemployment, the number of drug-related criminal offences and local cash demand, but due to the numerous uncertainty factors, the authors feel that the results are suitable to draw conclusions regarding the relationship of cash and the shadow economy only to a limited extent.

4. International comparison of domestic data

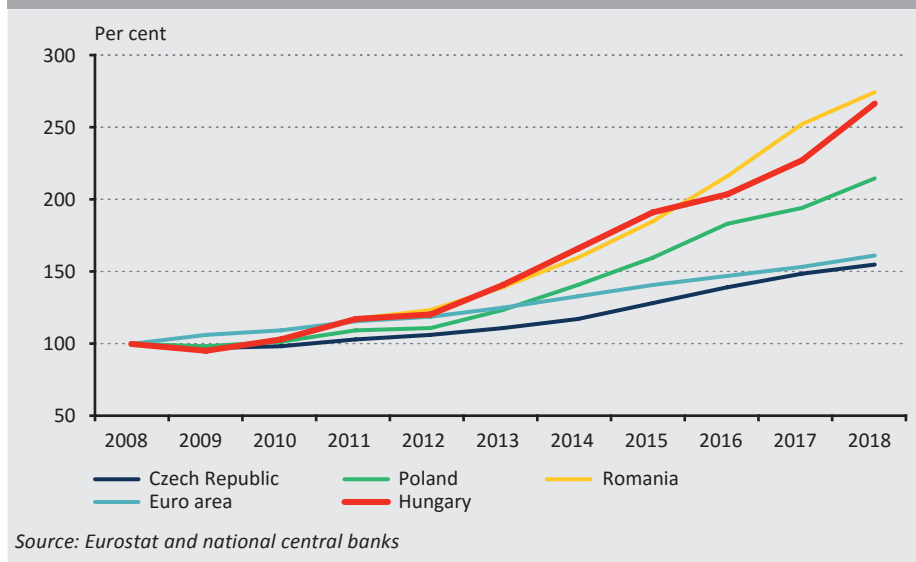
Correct interpretation of domestic processes requires familiarity with regional, European and global trends. The use of nominal values – or their percentage changes in order to avoid exchange rate fluctuations – may seem logical in comparing the outflow of cash and the cash volume in circulation, but the use of the so-called cash-to-GDP ratio is considerably more widespread in general practice. This particular indicator expresses the value of banknotes and coins in circulation relative to the gross domestic product of the given country. Its introduction is based on the underlying logic that the cash demand of a country's economy can change even with constant household and corporate payment and savings habits, if the economy's capacity increases or decreases. Another benefit in terms of comparability is that it is free of the distorting effects of exchange rate fluctuations.

Accordingly, the remaining part of the chapter only touches on conclusions drawn from nominal volume data and places greater emphasis on cash-to-GDP ratios as well as factors potentially impacting demand for cash. In addition, some international examples that provide lessons in respect of the current and future situation of cash are also presented in more detail.

4.1. Nominal cash volume

Examining the nominal data of the central banks of the euro area and the Central Eastern European region, we can establish that the strong increase in cash demand in recent years was not only typical of Hungary (*Figure 3*). Taking 2008, representing the start of the economic crisis, as a basis, we can observe that the volume of cash in circulation grew at a rate similar to Hungary in Romania and – until 2016 – in Poland as well. A constant, although in nominal terms considerably lower increase was seen in the Czech Republic and the euro area. It must, however, be emphasised that the examination of the nominal change in cash volume has very slight relevance if the economic indicators (e.g. inflation, income changes, interest rate level) typical of the given country are not taken into consideration.

Figure 3
Growth in the value of cash in circulation, shown as a percentage, in some countries of Central Eastern Europe and the euro area (2008 = 100%)

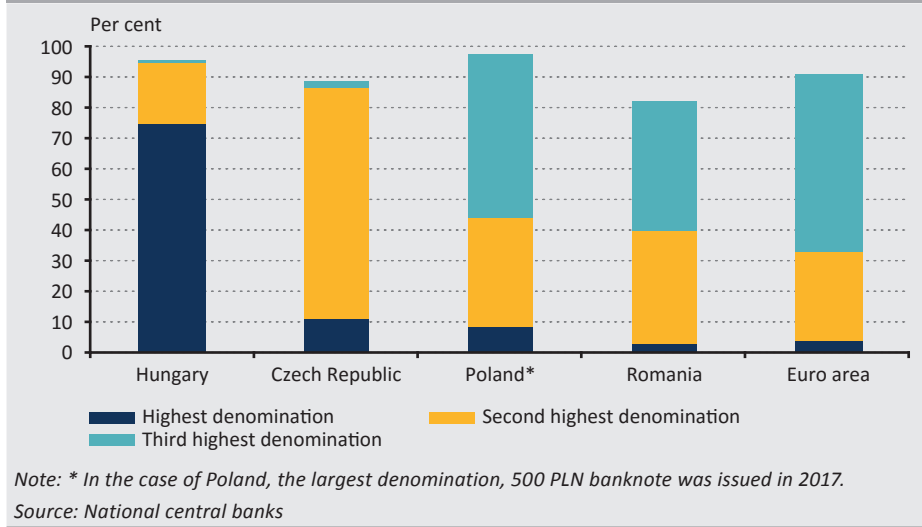


As is the case in Hungary, it is not typical of the region that the highest-denomination banknote represents the majority of the cash volume in circulation. In recent years, a shift of the denomination structure towards higher denomination banknotes was seen essentially everywhere, but the increase in demand typically concerned the second or perhaps third highest denominations (*Figure 4*). The situation is slightly nuanced by the fact that, adjusted for purchasing power parity,³ the highest banknote denominations of the euro area⁴ and the examined countries are all (1.5–2.5 times) greater than the 20,000 HUF banknote, and that these high-value banknotes are typically not or are only rarely offered by ATMs. This allows us to reasonably assume that in these cases, savings purposes could also be significant for the second or perhaps the third-highest denominations as well. These data, therefore, do not allow us to clearly state that transactional demand in the neighbouring countries would have had proportionally greater effect on the growth of cash in circulation than in Hungary.

³ The source of PPP conversion values is the World Economic Outlook (October 2019) database compiled by the IMF.

⁴ For the euro area, we considered the 200 EUR banknote to be the highest denomination, as the EUR 500 note – although still considered legal tender – has not been issued since April 2019, and its volume in circulation recently has essentially stagnated.

Figure 4
Ratio of high denomination banknotes in the increase of total cash in circulation between 2008 and 2018 in some countries of Central Eastern Europe and the euro area

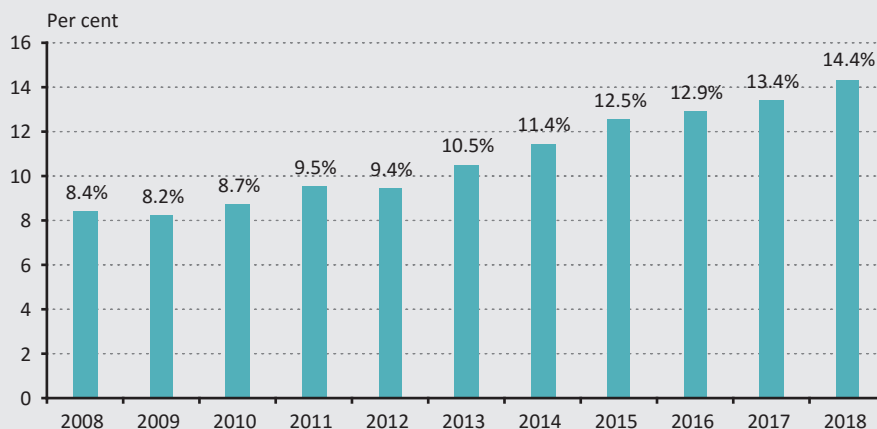


An illustrative piece of data on the global state of cash is that, according to data from central banks, there are only two countries in the developed world that have seen a lasting nominal decline in the cash volume in circulation in recent years: Norway and Sweden. In the case of the former, the decline has been recorded only since 2015, while for the latter, the reduction in banknotes and coins in circulation has been ongoing for 10 years, but surprisingly the trend turned around in 2018. The value of cash in circulation in Sweden increased by 7.2 per cent during the year. The possible reasons for the earlier decrease are detailed in *Sub-chapter 4.4.1*.

4.2. Cash-to-GDP ratio

In respect of domestic data pertaining to this indicator, we can state that between 2012 and 2018 – similarly to nominal value – the cash-to-GDP ratio increased substantially in Hungary, rising by more than 150 per cent over the course of six years (*Figure 5*).

Figure 5
Cash as a percentage of GDP in Hungary between 2008 and 2018



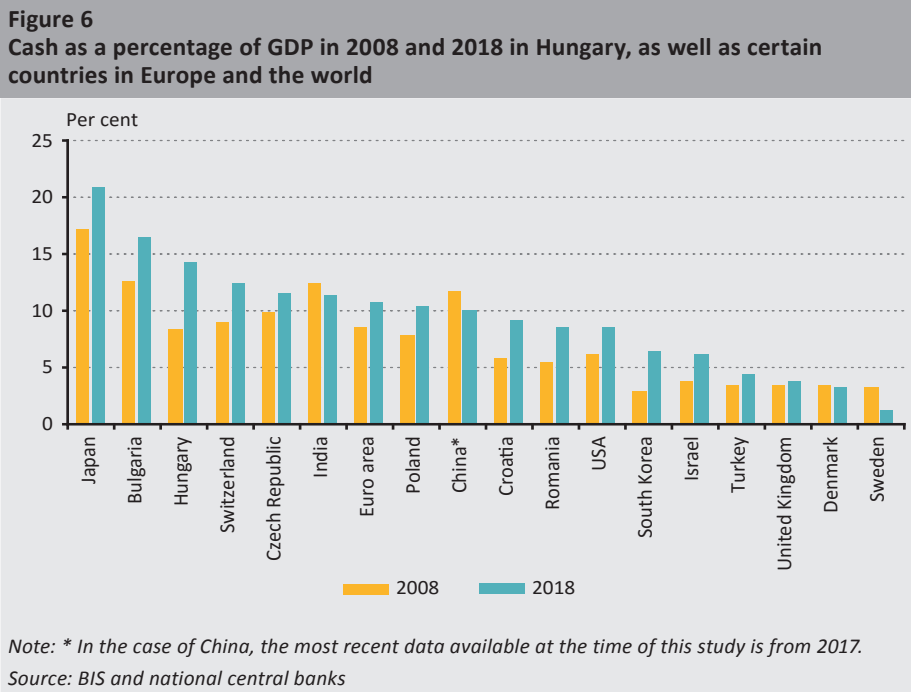
Source: MNB

Comparing the Hungarian values for 2018 with the euro area⁵ and the EU Member States which have their own currency (as well as Switzerland), we come to the same conclusions as in examining the nominal increase. The Hungarian cash-to-GDP ratio can be considered high in a European comparison, but the difference is not outstanding, neither compared to the neighbouring countries nor to the euro area (*Figure 6*). According to the *World Cash Report* issued by British group *G4S* (2018), one of the world's largest cash logistics providers, aggregate global cash in circulation relative to GDP has been continuously increasing since 2011, with its current estimated value at close to 10 per cent. The aggregate value for Europe is only slightly lower, at around 9 per cent, and is also characterised by continuous growth.

It is worth noting that the value of the indicator for the euro area is 2 percentage points higher than the Romanian data, and that – extending the comparison to other continents as well – it considerably exceeds the value for Turkey and is only 0.6 per cent behind the figure for India. This illustrates well that the cash-to-GDP ratio is not always suitable for comparing the level of development of the payment infrastructures of various countries, the rate of cash usage or the attitude of the population and companies towards cash. The fundamental reason for this is the significant difference between the central bank base rate in developed and developing countries both today and historically. Differences in foreign demand for the currency of a given country may also be substantial in some cases. Albeit

⁵ Based on the location of issuing cash into circulation, the cash-to-GDP ratio can also be estimated separately for the various Member States of the euro area, but these estimates are highly inaccurate on account of the extensive flow of cash between these countries, and can only be used to draw reliable conclusions to a limited extent; consequently, they are not taken into consideration in this analysis.

to a considerably lesser extent than the aspects above, cultural factors influencing the consumption and savings habits of households may also play a role.



Khiaonarong and Humphrey (2019) provide further criticism on using the cash-to-GDP ratio. They are of the opinion that the ratio would only have the meaning attributed to it if it did not take the whole of GDP, but only its components arising from consumption into consideration, as this is the area where cash would actually be used. However, applying their proposal is made very difficult because the necessary data in many of the countries examined in this paper are not available. In addition, the authors only take into consideration to a limited extent that the majority of the cash volume presumably serves savings and not consumption purposes.

4.3. Factors explaining the domestic increase of cash in circulation

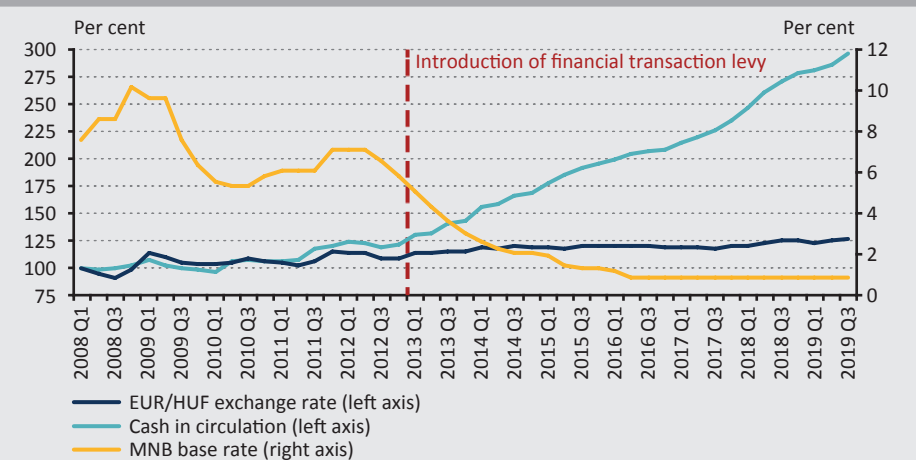
As previously presented, the increase of cash in circulation in Hungary is almost exclusively the result of rising demand for higher denominations, and this phenomenon is also observed – to varying degrees – in some of the neighbouring countries.

Given that higher denominations primarily serve savings purposes, we can conclude that changes in household savings habits may have a significant impact on cash demand. The opportunity costs of cash holding depend strongly on the central bank base rate, meaning that the development of the base rate level may

explain the different changes in cash volumes in the given countries as shown in *Figure 6*. This is particularly striking in the case of Japan, where the base rate – that has been near zero since the mid-1990s – is accompanied by a cash-to-GDP ratio that is outstanding even by global standards, but it is also true for Turkey or India that interest rates which are high in an international comparison result in lower cash-to-GDP ratios than in countries of the developed world. Although the growth in Hungary observed since 2012 is significantly impacted by the low interest rate level (see for example *Lybek – Dybczak 2019*), this in itself does not explain the differences compared to the neighbouring countries, as this phenomenon can be seen in practically all countries in Europe.

Further interesting conclusions may be drawn for Hungary from the joint examination of cash in circulation, the central bank base rate and the euro exchange rate (*Figure 7*). We can observe that the EUR/HUF exchange rate and the volume of cash in circulation typically changed in an identical direction between 2008 and 2012, meaning that the weakening of the HUF against the EUR was accompanied by an increase in cash demand. As far as key international currencies are concerned, similar phenomena are seen (see for example *Miller 2017*), but the underlying reason for these is primarily demand from abroad, which in the case of the forint is presumably negligible. In the period reviewed, the role of the exchange rate – as the indicator expressing the stability and performance of the financial-economic system – in Hungary may be more dominant, as the sudden dips of the HUF were typically linked to crisis situations, which may have also been accompanied by a loss of confidence from households in the banking system.

Figure 7
Percentage changes in the value of cash in circulation and the EUR/HUF exchange rate, and the central bank base rate between 2008 and 2019



Note: For cash in circulation and EUR/HUF exchange rate: 2008Q1 = 100%

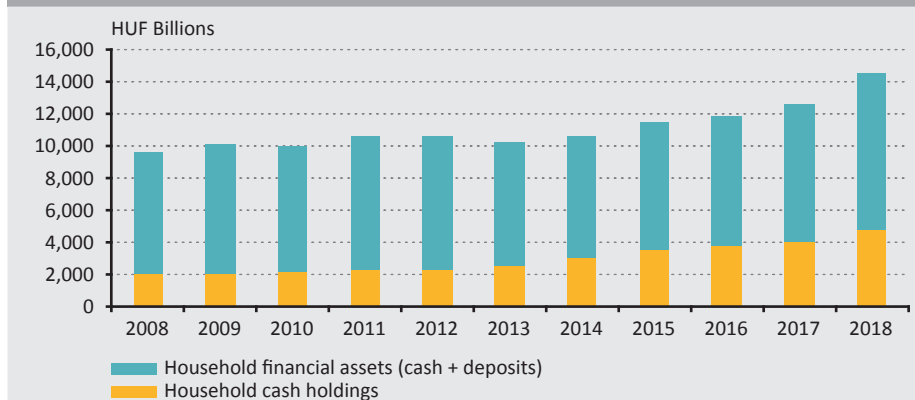
Source: MNB

Figure 7 shows the breaking point in the data series in 2012–2013, i.e. the acceleration of the increase in cash volume, which more or less coincides with the start of the rate-cutting period. In the lower interest rate environment, cash is no longer simply a ‘safe haven’, but also a realistic form of savings for the long term. At the same time, the financial transaction levy was also introduced, which also may have had a significant impact on cash demand, primarily through the transactional use of higher denominations (for more details, see the end of this Sub-chapter).

The European Central Bank coordinated a series of surveys in two phases in recent years on household savings habits as well as the factors impacting these habits, and both the MNB (*MNB 2017* and *MNB 2019b*) and the National Bank of Poland (*NBP 2015* and *NBP 2017*) were involved in these surveys. The common conclusion drawn from the surveys is that in the years reviewed, in line with the increase in incomes, the value of households’ financial assets also rose substantially in both countries, but for questions pertaining to cash holdings, the willingness to respond was extremely low, making it more expedient to rely on data from national accounts.

HCSO data between 2008 and 2018 clearly show that starting from 2012, the value of cash holdings increased continuously and at a strong rate, while the expansion of deposit volumes is considerably more moderate (*Figure 8*). Impressively, the ratio of cash among household assets grew from 21 per cent to 33 per cent between 2012 and 2018. According to *Jobst – Stix (2017)*, the possible reasons for this could include the financial and socio-economic uncertainty caused by the economic crisis of 2007–2009 and the crisis in the euro area between 2010–2013, which may have pushed households towards holding cash, which they perceived

Figure 8
Change in the financial assets and cash holdings of Hungarian households between 2008 and 2018



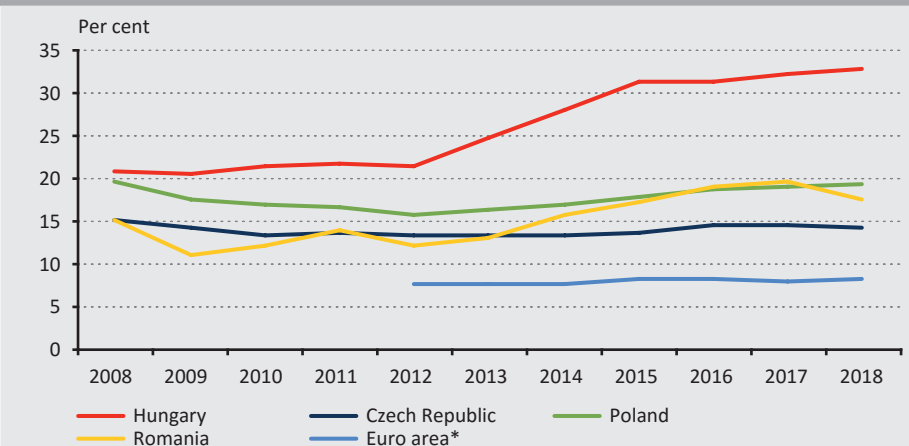
Source: HCSO

as more reliable. In Hungary, this effect and – as a result – the loss of confidence in banks may have been spurred by the liquidation of numerous brokerage firms and credit institutions in 2014 and 2015.

The objectives of the Hungarian Government Security Plus product issued from June 2019, offering above-market returns with low risk, included reducing the cash hoarding of households, but MNB data show that this was not realised in the first few months. Cash in circulation increased – albeit at a decelerating rate – between June and September 2019 versus the same period of the preceding year (rising by HUF 135 billion and HUF 278 billion, respectively), and this essentially coincides with the trends observed in the first five months of 2019, which also reflect deceleration (growth of HUF 62 billion and HUF 350 billion, respectively).

The rise in the ratio of households’ financial assets held in cash stands out, both in comparison to neighbouring countries and the euro area, although a slight shift towards cash holdings can be observed for Romania and Poland as well starting from 2012 (Figure 9). Lybek – Dybczak (2019) examined the effects of banking sector crises and the resulting economic uncertainty on cash volume, specifically looking at Hungary, using data from between 2000 and 2018 and applying regression analysis, but the authors were unable to show any significant correlation. Although the effect of the above phenomena on households’ way of thinking is difficult to quantify, diminishing the reliability of results, is still allows us to conclude that the crises of the past decade in themselves do not provide sufficient explanation for the strong growth in Hungarian cash demand.

Figure 9
Ratio of cash in households’ financial assets between 2008 and 2018 in some Central Eastern European countries and the euro area



Note: * In the case of the euro area, the data series is only available from 2012.

Source: Calculation based on HCSO and Eurostat data

We should also take into consideration the possibility that, in some cases, high denominations may also serve transactional purposes, meaning that in addition to long-term savings, holding cash could also be aimed at settling future transactions. According to the previously mentioned results of *Flannigan – Parsons (2018)*, such transactions could include payments related to home purchases and renovations, although the real estate price indexes of Hungary and the neighbouring countries (using MNB and Eurostat data) show no significant correlation with demand for cash; this is well illustrated by the fact that between 2008 and 2018, Romania saw a strong increase in cash volume while the price index dropped.

The financial transaction levy – which in this particular form is only typical of Hungary – may have an impact pointing to the transactional use of high denominations, as it concerns retail and corporate banking transactions (in the case of the former only over HUF 20,000) as well as cash withdrawals (with the exception of the free-of-charge withdrawal twice a month, in a value of HUF 150,000 at the most, as set out by legal regulations). According to the survey-based results of *Belházyné et al. (2018)*, large-amount cash transactions became more frequent between 2013 and 2017 in the Hungarian SME sector, while according to *Végső et al. (2018)*, in a European comparison Hungarian households typically withdraw larger amounts of cash to optimise banking costs, which necessarily also involves withdrawing higher denomination banknotes. According to the regression analysis by *Lybek – Dybczak (2019)*, the introduction of the financial transaction levy explains the stronger growth in cash demand observed after 2013 (*Figure 7*). However, according to the authors, the new national instant payment system set to launch in March 2020 and impacting all banks, could – with suitable pricing – play a key role in mitigating the rate of cash transactions.

4.4. Lessons from international examples

The following section presents the cash landscape characteristics of a few countries not discussed in the previous sub-chapter, but shown in *Figure 6*, primarily focusing on states that have unique properties that can be well outlined.

4.4.1. Sweden

Among the countries examined, the situation of *Sweden* is perhaps the most unique, as – except for Norway where this trend started only in 2015 – this is the only country where a lasting, continuous drop in nominal cash volume was seen in the past decade, while the cash-to-GDP ratio also halved between 2012 and 2018. According to *Arvidsson (2019)*, this phenomenon owed much to the decision of the central bank of Sweden providing a very short period of only a few months to exchange old, high-denomination banknotes withdrawn from circulation when it issued its new banknote series in the 2010s. Together with a wave of bank robberies committed in the country shortly before which received significant

publicity, this greatly undermined confidence in cash as a simple and secure means of savings. At the same time, the Swedish government implemented measures to combat the shadow economy and to reduce tax avoidance, which specifically targeted the construction industry and various household services (e.g. gardening, child supervision), thereby primarily reducing transactional cash demand but, to a smaller extent, cash demand for savings purposes as well. In addition, *Arvidsson (2019)* and *Engert et al. (2019)* emphasise the role of the spread of cashless bank branches which, on the one hand, motivated retailers to favour electronic payments in both buyer and supplier relationships and, on the other, by limiting the use of cash, presumably continued to lower the popularity of holding savings in cash.

Overall, we can establish that Sweden managed to accomplish a lasting, significant reduction of cash in circulation primarily by reducing cash held for savings purposes. The reduction of transactional cash usage was of a similar rate in other developed countries, including Norway, Denmark (*Smestad 2017*), Canada (*Engert et al. 2019*), the Netherlands (*Jonker et al. 2018*) or the United Kingdom (*Greenham – Travers-Smith 2019*), but this in itself was insufficient to reduce nominal volume.

Moreover, it should also be mentioned that following the 2002 issue of euro banknotes, Finland (neighbours to Sweden) saw a stronger-than-expected surge in cash demand, which was not supported by local household transaction data (*Kangas 2019*). As this period more or less coincides with the 2006–2007 start of the drop observed in Sweden, it is also possible that the Swedish population keeps some of its cash holdings in euro banknotes from Finland instead of Swedish krona.

4.4.2. Israel

From a Hungarian perspective, the example of Israel has particular relevance, as it is one of the few countries where – similarly to Hungary – the two highest-denomination banknotes⁶ represent the majority of cash in circulation (54 per cent and 27 per cent, respectively, according to end-2018 data from the central bank). According to the assumptions of the Israeli government, high-denomination banknotes facilitate tax avoidance as well as the operation of the shadow economy, which is why a bill was submitted in 2015 aimed at prohibiting high-volume cash transactions as well as exaggerated cash holdings mainly rooted in cultural reasons, which applied to both business payments as well as payments between private individuals (*Fein 2018*). After numerous amendments and lengthy social debate, the bill was passed by the Israeli parliament in February 2018, with the law entering into force on 1 January 2019 (*Fein 2019*).

⁶ As per the exchange rate in December 2019, the value of the 200 ILS note was approximately HUF 17,000.

The law capped cash transactions at ILS 11,000 (after adjustment for purchasing power parity approximately HUF 380,000) in business transactions, and at ILS 50,000 (after adjustment with purchasing power parity approximately HUF 1.74 million) for transactions between private individuals. According to the data of the Bank of Israel, the value of cash in circulation in the country in 2019 stagnated afterwards, but this is not considerably different from the trend of previous years showing decelerating growth. This is why it may be useful down the line to examine whether the composition of Israeli cash volume changes in the long term as a result of the act, whether the expected growth in tax revenues and the suppression of the shadow economy is realised, and whether the measure causes problems for the part of the population that has no access to bank accounts.

4.4.3. India

In 2016, the government of India turned to an even more drastic method, so-called demonetisation, to suppress large-scale cash transactions and cash holdings linked to the shadow economy. With an unexpected announcement by Prime Minister Narendra Modi on 8 November, the highest-domination 500 INR and 1,000 INR banknotes were withdrawn from circulation with effect at midnight the same day, with the government providing only until the end of the year to exchange them. According to the report of the *Reserve Bank of India (2017)*, more than 99 per cent of withdrawn banknotes were exchanged by the deadline set, but the cash-to-GDP ratio only dropped temporarily.

Accordingly, the measure accomplished its initial goal only to a limited extent, but it did lead to a serious crisis nationwide, which in turn also impacted agricultural production and employment. The temporary cash shortage arising during demonetisation, in contrast to the government's intentions, reinforced the role of the informal economy, and overall had a highly negative impact on poorer classes living in rural areas that had no large amount savings or access to bank accounts (*Guérin et al. 2017*). In addition, *Chodorow-Reich et al. (2018)* used mathematical models to confirm that regions where cash shortage arising as a result of demonetisation was greater saw a more substantial decline in both the performance of the economy and lending.

4.4.4. China

Chinese households have a traditionally high savings rate – which has actually started dropping in recent years – with a particularly high share of cash holdings (*Zhang et al. 2018*). As a result of the financial liberalisation seen in the 2010s and the higher yields offered by the increasingly robust shadow banking system (*Elliott et al. 2015*), the popularity of cash holdings seems to be dropping today, and one consequence of this is a decline in the cash-to-GDP ratio. Another contributing

factor may be the relatively low value of the highest banknote denomination.⁷ It must also be noted that the Chinese payment landscape is strongly characterised by the swift spread of innovative cashless solutions. By this, we primarily refer to mobile phone payments (*G4S 2018*), but this is also where payment methods based on facial recognition (i.e. not requiring any other tools for the transaction) first appeared in great numbers.

4.4.5. South Korea and Japan

These two countries primarily merit mention because in the South Asian region these were the only two countries where a strong increase in the cash-to-GDP ratio was observed in recent years. In Japan, this growth started from an already very high base, the main reason for which according to *Fujiki – Nakashima (2019)* was cash demand for savings purposes, which accounts for 40–45 per cent of total volume. According to the authors, the expansion of cash holdings in recent years and even today exceeds the reduction arising from the spread of electronic payment solutions. The reasons for the high volume of cash holdings include the base rate that has been near zero since the mid-1990s, the ageing of society and, on a related note, attempts to avoid the exceptionally high inheritance tax (*Shirai – Sugandi 2019*).

In the case of South Korea, the cash-to-GDP ratio was considered to be low back at the beginning of the 2010s, but in the past decade the volume of cash in circulation increased so dynamically that its rate relative to GDP growth significantly exceeded even the values typical in Hungary (*Figure 6*). To a great extent, this was potentially the result of savings held in cash, which is also confirmed by the decision of the Bank of Korea to issue, prior to this increase, a new banknote in 2009 with a value higher than any of the denominations in circulation until that point.⁸

It should also be mentioned that at the same time, based on data by the central bank, transactional cash usage showed a continuous, swift decline, with today more than 80 per cent of payments made electronically. Furthermore, in 2017 (on a trial basis), the government launched the ‘coinless society’ programme, as part of which consumers can choose to load the change they receive from small purchases directly to pre-paid cards or their bank account.⁹

⁷ As per the exchange rate in December 2019, the value of the CNY 100 note was approximately HUF 4,200.

⁸ As per the exchange rate in December 2019, the value of the KRW 50,000 note was approximately HUF 12,600.

⁹ Currency News (2017): *South Korea Plans to go ‘Coinless’*. Currency News, 2017, 15 January, p. 3.

5. What will the future bring?

Given that the cash demand of both the whole world economy and the various states is the result of highly complex processes, related forecasts often prove highly inaccurate. This chapter briefly introduces the potential methodologies of forecasting as well as their limitations, and then presents the possible future of a cashless society along with the social risks this entails, also touching on the issue of central bank digital currency.

5.1. Opportunities of forecasting cash demand

Cash circulation and demand for cash have undergone numerous structural changes in the past decade, which also makes forecasting difficult because as a result, past data only have limited explanatory power regarding the future. The associates of central banks and analysts project the continued reduction of cash usage in the developed world (for example *Lalouette – Esselink 2018* in respect of the euro area, or *Perkins 2019* for the US), but it has become clear that this phenomenon does not necessarily result in a drop in cash in circulation.

Miller (2017) uses the methodological framework developed by the Bank of England to present the importance of breaking the demand for cash down into components,¹⁰ and also that to achieve appropriate robustness, in addition to econometric modelling – which for instance takes household consumption, the interest rate environment and exchange rates into account as well – it is also necessary to consider qualitative factors, such as potential changes in the regulatory environment or the various directions of technological progress. In respect of cash, he also highlights the importance of forecasts having the primary objective not of determining accurate values in the future, but rather defining the range of possible outcomes, along with the accompanying probabilities.

5.2. Vision and risks of a cashless society

While the complete disappearance of cash may seem very distant when one examines the aggregate Hungarian or European Union data, officials at the Bank of Sweden are already trying to prepare the country's population for the possibility of a cashless society (*Skingsley 2018*). However, going cashless does not represent positive changes for all. According to an analysis by *Greenham – Travers-Smith (2019)* – which formulated recommendations for Great Britain, which is at the forefront of reducing transactional cash usage – 12 per cent of the British population, by their own admission, would be unable to carry out day-to-day transactions without cash. This group primarily includes the elderly and low-income people, meaning that the abolishment of cash would have the greatest impact on societal

¹⁰ Transactional cash, cash for savings purposes, foreign demand, and cash usage by the shadow economy, for more details see *Chapter 4*.

classes that are already vulnerable. The end of potential anonymity may also have a negative impact on many, and the household surveys conducted in the countries concerned (for Denmark, for example, see *Smestad 2017*) clearly show that many people also want cash to remain accessible for purely subjective reasons.

Beyond social risks, moving payments fully to electronic platforms also entails other, primarily technology-related risks. According to *Almedia et al. (2018)*, in a cashless society the potential errors or breakdowns of communication and electricity networks or the servers operating payment systems – that may be caused by natural disasters or even external attacks – would represent a risk considerably greater than those seen currently. Based on the Fed's data (*Bau – O'Brien 2019*), recent natural disasters in the United States (Hurricane Harvey, for example, that swept through Texas and Louisiana in 2017) generated extremely high cash demand locally in the regions affected, even in the weeks preceding the actual disaster. This phenomenon confirms that the role of cash as a security reserve continues to be extremely important for households.

As a result, public discourse and communication by central banks is increasingly striving to replace the concept of 'cashless' and trying to emphasise the use of 'less cash' (*John 2019*). Although the continuous drop in transactional cash usage over the long term does point to a complete disappearance of cash as a means of payment, on the one hand, based on current experiences this does not necessarily incur the elimination of cash as a form of savings and, on the other, the social concerns regarding cashlessness may also justify maintaining the cash infrastructure for additional decades.

A key element of visions aimed at completely getting rid of banknotes and coins is the option of central bank digital currency. This solution ideally allows for the elimination of manufacturing and distribution costs linked to cash by ensuring – with appropriate state and central bank supervision – that no part of the population is under threat of being excluded from the financial system, as this would allow for the elimination of the monopoly of commercial banks and card companies in the field of electronic payments. Although we see numerous pilot and research projects examining the possibilities of implementation (Canada, China, Norway, Uruguay as per *Mancini-Griffoli et al. 2018*), there are currently no practical examples of central bank digital currency today, with perhaps the plans of the Bank of Sweden in the most advanced phase (*Söderberg 2018*). The BIS (*Barontini – Holden 2019*) recently concluded an international survey on this topic, while the IMF (*Khiaonarong – Humphrey 2019*) published a comprehensive study on the same.

6. Summary

If we ask the question of whether we use too much cash, the best answer would be that although we are not using too much to make payments, we can still state that compared to the examples seen in neighbouring countries, the volume of cash in circulation today in Hungary is too high, but it primarily serves savings purposes. There is still room to grow in increasing the share of electronic payment solutions in Hungary, but we can establish that the Hungarian population is using less and less cash in line with international trends. In contrast, the volume of cash in circulation in both Hungary and the majority of developed countries is continuously rising, typically at a rate even greater than GDP growth. The key drivers of the change in Hungary – not in unprecedented fashion – are higher-denomination banknotes which, beyond making payments, households also use as an instrument of savings. This may be explained by, among other things, the permanent low-interest rate environment, the uncertainty generated by the economic crises of the past decade as well as the resulting distrust in the banking system. The role of the financial transaction levy is not negligible either, which is assumed to have an impact on the rate of higher-value cash transactions.

At first glance, the continuously increasing cash demand in Hungary may seem extreme, however – even at an international level – there are very few examples of a lasting reduction of cash in circulation, and in all such cases accomplishing this required the concurrent existence of multiple factors aimed at preventing both the use and holding of cash. In the case of Hungary, an achievable goal seems to be to reduce the average growth rate of cash in circulation to the levels seen in the euro area or the Czech Republic in the short term. The rollout of the instant payment system in 2020 could represent a major step forward down the line in accomplishing this, but reducing the fees charged for banking services or the continued promotion of attractive and accessible savings instruments could also induce favourable changes (such as the Hungarian Government Security Plus issued in 2019). However, one important lesson to draw from recent international trends and research based on these trends – a lesson that could also impact domestic cash demand in the future – is that in the wake of a global economic recession or crisis, the cash demand of households may increase significantly, even over the long run.

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Studying Poverty in Economics – The Work of the 2019 Nobel Prize Laureates*

Klára Major

In 2019, the Nobel Prize in Economic Sciences was awarded jointly to Abhijit Banerjee, Esther Duflo and Michael Kremer “for their experimental approach to alleviating global poverty”. Their work gave rise to the transformation of development economics both in terms of approach and methodology: the effect of the development programmes aimed at reducing poverty is now typically measured by randomised controlled trials, enabling researchers to reveal causal effects. Throughout their studies, the authors relentlessly seek the drivers of human behaviour with a view to enabling the design of effective development programmes based on a deeper understanding of the nutrition, health, education, finances, etc. of the poor.

Journal of Economic Literature (JEL) codes: B31, B41, O12, C93

Keywords: poverty, development economics, Nobel Prize in Economic Sciences

1. Foreword

In 2019, the Nobel Prize in Economic Sciences¹ was awarded jointly to Abhijit Banerjee, Esther Duflo and Michael Kremer “for their experimental approach to alleviating global poverty”. Traditionally, the Noble Prize goes to economists who introduce a novel approach to scientific thinking with a sizable impact on contemporary researchers, often receiving this prestigious award as a culmination of their scientific career. How should we take measure of the 2019 Laureates? How significant is their contribution to economic sciences as a whole? Can we deem their nomination this year a surprising choice of the Committee?

To begin with, let us look at the numbers and a few dry facts. It is a fact that among the 84 Laureates in Economic Sciences who have received the prize since 1969, Esther Duflo is only the second female researcher. It is another fact that, at 47, she is also the youngest Laureate among the winners of the Nobel Prize in Economic Sciences. But she is not the only one who stands out from the crowd for her youth:

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

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¹ Specific title: Prize in Economic Sciences in Memory of Alfred Nobel.

there were only four Laureates younger than Michael Kremer and twelve younger than Abhijit Banerjee in the history of the Prize. And as a team, at the average age of 58, the three of them were 5 years younger on average upon being awarded the Prize than the “second youngest team” – Robert C. Merton and Myron S. Scholes. Contrary to the practice of previous years, this year’s overall team of Laureates is the youngest so far: while being recognised may seem surprising at this early age, it is by no means an accident.

This is evidenced by the numbers themselves (*Table 1*). The science-metrics of the three Laureates indicate significant scientific performance both in terms of the number of papers and volumes and the number of citations. The three Laureates achieved an impressive position in the worldwide ranking of the international economic researcher community based on aggregate scientific performance: Banerjee ranks 73rd, while Duflo and Kremer rank 97th and 746th, respectively. Accordingly, all three economists are in the top 1.5 per cent, although the scores of Duflo and Banerjee put them in the top 1 thousandth.²

	Abhijit Banerjee	Esther Duflo	Michael Kremer
Publications	272	219	130
Independent citations	8,538	9,390	3,033
Hirsch-index ³	44	42	28

Source: *ideas.repec.org*

For now, however, let us continue with the facts. It is yet another fact that in this day and age – the age of artificial intelligence, space research and digitisation – about five million children under the age of 5 still die of diseases that could have been prevented or cured with inexpensive treatments. Moreover, in 2015 10 per cent of the world’s total population – more than 700 million people – lived in extreme poverty. This is at a time when in most developed countries health problems are far more related to obesity than to the lack of food. There is an endless list of devastating poverty statistics and quasi facts; indeed, it is impossible not to be confronted by these facts unless we consciously try to ignore them.

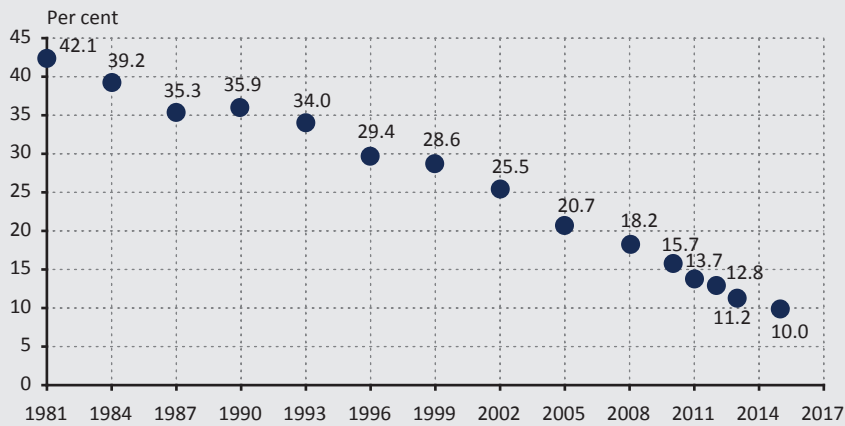
Poverty as a phenomenon and a problem is nothing new. The history of mankind can be viewed as breaking out of the shackles of poverty; from a historical perspective, the percentage of those living in relative welfare increases continuously. Similarly, focusing on past decades it becomes evident that the percentage of those living

² Based on the science-metrics data of the *ideas.repec.org* website. The list of the top 5 per cent contains 2,880 names.

³ The Hirsch-index or h-index – in short – is an indicator of scientific effectiveness; the higher its value, the greater the researcher’s impact, see in more detail in *Hirsch (2005)*.

under the poverty threshold has steadily declined (*Figure 1*), falling to around one quarter of the value recorded in 1981. While the indicators expressed as population ratios show significant improvement, absolute numbers appear to improve at a slower rate: between 1981 and 2015, the number of those living below the poverty threshold dropped to 734 million from 1.9 billion; in other words, in three and a half decades it merely halved. This is a meagre result in view of the fact that global GDP grew by 250 per cent over the past three decades (since 1990), and even GDP per capita rose by 77 per cent. We might add to the list of stunning quantitative facts that those living under the poverty line – 10 per cent of the population – subsist on incomes that account for an infinitesimal 0.5 per cent of global annual income.

Figure 1
Poverty headcount ratio as a percentage of global population



Source: World Bank

Banerjee, Duflo and Kremer made a contribution to dissecting the issue of poverty and fighting poverty in such a way that they radically broke with other contemporary approaches. Rooted in growth theory, the *standard* approach to development economics examines the issues of economic growth and convergence essentially at the level of and with the tools of macroeconomics. An excellent overview of this approach is, for example, Debraj Ray’s textbook entitled *Development Economics*, published in 1998, while the historical background of the approach is presented in *Thorbecke (2019)*. The macro approach to development economics identifies poverty with the slow growth of GDP and income and accordingly, it takes account of individual factors required for growth, concentrating primarily on the accumulation of production and human capital. The fight against poverty, in turn, is mainly embodied in aid programmes that are aimed at accelerating the accumulation of scarce physical and human capital elements in poor countries, essentially by way of aid. The deficiencies of this approach are convincingly

highlighted in *Abhijit Banerjee and Esther Duflo (2005)*, in *Chapter 7* of the first issue of the “Handbook of Economic Growth”.

Regarding the work of Banerjee, Duflo and Kremer – the three economists who received the 2019 Noble Prize – the Nobel Committee highlighted the following:⁴ the new experiment-based approach of the three Laureates has transformed development economics. Their approach is founded on microeconomics, and the authors rely on microeconomic data to identify and measure the impact of development programmes aimed at fighting poverty. The authors have changed research methods and approaches fundamentally in an effort to identify those aid programmes that truly improve our ability to fight poverty in practice.

1. In the mid-1990s, the Laureates conducted numerous controlled, randomised trials in Kenya to measure the impact of education. Their research findings significantly improved our understanding of *how* aid programmes can contribute to the accumulation of human capital.
2. They have also conducted numerous, similar research programmes in emerging countries, amassing an extraordinary amount of empirical facts and information in the process. Their regular, systematised publication of this information has transformed (public) thinking.
3. They enhanced their experimental research methods and attempted to assess whether the results of their experiments could be generalised (i.e. the issue of external validation).

In the following, we select and discuss a few important elements from the list above. Having said that, their results are not discussed comprehensively here; we merely point out the methodology applied by the authors and the significance thereof, and summarise a few of their results. We sincerely hope that by doing so we will raise the interest of Readers yet unfamiliar with the work of the Laureates as indeed, their achievements and results are not only important and useful but also very interesting, and their presentation is nothing short of brilliant.

2. Controlled randomised trials

Fighting poverty needs answers to such questions as the impact of education on productivity, or how the number of students in a classroom affects the educational attainment of the students. We need to explore causal relationships to answer these questions, and in order to do so, we should be able to answer such hypothetical questions as “how would the students’ academic performance have changed *if they had not participated* in the programme”? The latter scenario

⁴ See *The Royal Swedish Academy of Sciences (2019)*.

is non-existent, given that a person either participated in the programme or not and accordingly, only one side of the comparison is available for each individual person. Observing the same person over time and comparing his status before versus after the programme is *usually* unsuitable for answering this question because typically, numerous other factors have also changed in the meantime and thus, based on the changes over time, the impact of the programme cannot be distinguished from the impact of other changes.

The solution lies in control groups: control groups consist of persons who did not participate in the programme, and *had they participated, their results would have been similar to* those of the actual participants. As such, by way of a properly selected control group we can estimate the general impact of the programme on the treatment group, but we still cannot identify the programmes' effect on individual participants. The greatest challenge, however, is the fact that the participants of most development programmes and those not participating in the programme are typically not similar to each other in respect of the expected impact of the programme; therefore, the comparison does not make sense. For instance, if participation in the programme is organised on a voluntary basis, the level of motivation of the participants is not the same as that of non-participants. The resulting distortion is referred to as selection bias. It may arise not only from the voluntary nature of participation in the programme; this phenomenon can be observed in numerous other cases as well, for example, where participation in a programme is conditional upon some criterion such as a pre-specified income level above which a person may not participate. In such a case persons with other income levels are not suitable to be part of the control group. This also means that if all members of a target group participate in the programme, there are no subjects who would be suitable to comprise a control group. In this case, we cannot measure the impact of the programme.

Randomised controlled trials are conducted to strip out the selection bias, in the course of which in order to measure the impact of the intervention programme, a part of the target population is selected and each individual in the group is randomly assigned to the treatment group or to the control group. The treatment group participates in the programme, while the control group does not. The impact of the programme is derived from a comparison of the average dependent variables of the two groups. In a development economics context, further procedures often need to be applied in order to exclude the selection effect. *Duflo et al. (2006)* provide an excellent summary of these procedures.

Another significant advantage of randomised controlled trials over other programme design methods is their ability to enable researchers to measure the impact of the programme; in other words, they explore *causal* linkages. On an empirical basis, the definition of causality is by no means a trivial task; it is easy

to detect obviously unrelated time series that exhibit (ostensible) covariance.⁵ An empirical data analysis typically explores *correlations*, which merely means, in and of itself, that two time series move together; for example, they take higher or lower values in tandem. But how should we interpret this phenomenon? There are at least three – but often more – possible interpretations: it is possible that X causes Y or vice versa, but it is also possible that a third, Z phenomenon causes both X and Y. It often happens during time series comparisons that unrelated phenomena appear “connectible” merely because both increase or decrease over time. Determining causality is critical for researchers seeking to understand the effect or the significance of individual programmes, and virtually the only possible way to do so today is through randomised controlled trials.

Obviously, this research method is not new; in the second half of the 20th century it became the *standard* method of pharmaceutical research in the clinical trial phase, for the purposes of measuring the effect of pharmaceutical products. There are also a number of early examples for their use in economics⁶ as well; however, the application of randomised controlled trials became a standard approach mainly in the 1990s both in the studies of the three Laureates and through their example, in the work of others. Duflo and Banerjee address methodological issues in numerous studies (e.g. *Banerjee et al. 2010a*; *Duflo et al. 2006*; *Banerjee et al. 2017*). Essentially, the application of randomised controlled trials enabled researchers to answer previously unanswerable questions.

3. Exploring causal effect: the drivers of human behaviour

In order to explore causal effects, it is fundamentally important to understand the drivers of human decisions; i.e. to understand the way in which incentives, constraints and information influence human decisions. For example, the population of emerging countries is exposed to numerous health risks – such as malaria or (viral) gastroenteritis – that can be prevented or cured with relatively inexpensive treatments. Malaria vaccine costs far less than the extra income that could be realised by preventing the disease. Similarly, the cost of the chlorine required for disinfecting drinking water is only a fraction of the costs of the disease or, for that matter, the complications thereof. Why is it, then, that the use of vaccines, anti-malaria nets, or chlorine for water treatment is often neglected in emerging countries? A lay observer would probably conclude that health is not the first priority of the people living in these countries; consequently, they fail to do something about preserving it. However, interview-based qualitative studies

⁵ The literature refers to this phenomenon as “spurious regression” – see, for example, *Greene (2012), Chapter 21.2.2*.

⁶ For testing the effects of negative taxation, see, for example, *Hausman – Wise (1985)*, or for measuring the welfare effects of social programmes in the 1980s and 1990s, the study of *Manski – Garfinkel (1992)*.

all found that the people of these countries are in fact fairly concerned about their health and spend a great deal of money for these purposes. What is it, then, that makes such spending so ineffective? In their science education book, *Abhijit Banerjee and Esther Duflo (2011)*⁷ demonstrate, in the succinct and tenacious manner of an investigative journalist, how the lack of reliable information, low education and insufficient knowledge can repeatedly become a source of bad decisions.

The persistence of poverty and the fact that entire generations are permanently stuck in such conditions suggest that the poor are trapped in poverty with no real way out. The life of the poor involves numerous trap situations. In addition to the health problem mentioned above, they are found in almost all areas of life, including nutrition, education decisions and finances. It appears obvious that poor nutrition may itself create a poverty trap: malnutrition prevents individuals from being able to keep step in the workplace and losing a job, in turn, makes it even more difficult – through the loss of income – for a person to put food on the table. Is this seemingly logical train of thought a realistic explanation for the poverty trap? On closer look, data reveal that the picture is far more complex than that. On the one hand, the wages of better nourished employees will not necessarily be higher if the employer cannot make a distinction between a properly fed and a malnourished employee. It has been observed, for example, that physical workers tend to consume more food on days when they earn efficiency wages than on any other days. On the other hand, nutrition habits are largely influenced by ingrained habits and beliefs and are therefore fairly resistant to changes – especially when a stranger shows up to offer novel reforms. In addition to all this, an empirical analysis of eating habits found that, based on the calorie content of the food consumed, most poor people are not malnourished: even if there is a nutrition issue, it has far more to do with the quality, rather than the quantity, of the food consumed. The lack of micronutrients might be a less-documented but more probable explanation for children’s nutrition-related developmental delays. Insufficient iodine or iron intake restrains children’s cognitive and physical development to such an extent that its impact is perceivable even in adult-age wages. For more detail, see, for example, the studies by *Banerjee et al. (2010b)*, and *Banerjee et al. (2010c)*.

Exploring the drivers of human behaviour is the central focus of their research. In the science education work referred to above, the authors present an extensive discussion on whether we are wrong in trying to apply the model of rational behaviour assumed by microeconomics to understand the decisions of

⁷ Banerjee – Duflo: *Poor Economics: A Radical Rethinking of the Way to Fight Global Poverty*, published by Public Affairs, New York, 2011. In 2016 it was also published in Hungarian under the title “A szegények gazdálkodása” by Balassi Kiadó.

the poor. Can it be a rational behaviour not to use the bed nets available free of charge for protection? How can we explain the observation that not all children complete primary education but oftentimes, the family spends all its resources on schooling one child only? Why do families use low-quality, expensive but ineffective remedies? Their research generally point out that the drivers of human behaviour among the poor are not so different from what we would expect based on our microeconomics studies: school teachers are clearly responsive to financial incentives (Duflo *et al.* 2012) but at the same time, more (better) textbooks or more time (days) spent at school do not lead to better performance at school, whereas an improvement in the quality of education does. (Banerjee *et al.* 2007; Duflo *et al.* 2011; Banerjee *et al.* 2016; Duflo *et al.* 2015; Duflo – Hanna 2005).

4. Macro level conclusions “from the bottom up”

Esther Duflo and Abhijit Banerjee summarised the results of their decades-long research in a truly enjoyable work – the science education monograph entitled “Poor Economics”.⁸ This book alone provides a comprehensive insight into the authors’ work. The book was also highlighted in the press release on awarding The Prize in Economic Sciences 2019 as it is the summary of the results of years of research, in which the authors demonstrate – both from a micro and a macroeconomic perspective – why so many well-intentioned aid programmes fail as a result of ignoring the incentives and constraints of individual behaviour.

In any discussion on economic growth or economic development, the significance of the institutional system is an unavoidable issue. Numerous studies have emphasised in recent years the enormous extent to which the institutional system determines the welfare of a nation over the long term. For example, *Acemoglu and Robinson (2005)* argue that a country has no chance to develop – for example, it cannot improve the enforceability of ownership rights or clamp down on corruption – if its political institutional system is outdated. An institutional system conducive to economic growth can be best described as one where a person’s advancement is more likely to be influenced by individual talent than social relations. Ultimately, the institutions wield an influence on economic incentives, such as decisions related to further education, investments in innovation, the application of novel technologies, etc. In addition, political institutions also affect the extent to which the people can control politicians. When economists refer to the quality of institutions, they often choose an extremely high level of abstraction, discussing such institutions as democracy, division of power, the enforceability of ownership rights, or restricted voting rights. Economic institutions conducive to growth encourage people to invest, study, accumulate or invent new technologies

⁸ Banerjee – Duflo (2011)

– in other words, they promote activities that are important sources of economic growth and development. By contrast, institutions encouraging rent-seeking achieve just the opposite effect. These are the institutions that, instead of inciting to invest, learn or accumulate, encourage the individual to forge ahead – through relations with social or political leaders or monopolistic positions – at the expense of others. Institutions conducive to growth ultimately restrict political leaders from putting personal interests above all by forcing them to base their decisions on public interest.

Studies devoted to the role of institutions in economic growth typically confirm the findings regarding the direction of the linkages (while the way in which the quality of the institutional system can be measured is widely debated). It is still an open question, however, as to which factors can prompt a change over what horizon. Are countries condemned to being trapped in poverty and destitution forever if they inherited a “bad institutional system” due to their historical legacy? In this important and extensive debate, the empirical studies of Duflo and Banerjee contribute to expanding our knowledge by pointing out new directions in thinking. As they put it: *“Acemoglu and Robinson’s pessimism comes in part from the fact that we rarely see successful drastic regime change from authoritarian and corrupt to well-functioning democracy. The first thing the view from below allows us to see is that it is not always necessary to fundamentally change institutions to improve accountability and reduce corruption.”*⁹

Although wholesale democratic reforms are few and far between, there are many instances where democracy has been introduced, to a limited extent and at the local level, within an authoritarian regime.”⁹

Their papers show numerous examples in this regard. Just to mention a single example: in Uganda, where schools are subsidised on a per capita basis, a survey conducted in 1996 asked a simple question: what percentage of the subsidies is actually received by the schools from the funds allocated by the Ministry? Both schools and Ministry officials were interviewed with the stunning result of only 13 per cent; the rest of the money ended up padding the pockets of various officials. Of the numerous important lessons offered by the story, we would like to highlight its outcome. The publication of the findings prompted a heated discussion in Uganda; so much so that the Ministry changed its practice and published in national papers the specific amounts allocated to each individual school. When the survey was repeated in 2001, it was found that this time around 80 per cent of the funds had actually reached the schools. This exercise (which is only one example of the countless similar stories presented in the authors’ studies) proved to be very enlightening. On the one hand, if education is an important source

⁹ Banerjee – Duflo (2011), p. 226.

of development, increasing the funding of schools may contribute to economic growth. But if the funding does not even reach its destination, it cannot be expected to have such an effect. On the other hand, when discussing the role of institutions, we do not necessarily need to grapple with difficult issues; oftentimes accountability and transparency are enough to improve the efficiency of the system. In the words of the Laureates, “little changes” may have a surprisingly big impact; therefore, with respect to economic growth and the fight against poverty, far more attention should be given to details than to “big ideas” in order to ensure the uninterrupted continuation of little changes.

Having said that, we would not like to leave the Reader with the impression that the fiercest debates of Duflo, Banerjee or Kremer are aimed at the abovementioned scientific approach; i.e. that Acemoglu and Robinson are the authors’ counterpole. On the contrary: the latter achieved similarly groundbreaking results in their empirical research on the role of institutions in economic development and growth than the 2019 Laureates. Economic or political institutions, however, are a fairly abstract concept, and the questions of how they should be measured and which abstraction level should be applied in individual analyses are often debated in the course of various surveys. In the works of Duflo, Banerjee and Kremer, however, institutions are often presented – as shown in the example above – in a very specific manner, enabling the authors to give much deeper insight into the issue for the purposes of the still ongoing scientific debate.

The authors clearly oppose the (“traditional”) approach that attempts to address the poverty issue in general terms without focusing on such specific details as the micro nutrient content of food intake, fighting malaria, etc., and focuses most scientific debates on whether aid (generally) offers a way out of poverty or just the contrary, conserves the poverty trap. They also debate the approach of Jeffrey Sachs who argues that adverse climate factors are the major cause for poverty in the countries involved or, for example, that of William Easterly, who claims that aid “*does more bad than good. It prevents people from searching for their own solutions, while corrupting and undermining local institutions and creating a self-perpetuating lobby of aid agencies.*”¹⁰ What is wrong with this approach? It is the question itself. The right question is not about whether aid is good or bad. This is far too generalised; effectiveness is in the details. As the authors put it:

“Whom should we believe? Those who tell us that aid can solve the problem? Or those who say that it makes things worse? The debate cannot be solved in the abstract: we need evidence. But unfortunately, the kind of data usually used to answer the big questions does not inspire confidence. [...] But if there is really no evidence for or against aid, what are we supposed to do – give up on the poor?”

¹⁰ Banerjee – Duflo (2011), p. 17.

*Fortunately, we don't need to be quite so defeatist. There are in fact answers. [...] The main disagreement shows up when we turn to the question, 'Do we know of effective ways to help the poor?'. [...] I(i)t is really helpful to think in terms of concrete problems which can have specific answers [...]."*¹¹

5. Epilogue

How significant, then is the work of the Laureates? Is it surprising that economists researching poverty were awarded this prestigious prize? Looking at the Laureates of previous years it appears that poverty research, healthcare, education – in general, the other branches of “public administration” – receive this significant recognition less often than other branches of science, such as macroeconomics.¹² Recently, this area has been given greater recognition (as suggested by the nomination of Angus Deaton). We wish to carry this thought somewhat further. In our view, this is not merely about increased professional attention but can be rather attributed to the fact that applying the toolkit of microeconomics, the Laureates have conquered new areas, making them part of economics.

This essay was intended to be a commendation: our goal was not merely to *provide an overview* of the work of the economists receiving the Nobel Prize in 2019. Our primary goal was to demonstrate their *significance*. Their scientific work covers numerous aspects of the life of the poor; it is virtually impossible to enumerate all of their accomplishments and present them in detail; however, their *novelty* and *effectiveness* – in our opinion – point far beyond the multitude of results. The authors' work has transformed development economics; it is owing to them that we now pose the questions in a different way. They also set new standards in respect of methodology. *We are convinced that the 2019 Noble Prize in Economic Sciences could not have been awarded to more deserving candidates.*

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¹¹ *Banerjee – Duflo (2011)*, pp. 18–20.

¹² Thanks are due to the anonymous proofreaders for their valuable ideas and thoughts on the manuscript. Even this observation was borrowed from them.

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Bitcoin: Digital Illusion or a Currency of the Future?*

Gyöngyi Bugár – Márta Somogyvári

Bitcoin has been one of the most interesting financial innovations in the last ten years. In this essay, we set out to discover why it has not spread as a medium of payment and how it has become a high-risk form of investment instead. We examine the operational mechanisms of bitcoin technology and explain the ideological background for the popularity of bitcoin. We conclude that, in its present form, bitcoin is not suitable to become a generally accepted medium of payment.

Journal of Economic Literature (JEL) codes: E42, G10, O31

Keywords: bitcoin, cryptocurrency, blockchain, libertarian economic policy

1. Introduction

The emergence of bitcoin and other cryptocurrencies may have been one of the most interesting financial innovations in the last decade. Originally intended as a medium of payment, this form of investment is now available to everyone both on-line and at bitcoin ATMs, which can be found in Budapest as well. Yet neither average users nor most finance professionals understand the ideology underlying bitcoin, the operational mechanisms and the risks inherent to this cryptocurrency. Our aim is to present the theoretical problem (double spending) that Nakamoto wished to tackle when he developed the blockchain system on which bitcoin is based; we will also outline the operational mechanisms of bitcoin and its role today. We also examine the ideological background that ensures the popularity of bitcoin and sustains the bitcoin community. Through our survey of these areas we hope to answer the question posed in the title and take a look at the future opportunities for using bitcoin. We then describe the white paper

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

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serving as the technological background for bitcoin and the ideology underlying the cryptocurrencies; we also point out the importance of bitcoin. In *Chapter 3*, we describe the blockchain technology on which bitcoin is based, along with its operational mechanisms. In *Chapter 4*, we look at the role bitcoin plays in the economy as a medium of payment and as an investment opportunity. In *Chapter 5*, we highlight the constraints to its spread, due firstly to its technology and secondly to the regulatory environment. In conclusion, we summarise our insights into the future of bitcoin.

2. The development of the bitcoin system; the role and importance of bitcoin

2.1. The Bitcoin White Paper: the development of a system

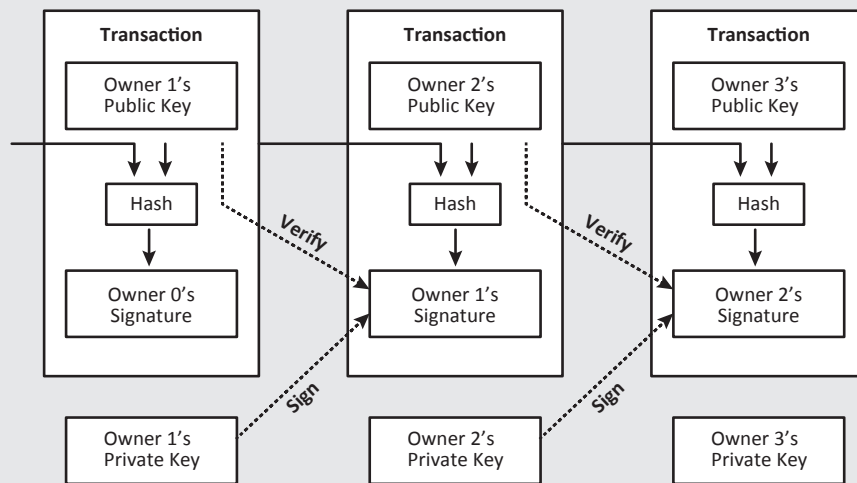
On 31 October 2008, *Satoshi Nakamoto* published his idea for a new innovative system of payments in a cryptography mailing list. Led by a sense of philanthropic mission, the author describes in his nine-page essay (published in the worst year of the last global financial crisis) an on-line network of payments that is free of any banks and central (mediating) authority, operates between independent and equal players and is in effect accessible by everybody (*Nakamoto 2008*). Bitcoin may be considered the very first conceptual design of all time for a system of decentralised, cryptography-based payments (*Gábor – Kiss 2018*).

The open-source-code system implemented as envisioned by Nakamoto is based on digital signatures rather than trust. The open source code makes the system public, so that anyone can freely enter and leave it at any time. The author defined the *bitcoins* created in the network as a *chain of digital signatures*. In a transaction, the holder of the electronic coin transfers it to the next holder by using their private key to digitally sign the hash¹ from the preceding transaction and the public key of the next holder, and attaches this to the end of the signature series representing the coin. Hash functions are processes used in informatics (essentially cryptographic algorithms) for converting data of any length to a particular length. The resulting final data will be called the hash (hash value). In fact, the hash is a check code identifying the original message, a kind of digital fingerprint². The payee can check the digital signatures to confirm the proof. *Figure 1* demonstrates the sequence of transactions described above.

¹ A literal translation of the word 'hash' would be 'mince', 'chopped, ground meat'.

² József Schaffer: *Minden, amit a bitcoinről tudni akartál – végre magyarul is* (*All You Ever Wanted to Know about Bitcoin – Now Finally in Hungarian*). Electronic memorandum, 7 January 2014 <http://plastik.hu/2014/01/07/a-bitcoin-ismertetoje/>. Downloaded: 14 August 2019.

Figure 1
A chain of transactions for the transfer of bitcoins



Source: Edited from Nakamoto (2008:2)

A significant challenge in the operation of the system is to prevent amounts already spent from being spent again. To solve this problem, *Nakamoto (2008)* suggested the publication of transactions and transaction proofs based on consensus among the participants of the network. This removes the need for a central player to perform clearing and provide proof of transactions.

The transactions are published with the help of a distributed ledger, which is essentially a database that contains the transactions and is available to all participants. The data (individual transactions) in it are organised into blocks; the validated blocks constitute a chain (the blockchain). Individual nodes in the network compete to be the first to decrypt the next data block containing financial transactions and to supply it with a digital timestamp as proof. This involves decryption based on the use of a sufficiently difficult mathematical algorithm (proof-of-work). This provides proof that the participant of a particular transaction has not attempted to spend the amount in that transaction before.

Nakamoto (2008) calls the players competing for the transactions proof miners. Miners are motivated by the bitcoins they receive in return for decrypting the blocks. This is basically how money is created in the system: the transaction validators who decode the blocks are responsible for money creation.

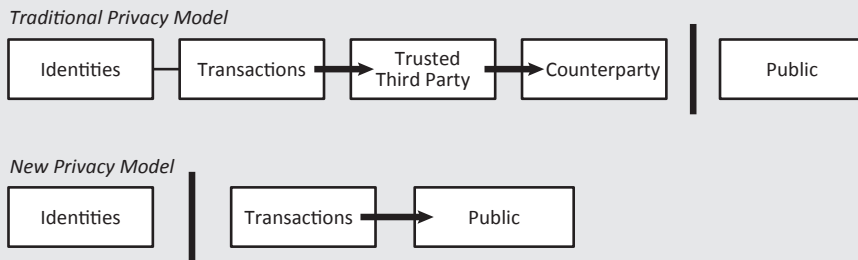
Nakamoto (2008:3) describes the steps of operating the network as follows:

- 1) New transactions are broadcast to all nodes.
- 2) Each node collects new transactions into a block.
- 3) Each node starts to work on block decryption.
- 4) When a node has succeeded in decrypting the block, it broadcasts it to all the other nodes.
- 5) The nodes will accept the block only if all the transactions in it are found to be valid and there is no sign of any intention to spend an amount repeatedly.
- 6) Nodes express their acceptance of the block by starting to work on the next block in the chain through starting to use the hash value of the preceding, accepted block.

The secure operation of the system is guaranteed by the validation process based on the majority consensus of individual nodes. Nodes always consider the longest chain to be the correct one and will keep working on extending it. If two nodes broadcast different versions of the next block simultaneously to the other nodes, some nodes may receive one of these versions first, while other nodes receive the other one. In such a case, they will work on the first block they received, but save the other one in case the blockchain containing it becomes longer. It is always upon the decryption of the next block that it becomes clear which block is to be discarded, i.e. which branch is to be followed. (As a result, transactions in a shorter block version will not be executed and will need to be resubmitted.)

As regards the security of the system, *Nakamoto (2008)* highlighted the importance of the system of incentives within it. The first transaction of each block is a special transaction that creates new virtual money (bitcoin) that will become the property of the decryptor of the block. This incentivises the nodes to support the system and also ensures that virtual currency units enter into circulation. The 'remuneration' for the decryption of a block essentially serves as the return on the computer resources (CPU capacities) and the associated electricity expenditures. *Nakamoto (2008)* is convinced that a built-in incentive will ensure that system participants comply with the rules. If a greedy 'attacker' enters the network and possesses more CPU capacities than all of the honest nodes in total, then it may choose whether to take advantage of this and, misleading the system participants, reclaim all its former payments, or whether to use its resources to create new money. *Nakamoto (2008)* says that, in that case, it must recognise that it will be more profitable for it to respect 'the rules of the game', which will help it acquire more new bitcoins than all the other participants together.

Figure 2
Comparison of the traditional system of financial intermediation and the bitcoin confidentiality model



Source: Edited from Nakamoto (2008:6)

Nakamoto (2008) describes a system of payments that deviates from the traditional confidentiality model of banking in terms of the public disclosure of the transactions as well. In the traditional banking model, the participating parties and a Trusted Third Party (intermediary bank) have limited access to information, and a firewall completely excludes the public from the information flow. While the need to make transactions public makes it impossible to use the above model, personal data can still be protected; in fact, anonymity can be preserved by stopping the flow of information at a different point in the process. This is because public keys are not specific to individuals. Information about someone sending another person (identity) a particular sum is available publicly without making the transaction participants identifiable. This is similar to the confidentiality principles followed by stock markets, where the amount and the time of the transactions is published but the parties to the transaction are not disclosed. We demonstrate the difference between the two models in *Figure 2*.

2.2. The philosophies underlying bitcoin

Nakamoto's essay laying the foundations for bitcoin is seemingly a study of the technical problems of on-line payment systems, one that wishes to remove the banks and financial institutions from the payment process. But bitcoin and the cryptocurrencies have spread not due to the technology, but due to the ideology embodied in the technology. Two important components of this ideology are the questioning of regulation by any kind of government, including central banks and monetary governance, and a cyber-libertarianism that proclaims the primacy of the digital way of life.

It is a belief held in ultraconservative circles in the United States that the state is authoritarian (*Levin 2009*) and that any kind of government intervention, for

example social transfers and therein the automatic right to health insurance, will represent a breach of the freedom of the individual. These ideas regularly recur in bitcoin communities, which explains why bitcoin is a kind of movement and why it is able to convert more and more people into bitcoin believers. According to these ideas, all government should be rejected, only market forces are good and they can help prevent the concentration of power, which, if held by the state or the government, could lead to excessive power focus. They criticise the conduct of monetary policy and, based on conspiracy theories, the activities of the Fed and central banks (*Rothbard 2002, Mullins 1992*). According to these extreme views (see *Golumbia 2016*), inflation and deflation are not rooted in economic reasons, but rather in central banks' activities. This ideology lays the groundworks for creating money that is free from inflation through the bitcoin algorithm.

Cyber-libertarianism emphasises the primacy of the digital way of life; this is the only acceptable world view for not only the proponents of bitcoin but, often, for the participants of the digital world as well. One of the forms this takes is the defence of the absolute freedom of the internet. For cyber-libertarians, the only important, genuine expertise concerns digital technologies and since everything can be traced back to IT processes and IT-algorithms, if anyone does not understand these, they have no right to express an opinion (*Golumbia 2016*). Thus any criticism of bitcoin highlighting economic or social considerations will be disqualified in the eyes of bitcoin proponents.

2.3. The importance of bitcoin among cryptocurrencies

2.3.1. Types of cryptocurrency

The two main groups of cryptocurrencies are digital coins with their own blockchains and tokens building on existing blockchains. The first group itself is also normally subdivided into two. It includes bitcoin, which has been able to benefit from the innovative advantages of first entrants to a market and remains the most important cryptocurrency to this day, and alternative cryptocurrencies, altcoins, which are either descended from bitcoin or built on entirely new blockchain algorithms.

How can new cryptocurrencies be created from bitcoin? Bitcoin is built on blockchain software with an open source code and ledger, which means that there is an opportunity to change the software code. If there is disagreement in a blockchain community regarding such a change, the blockchain may split into two for good (this is called a 'fork'). Once it relies on the new code, the blockchain that was previously part of bitcoin will start to live a life independently of bitcoin. One of the purposes for changing the code is to add new features to the software; an example was the creation of litecoin, which increases the speed of the

transactions. It is also possible to introduce fundamental changes to the code, e.g. raising the size of blocks from 1MB to 8MB; this led to the emergence of bitcoin cash. There are also altcoins that are not descended from bitcoin, but are built on entirely new blockchains; examples are Omni, Ether and Ripple.

The other group of cryptocurrencies contains so-called tokens. Tokens do not have their own blockchains; instead, they use platforms (one example is Ethereum, which has its own altcoin called Ether) that allow for the creation of secondary digital 'cryptocurrency-equivalent' means using apps reliant on the platforms' own blockchain architectures (DApp). This process is much simpler than setting up a new blockchain. Coins are initially offered by announcing an ICO (Initial Coin Offering) in a White Paper. Tokens may represent a service that can be accessed in the event of the launch or the success of the project, i.e. the issuance of the token can be considered as a new form of crowdfunding; nevertheless, they are often purchased for investment purposes.

Popular tokens, whose price reaches several times their value at issuance, tend to be the ones aiming at an enhancement of blockchain technology. The objective of IOTA³ is to accelerate transaction execution on the basis of a new philosophy, while NXT is intended to protect against attacks on cryptocurrencies with a proofing method. More than 90 per cent of the 1,394 tokens listed on the website cryptocompare.com lose their value quickly and are worth a fraction of their value at issuance after only a few months. According to some estimates, investors incurred USD 3.5 billion in losses on the collapse of PLUS Token, which was popular in Asia, especially in Korea and China, and offered 9–18 per cent interest per month in a kind of Ponzi scheme (*Emsley 2019*).

2.3.2. Market capitalisation of the most important cryptocurrencies

As of 24 August 2019, coinmarketcap.com had on record almost 2,500 cryptocurrencies. More and more cryptocurrencies are generated day after day, but most of these are relatively short-lived. Bitcoin is the biggest cryptocurrency, dominating the market at nearly 70 per cent, which, depending on prices, represents a market capitalisation of around USD 180 billion. The second biggest cryptocurrency after bitcoin is Ethereum, with USD 20 billion market capitalisation, while Ripple has USD 11 billion (this is a centralised blockchain that is concentrated in the hands of a single company and aims to accelerate interbank transfers). But what does market capitalisation expressed in USD mean in the case of a cryptocurrency? By definition, this is the quantity of cryptocurrencies (coins or tokens) in circulation, multiplied by the market price. This calculation method

³ IOTA diverges from blockchains and uses graphs for proofing (DAG: Directed Acyclic Graph). As mining is not needed, the energy use of individual transactions is negligible and the system is much faster and more scalable than blockchain. Popov, S. (2018): *The Tangle Version 1.4.3*. https://assets.ctfassets.net/r1dr6vzfxhev/2t4uxvs1qk0EUau6g2sw0g/45eae33637ca92f85dd9f4a3a218e1ec/iota1_4_3.pdf

copies the definition of the market capitalisation of securities. Since the indicators that are used to describe currencies (conversion rate, purchasing power, inflation, etc.) cannot be applied to cryptocurrencies, the very fact of using this indicator will question whether cryptocurrencies can be considered as money.

3. The technological background of bitcoin

3.1. Blockchain (ledger) technology

The blockchain is the main technological innovation of bitcoin.⁴ It operates as a split, public ledger that records all bitcoin transactions. This ensures openness and transparency for all participants in the system. Essentially, the blockchain is a continually growing list of data blocks containing transactions, in which individual blocks are connected in a way that prevents forgery and tampering.

The digitally recorded data blocks are stored in a linear chain. The data blocks containing the transactions are encrypted (coded cryptographically) with a hash function and a time stamp is added. When a miner creates a new block, that block will contain the hash of the previous block and, as a result, the blocks will constitute a chronologically ordered chain (starting from the initially created 'genesis' block and ending with the most recent block). The network grows as this process is repeated over and over again.

Each block in the blockchain contains data (e.g. data about bitcoin transactions), a block header, a block identifier and a Merkle tree.

- The block header contains the metadata of the block.⁵ These are the following: (a) the hash value of the block chronologically preceding the block; this serves the purpose of identifying the previous block; (b) the identification data of the miner decrypting the block; (c) the data structure capturing the transactions in the block, also referred to as the Merkle tree root.
- The block identifier is essentially the hash value that uniquely identifies the block.
- The purpose of the Merkle tree is to summarise the transactions in a block. 'Tree' is a term used in computing to describe a branching data structure. Merkle trees are normally shown upside down, with their 'roots' at the top and their 'leaves' at the bottom of the diagram. The role of the Merkle tree is to create an overall digital fingerprint from the transactions in the block, thus providing an

⁴ In writing this section, we relied on two sources: information published on the website of Blockchain Technologies (<https://www.blockchain-technologies.com>) and an open publication book by Andreas M. Antonopoulos, 'Mastering Bitcoin', in a translation available electronically (<https://bitcoinbook.info/wp-content/translations/hu/book.pdf>).

⁵ Metadata are data about data.

efficient process for checking whether a particular transaction is indeed included in a block. The Merkle tree is constructed by the recursive hashing of pairs of nodes until only one hash, the so-called Merkle root remains.

The most important characteristics of the bitcoin blockchain technology are the following:

- **Consensus:** all anonymous participants in the network agree to follow the rules of the network, i.e. they accept that ‘there is only a single source of truth’ in a blockchain environment.

This requires agreement from 51 per cent of participants. It follows therefore that a participant with sufficient computing capacities and 51 per cent of the nodes can hack the blockchain.

- **Distributed data processing:** there is no central node for the processing and distribution of data; all nodes can independently process and forward the proofed data to the network.
- **Information storage capacity:** the technology is able to record and keep the data of the transactions and the associated information.
- **Identifiability of transaction origin:** each transaction is recorded alongside the activity associated with it, so that it can be monitored in full.
- **Non-alterability:** no participant in the network may alter an already recorded transaction. Faulty records cannot be deleted and will remain visible at all times once recorded. Errors may be corrected only by submitting a new transaction offsetting the faulty transaction.
- **Public access:** all participants in the system may connect to the network without any constraints and may access the data stored in the blockchain.

3.2. SHA–256 algorithm

SHA is an acronym of Secure Hash Algorithm. This procedure is one of the most widely used hashing algorithms in cryptography. SHA is an overall name for the standard processes issued by the United States National Institute of Standards and Technology (NIST), one of which is the SHA–256 algorithm used for bitcoin. Although hash functions were first introduced to computing in the early 1950s, their real popularity may be dated to the late 1980s and the emergence of electronic signatures (*Buttyán – Vajda 2012*).

The first version of SHA (SHA 1) was developed in 1993 under the supervision of the United States agency responsible for radio signals intelligence technology (NSA: National Security Agency). This creates a 160-bit message digest, which

can then be used in the digital signature algorithm. The SHA–256 used for bitcoin operates along similar principles, but can manage significantly larger volumes of data. Its input (the message to be forwarded) may be $2^{64} - 1$ bit in length, which is subdivided into blocks of 512 bits during processing. The size of the output (the resulting hash value) is 256 bits long in total and comprises 8 blocks of 32 bits.⁶ The denomination SHA–256 therefore refers to the bit size of the hash value received as an output from the algorithm.

3.3. Proof-of-work

Proof-of-work is a numeric value that requires significant computing capacities to be generated. Bitcoin miners use the SHA algorithm to find a hash value that matches the level of difficulty applicable to the network as a whole (*Antonopoulos 2016*).

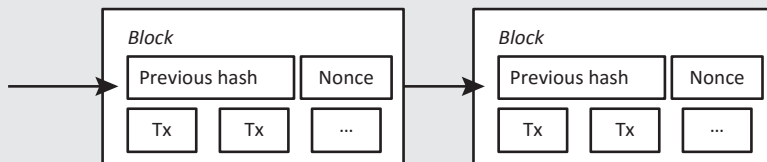
In the case of bitcoin, executing a proof-of-work entails searching for a value as mentioned above; applying the SHA–256 algorithm to that value returns a hash value starting with a certain number of zero bits. The step count of the algorithm is exponential in the number of zero bits required and can be verified by executing a single hash (*Nakamoto 2008*). Specifically, the miner decrypting the relevant block writes a value behind the previous hash (nonce) and then this nonce is incremented until the resulting hash value of the given block reaches the required number of zero bits (*Figure 3* illustrates the process). If the decryption is successful, the resulting new block can be altered only by performing the above work again. If new blocks join the chain in the meantime, then changing a particular block will also demand the decryption of all newer blocks following that particular block.

It is important to mention that, in addition to proof-of-work, the now increasingly popular proof-of-stake process is also used in the operation of cryptocurrency blockchain networks. In this case, the creator of the next block is selected by a combination of chance and wealth or age (stake).⁷ It has the advantage of accelerating the operation of the system and eliminating the loss incurred by miners who start the calculations but do not receive bitcoins as someone else overtakes them. By contrast, with proof-of-work-based cryptocurrencies such as bitcoin, the creation of new blocks is based on mining, i.e. the successful execution of an algorithm with high computation requirements.

⁶ For more detail on the above, see: *Kathi (2009)*.

⁷ <https://blockgeeks.com/guides/proof-of-work-vs-proof-of-stake/>

Figure 3
The proof-of-work mechanism



Source: Edited from Nakamoto (2008:3)

3.4. The participants and the operation of the system

The key participants of the system operating the blockchain are called nodes, which may be miners or users. There is a high number of intermediaries relying on the above, which allows those with no computing knowledge or technical facilities to access the cryptocurrencies. In order for to submit and receive bitcoin transactions, users need an electronic wallet, which is normally a freely downloadable application. Transaction proofing is done on the computers of the miners and the resulting new block has to be accepted by the entire network. It is then attached to the previous block, thus increasing the size of the whole blockchain. Storing the entire blockchain on your computer is not necessary in order to take part in the network. In the first quarter of 2019, approximately 36 million users had access to cryptocurrencies such as bitcoin (Tassev 2019). By contrast, the number of computers (full nodes) that store the entire bitcoin blockchain stood at around 9,000 in August 2019 and has been gradually decreasing over the last two years.⁸ The decrease is understandable; after all, there are no financial benefits from running the entire bitcoin blockchain, even as the number of blocks continues to rise. The size of the full blockchain, including the generic block, reached 226 GB in the first quarter of 2019. Most of those operating the entire node are not idealists rebelling against a monetary system overseen by governments and central banks but miners and investors. As the size of the blockchain grows, the proofing process carried out by the miners demands increasingly large computing capacities and specialised hardware and software. This has resulted in a process of concentration. The largest player on the market is the Chinese company BitMain, which is the largest specialised hardware producer and software developer and executes more than 20 per cent of bitcoin mining. By the start of 2019, a large proportion, approximately 70 per cent of energy-intensive mining was concentrated in China, specifically in areas where energy prices are low due to the underutilisation of

⁸ <https://bitnodes.earn.com/dashboard/?days=730>

the electricity production capacities installed there (*Tuwiner 2019*). In 2019 the energy and other costs required for mining 1 bitcoin in China ranged between USD 507 and 4,562, depending on the price of electricity.⁹ This situation will change in the future, however: after liquidating its cryptocurrency exchanges, China has listed mining as an undesirable activity and will most probably ban it (*Brenda – Alun 2019*).

There is an entire industry built on cryptocurrencies made up of service providers that allow the purchase of cryptocurrencies for ‘real’ national currencies and the trading of cryptocurrency at cryptocurrency exchanges, providing platforms for token issuance and the development of diverse applications; they maintain investors’ accounts and analyse the exchange rates of the different cryptocurrencies.

As regards the regional spread of cryptocurrencies, 27 per cent of market players are concentrated in North America, where 18 per cent of the transactions take place and 39 per cent of the wallets are found. The second most important player is Europe, with significant growth also expected in the Asia Pacific region, especially Japan.¹⁰

4. The role and importance of bitcoin within the economy

4.1. Bitcoin as medium of payment

During its existence for more than a decade, bitcoin has not fulfilled its originally intended role. Paying with bitcoin has not become daily practice, and its acceptance as a medium of payment is rare. This is obviously due to its extreme exchange rate fluctuations. It is entirely understandable that merchants are not willing (or even able) to state the value of their products in a currency that does not have a stable exchange rate.

It should also be noted in this context that the lead time of bitcoin transactions is high compared to that of other payment methods (PayPal, credit cards). If the system is overloaded, this may greatly increase the transaction fees. This is important at the moment because, unlike with debit and credit card purchases, the transaction fee for a bitcoin payment is paid by the buyer (*Gábor – Kiss 2018*). With conditions like this, it is unlikely that the use of bitcoin will spread any time soon for buying small-ticket items (like a book or a cup of coffee).

⁹ <http://www.chinacryptonews.com/industry/chart-bitcoin-mining-cost-china-cheapest/>

¹⁰ <https://www.fortunebusinessinsights.com/industry-reports/cryptocurrency-market-100149>

There are still numerous uncertainties regarding the categorisation of bitcoin. The U.S. Commodity Futures Trading Commission (CFTC) defines it as a commodity, whereas the U.S. Internal Revenue Service (IRS) considers it an instrument that incorporates property rights. The U.S. Securities and Exchange Commission (SEC) categorises it as a security in certain cases (*Chohan 2017*), whereas the European Central Bank considers it a convertible decentralised virtual currency (*Gábor – Kiss 2018, Bánfi 2018*).

In their study of cryptocurrencies, *Gábor and Kiss (2018)* emphasise the misleading nature of the term cryptocurrency on the grounds that it could suggest that they constitute a subcategory of traditional currencies. They believe, and we agree with them completely, that they are in fact an entirely unique, new group of instruments.

4.2. Bitcoin as an investment

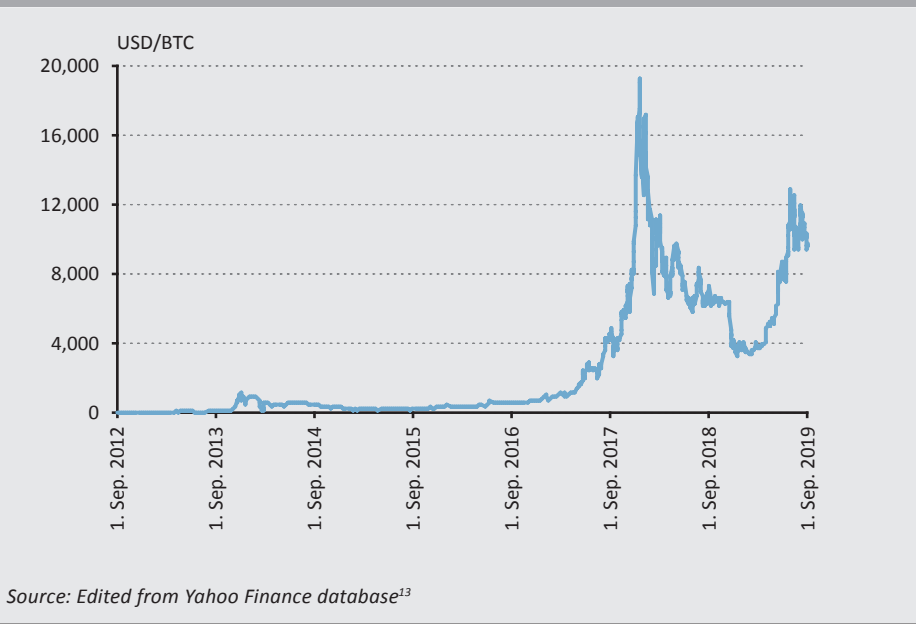
Since bitcoin is limited in its ability to function as money,¹¹ we should examine what opportunities it offers if we consider it as an investment asset. To see the changes in bitcoin exchange rates, we have downloaded its daily closing exchange rates against the dollar from the Yahoo Finance website for the seven-year period between 1 September 2012 and 1 September 2019. *Figure 4* presents the evolution of the exchange rate.

In the period examined, the daily bitcoin exchange rate rose from around USD 10 to USD 9,578, which is to say that it rose to around 960 times of its original rate. It should be remembered, however, that this extraordinary growth was coupled with outstandingly high volatility, i.e. extremely high risk. The graph shows clearly that the bitcoin exchange rate truly took off in 2017, when it rose from an initial rate of approx. USD 1,000 to above USD 19,340 (which is an annual return of about 1,900 per cent (!)).¹² The exchange rate then fell steeply, which bitcoin sceptics took as a sign of a ‘burst bubble’ (*András 2019*), but after a low point at around USD 3,000, it started to rise again and returned to values above USD 10,000.

¹¹ We do not discuss this question in detail in the present essay. We recommend reading *Bánfi (2018)* on the subject.

¹² In fact, bitcoin achieved the highest exchange rate of its history so far, namely 20,089 USD/BTC, on 17 December 2017 (<https://coinmarketcap.com/currencies/bitcoin/historical-data/>).

Figure 4
Bitcoin daily exchange rates between 1 September 2012 and 1 September 2019



Any assessment of bitcoin for investment purposes may rely on the combined assessment of its profitability and its risk profile. To this end, we first calculated daily returns from the daily exchange rate information available and then determined the annual effective return using the average daily returns in each individual year of the seven-year period. We used the standard deviations of returns to measure risk. In this case, we first used the time series of returns to calculate daily standard deviations for each of the years and then converted the resulting daily standard deviation values into annual values. We summarise our results in *Table 1*. We also state the return per unit of risk in the last row of the table.

¹³ <https://finance.yahoo.com/quote/BTC-USD/history?p=BTC-USD>

Table 1**Changes in the effective average returns and risks of bitcoin between 1 September 2012 and 31 August 2019**

Period	1/9/2012 – 31/8/2013	1/9/2013 – 31/8/2014	1/9/2014 – 31/8/2015	1/9/2015 – 31/8/2016	1/9/2016 – 31/8/2017	1/9/2017 – 31/8/2018	1/9/2018 – 31/8/2019
Annual Return (%)	2,294.27	11,741.89	-37.82	197.23	968.28	130.23	75.13
SD of Return (%)	102.95	390.02	71.53	57.61	71.19	97.9	73.54
Return/Risk	22.29	30.11	-0.53	3.42	13.60	1.33	1.02

Source: Calculated from Yahoo Finance database

Table 1 shows that both the returns and the associated risk values reflect the extreme fluctuation that already emerged from the historical exchange rate profile. Annual average returns ranged between –38 per cent and 11,742 per cent (the latter value is not a misprint and is equal to an average daily return of 1.3 per cent!). At the same time, the annual risk measured with the standard deviation of the returns ranged between 58 and 390 per cent. To compare: this measurement is generally between 10 and 20 per cent a year in the case of the S&P 500 share index (see *Misik 2018:70*). Return per unit of risk is, similarly to the Sharpe ratio, a measure of investment performance¹⁴ and also ranges on a rather wide scale. In this case it takes values between –0.5 and 30.¹⁵ Whereas the former points to losses from a falling exchange rate trend, the latter (outstandingly high) value reflects the impacts of the extremely high annual average returns. Even the associated extremely high risk failed to ‘neutralise’ the latter (cf. the values in *Table 1 Column 3*).

The above suggests that bitcoin is much more an instrument for speculation rather than a solid investment strategy ensuring balanced returns. A positive feature of investments in bitcoin is that its returns do not correlate with the returns of other instruments (equities, bonds, commodity market products, gold). Several authors (see e.g. *Brière et al. 2015* and *Misik 2018*) have pointed out this feature of bitcoin, which makes it suitable for offsetting the negative impacts of price falls of other instruments within an investment portfolio. Some studies have highlighted another positive characteristic, namely its ability to improve the efficiency of an investment portfolio (*Chen – Pandey 2014; Eisl et al. 2015; Misik 2018*). This means that adding bitcoin to the portfolio can help the resulting combination of investments achieve higher returns at the given level of risk thanks to the high returns of bitcoin per unit of risk, as shown above as well.

¹⁴ More precisely, this ratio enables the comparison of the performance of various investments with different profitability and risk characteristics.

¹⁵ It should be noted that *Misik’s (2018)* analysis puts this indicator at 1.68 in the case of the S&P 500 share index. In the period he examines, he calculates a return value of 13.07 per unit of risk for bitcoin.

5. Limits to the spread of bitcoin

5.1. Technology and energy constraints

There is a fundamental obstacle to the future use of cryptocurrencies in the trilemma formulated by Ethereum creator Buterin, namely that cryptocurrencies cannot satisfy all three requirements of scalability, decentralisation and security at the same time. Scalability is prevented by the system of proof-of-work, which limits the number of transactions per minute. Although decentralisation would ensure security, the rising size of blocks and increasingly complicated computational tasks are bound to lead to a centralisation of mining and, as is clear from the data, of trade as well (*Roubini 2018*).

The most important aim in creating bitcoin technology was to increase the security of transactions in such a way that reliance on a financial intermediary such as banks becomes unnecessary as the system is designed to prevent fraud. This is ensured by the open source code and the ability to backtest the entire blockchain. This may have been so initially but ever since cryptocurrencies have been used by more than a small group of cyberlibertarians and programmers, it is an illusion to speak of such an opportunity of control for 36 million users. Instead of a bank controlled by society or government, users need to trust cryptocurrency traders, token issuers and DApp developers, which operate on the verge of the law and, as shown by bankruptcies and scandals, can disappear in an instant. For example, the codes running on the Ethereum platform contain 100 bugs per 1,000 lines (*Gerard 2017:96*). The development of cryptocurrencies is centralised, essentially 'the code is the law' (*Roubini 2018*), but this code can be changed at any time and simple users have no say in that. Even the blockchain system itself is not protected from attacks and if 51 per cent of the system is concentrated in one hand, there is an opportunity to retroactively alter blocks (*Farivar 2014*).

The executability and speed of bitcoin transactions depends on whether there are enough miners to find proof. But mining will be worth it only if its costs do not exceed the prevailing market value of bitcoin. The annual average energy usage for bitcoin mining is 61 TWh,¹⁶ which is equal to 130 per cent of the total annual electricity use of Hungary (*MAVIR 2019*). Beyond its high energy use, bitcoin has no link to actual economic events, unless a country were to introduce bitcoin as a national currency and general medium of payment. Since this is unlikely, the electricity used in bitcoin mining is wasted energy and causes indisputable damage to society and future generations. The manufacturing of the hardware needed in the bitcoin infrastructure, the construction of the buildings and energy supply systems and the high energy use of mining create a very high environmental

¹⁶ <https://cbeci.org/>

burden even if the electricity is produced from renewable sources. There is no type of electricity production that does not damage the environment, does not use environmental resources and does not contribute to a decline in biodiversity.

5.2. Regulatory environment challenges

The regulatory environment of cryptocurrencies varies almost country by country, and ranges from a full ban to permission. China and India, the two most populous countries of the world have completely banned the use of cryptocurrencies. The Chinese government has also started to wind up the infrastructure and the industry serving cryptocurrencies, and as a last step in this process it has now declared cryptocurrency mining an undesirable activity, citing environmental protection as a reason. At the same time, the Chinese central bank is planning to issue its own cryptocurrency (CBDC - Central Bank Digital Currency), which will not be a decentralised currency based on peer-to-peer technology but involve a removal of all cash from circulation and the possibility of introducing control over financial transactions, or all transactions of its citizens (*Bloomberg 2018*).

In contrast to complete prohibition, there are countries where cryptocurrency exchanges can be operated subject to a permit; examples include Japan, South Korea and Luxembourg. Switzerland plays a special role: in Crypto-Valley, which is located in Canton Zug, tax allowances and other subsidies are provided to start-ups that work on cryptocurrencies and blockchain technologies and employ 3000 people. The 50 largest companies there have approximately USD 44 billion market capitalisation (*CVVC 2018*).

It reflects the uncertainties surrounding the use of bitcoin that regulations are still underdeveloped in the USA and the EU, the most important players in the trading of cryptocurrencies.

EU regulation¹⁷ is focused on the prevention of money laundering and also requires the registration of cryptocurrency exchanges and cryptocurrency services in the relevant country. Although the opportunity to launder money appears obvious when it comes to cryptocurrencies, in practice this risk is low, as demonstrated by a risk assessment by the UK Treasury (*HM Treasury 2015*). Due to their exchange rate volatility and uncertain liquidity, it is currently not worth using cryptocurrencies for money laundering. Also, the anonymity of bitcoin transactions is an illusion. All transactions remain indelibly in the ledger and also leave a trace on the Internet. However, the theoretical possibility of money laundering is a great challenge for regulators. The fight against money laundering is traditionally based on the identification of clients by financial institutions subject to central control. New

¹⁷ 5th Anti-Money Laundering Directive (2018/1080/COD)

principles and technological solutions are now necessary in order to reduce the risk of money laundering with cryptocurrencies (Campbell-Verduyn 2018).

Other than the implementation of EU directives, Hungary does not have specific rules on cryptocurrencies at the moment. The Ministry of Finance does not consider bitcoin as money (Fintechzone 2018), whereas the Magyar Nemzeti Bank warns of the high risk inherent in 'virtual instruments usable for payment' (MNB 2018).

6. Does bitcoin have a future?

In the debates about bitcoin, a frequently raised proposition is that bitcoin does not have inherent value (Brown 2019), that the cryptocurrency is in fact 'built on thin air'. Indeed, bitcoin cannot be used for any other purposes, unlike gold or other asset making tools. Bitcoin is pure information and, in this respect, it can play the role of an absolute currency that is not tied to any physical embodiment (Simmel 1900). However, information will become money only if a community accepts it as such. This means that money is made money not by its inherent value but the fact that market participants attribute value to it; this could be interpreted as an external rather than an internal value.

What motivates bitcoin users to buy bitcoins and other cryptocurrencies? It is primarily the infrastructure surrounding bitcoin and the secondary services reliant on it, which allow everyone to join; the news in the media about bitcoin and cryptocurrencies; the uncertainty of regulation and the profit outlook. Today, bitcoin is primarily a means for short-term speculation, an investment instrument that has no underlying specific economic process or performance other than its rather high use of energy and resources. Only one thing matters for those buying bitcoins: the belief that there will be others in the near or more distant future to whom they can sell their cryptocurrency. Since bitcoin users are not tied to a specific economic community or country, the potential users who will maintain cryptocurrencies in the future could number billions, coming from the population of Internet users.

It will be impossible for bitcoin or any other decentralised cryptocurrency to spread as a general medium of payment partly due to the technological and security problems detailed above. Also, it is hard to imagine a government that would give up its right to issue money and thus to exercise monetary control. For companies, accepting bitcoin would entail huge risks, as its exchange rate volatility could eliminate the company's margins in a matter of minutes.

Mention must be made of the impact of bitcoin on the development of financial instruments (*Kerényi – Molnár 2017*). In certain cases, blockchain technology may be suitable for tracking financial, economic or even social trends, while the idea of digital money, proposed by bitcoin, may generate new financial innovations such as Libra, which Facebook wanted to introduce but has faced rather significant obstacles, or the USD-based digital currency for which Wal-Mart has filed for a patent.

Bitcoin has not fulfilled the role intended for it by Nakamoto. This is due to the fact that while the software architecture he developed offers a technical solution to certain problems, it disregards the economic processes underlying financial transactions. To answer the question posed in the title, we can state that, in its present form, bitcoin is not suitable to become a generally accepted medium of payment. The security system built into blockchain technology increases the lead time of transactions and it is therefore unable to compete with the widely used financial technology solutions. The service providers of the bitcoin industry (the exchanges and wallet providers) operate on the verge of the law and can disappear or be wound up by government intervention at any time. Most countries do not have adequate regulations regarding their operations and thus users and investors cannot rely on any kind of protection. The history of over one decade of bitcoin shows that, even though it has not spread widely, it may survive as a high-risk investment instrument in a narrow market segment.

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Changes in Macroeconomic Policy: Evolution versus Revolution*

Balázs Világi

Olivier Blanchard – Lawrence H. Summers:

Evolution or revolution? – Rethinking Macroeconomic Policy After the Great Recession

MIT Press, 2019, p. 392

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Hungarian translation:

Fejlődés vagy forradalom? – A makrogazdasági politika újragondolása a Nagy Recessziót követően

Pallas Athéné Könyvkiadó, Budapest, 2019, p. 428

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In 2011, at the initiative of *Olivier Blanchard*, Chief Economist at the IMF at the time, a series of conferences commenced with the title “Rethinking Macroeconomic Policy”, with events organised every two years. The latest conference was hosted by the *Peterson Institute for International Economics* in Washington, and the conference papers were published by *MIT Press* in 2019 in the form of book: *Evolution or Revolution? – Rethinking Macroeconomic Policy after the Great Recession*. Fortunately, in September 2019 the Hungarian version was also published, under the editorship of *Pallas Athéné Könyvkiadó*.

The book’s two editors are a guarantee for relevant and interesting analyses, since – in addition to their scientific activity – they also have considerable economic policy experience, and following the 2007-2008 crisis both of them participated actively in the rethinking of macroeconomic policy: *Olivier Blanchard* was a Professor at MIT and then Chief Economist at the IMF; he is currently a Senior Fellow at the Peterson Institute. *Lawrence H. Summers* is a Professor at Harvard University, former Treasury Secretary in President Clinton’s administration and former director of the National Economic Council for President Obama, and once Chief Economist at the World Bank.

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

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In their introductory paper, the editors highlight three main lessons. First, the crisis made it obvious that one of the key reasons behind macroeconomic fluctuations is the behaviour of the financial system, and thus the further development of macroeconomics and the elaboration of more efficient macroeconomic policies calls for a more in-depth understanding thereof. Second, it is necessary to qualify the pre-crisis view according to which business cycles are caused by exogenous shocks, to which the economy reacts linearly. Financial shocks usually develop endogenously and the reaction of the economy to large shocks is non-linear. Finally, the permanently low interest rate environment is one of the key determinants of current economic policies. Blanchard and Summers emphasise that – in contrast to the pre-crisis period, when monetary policy enjoyed priority – we now need all three branches of macroeconomic policy, i.e. monetary, fiscal and financial regulation policy. The book examines five topics: *monetary policy, fiscal policy, financial policy, economic inequality and political economy, and international economy issues*. Each topic is accompanied by a comprehensive study, followed by short addenda and reactions. Due to space constraints, this review only discusses the five main papers.

The first paper in the book is by Ben Bernanke (Senior Fellow at the Brookings Institution, former Chair of the Federal Reserve and Professor at Princeton University) on monetary policy. In line with the introductory paper, Bernanke also regards the low interest rate environment as the greatest challenge for monetary policy, since this significantly narrows the room for monetary policy manoeuvre, as it is not possible to reduce nominal interest rates significantly below zero. At the same time, Bernanke considers forward guidance and quantitative easing as feasible alternatives to interest rate policy. In the paper, he provides an in-depth analysis of the experiences accumulated in applying the aforementioned instruments. He is of the opinion that negative interest rates and control of the yield curve cannot be regarded as generally applicable instruments. He rejects raising the inflation target as a potential method to reduce the real interest rate. On the other hand, as an alternative to this, he finds it worthwhile for central banks to consider price level targeting instead of inflation targeting, in a low interest rate environment.

The second part of the paper deals with central bank independence. Traditionally, the main argument for central bank independence is that due to the time inconsistency of monetary policy, there is a great temptation for economic decision-makers to generate surprise inflation based on short-term considerations; however, elected governments are less inclined to resist this temptation compared to independent central bankers. In the present low inflation environment, the validity of this argument has been questioned by many, noting that in a low inflation and growth environment, central banks should support fiscal stimulus packages

rather than autonomous monetary policy. On the other hand, the question of central bank independence goes beyond the problem of time inconsistency, since monetary policymaking can be highly technical and is often time-sensitive. Furthermore, effective monetary policy requires consistent, coherent and timely communication with financial markets. Hence, it should be controlled by a body that is able to provide prompt and accurate answers to changing economic and financial conditions.

But what is the situation with independence when the economy faces significant deflationary risks and monetary policy is only able to resolve the problem in cooperation with fiscal policy? Bernanke believes that central bank independence is a practical principle rather than an ideological or philosophical thesis: it only makes sense if (on average) it leads to better monetary policy outcomes. Thus, the applicability of central bank independence depends on the economic circumstances. Accordingly, central bank independence does not preclude cooperation between monetary policy decision-makers and fiscal authorities, if two conditions are met: first, the objectives of the cooperation must be consistent with the central bank's mandate and it is an important condition that they cannot be achieved without cooperation; second, the central bank must continuously evaluate whether the first condition is satisfied, retaining the power to stop coordinating at any point if it is not.

The paper by *Alan J. Auerbach* (University of California, Berkeley) deals with fiscal policy. One of the most important lessons from the post-crisis period is that since – in the low interest rate environment – monetary policy is constrained by the zero lower bound of the nominal interest rate, there is also need for fiscal policy. However, the practice of fiscal policy remains in the crossfire of disputes. Before the crisis, most policy-makers were sceptical about the effectiveness of fiscal policy, since they believed that expenditure and tax multipliers were low. Since then, however, numerous empirical papers have demonstrated that fiscal multipliers were higher than thought to be before the crisis, particularly during times of recession, and when the zero lower bound of the nominal interest rate is binding. Accordingly, in certain situations, fiscal policy is not only necessary, but also expedient.

The question of fiscal rules is important in terms of the effectiveness of fiscal policy. Fiscal rules are justified by the objective of avoiding time inconsistency, by the long-term effects of distribution among the generations and by fiscal sustainability. At the same time, it was confirmed that overly rigid fiscal rules are inefficient, and in certain cases the application of discretionary fiscal policy is unavoidable. Instead of overly rigid rules, the author urges the establishment of fiscal councils. In a low interest rate environment, it is favourable from the aspect of applying fiscal policy that the cost of capital and debt servicing burden

of government programmes is lower. However, it should be noted that the debt-to-GDP ratio is not a perfect indicator of fiscal sustainability, and that additional criteria, such as implicit liabilities, should also be taken into consideration.

The authors of the comprehensive paper on financial policy are *David Aikman, Andrew G. Haldane, Marc Hinterschweiger* and *Sujit Kapadia* (Bank of England). First, they review the reform of financial regulation implemented on the basis of Basel III. It should be noted that the new regulatory system does not only use the microprudential approach; i.e. it does not only focus on the stability of individual financial institutions, but also considers systemic risks, and thus also has macroprudential elements. In the analysis, they emphasise the significance of new components such as liquidity-based standards, the countercyclical capital buffer – as the first dynamic regulatory component – and management of the shadow banking system.

The authors point out that the new regulatory system has multiple elements and is multipolar, due to the fact that the risks of the financial system stem from a variety of sources, which can only be addressed by different instruments. Furthermore, the actors of the financial system are keen to circumvent certain regulatory tools, but when there is a complex network of regulatory instruments these attempts are less likely to succeed. The paper empirically demonstrates that the regulatory elements have a tangible effect on the banking sector's balance sheet and describes to what extent the regulatory instruments may reduce the probability of financial crises and to what extent they would mitigate the effects of a potential crisis. At the same time, the authors also consider the potential macroeconomic costs of the regulatory measures.

At the end of the paper, the authors review what kind of additional studies they deem necessary in areas such as defining the optimal level of regulatory capital, the development of financial stability models, the macroprudential policy framework and the financial stability implications of FinTech developments.

The relationship between economic growth and income/wealth inequalities is discussed in the presentation by *Jason Furman* (Harvard Kennedy School). According to the author, although intensive analyses are underway on the relationship between economic growth and inequalities, in terms of economic policy the key issue is the effect of potential public policies on growth and inequality rather than whether inequality reduces or increases economic growth. Thereafter, those examples are examined which have positive effects on both factors, such as, for example, education. Subsequently, policies, such as the tax policy are analysed, which do not necessarily have simultaneous positive effects both on growth and inequality.

The international aspects of macroeconomic policies are discussed in the paper by *Gita Gopinath*, Chief Economist at the International Monetary Fund. Her main findings are as follows: 1) The gains from exchange rate flexibility are smaller than you think; 2) The “trilemma” lives on (it is not possible to simultaneously implement a fixed exchange rate, autonomous monetary policy and free flow of capital); 3) The exchange rate of the US dollar drives global trade prices and volumes; 4) Gross capital flows matter as much as net flows, and global banks have internationalised US monetary policy; 5) Emerging markets’ shift away from foreign currency debt towards local currency debt reduces their exposure to global risk factors; 6) The low interest rate environment can lead to misallocation of resources and lower productivity; 7) The relationship among global imbalances, reserve accumulation and currency manipulation is not well identified; 8) Uniform border taxes are not neutral; 9) Trade is not the main driver of earnings inequality, but at the same time, policy has failed to address its redistributive consequences; 10) Global coordination of financial regulation is essential.

On the whole, it can be stated that in the past decade the direction of economic policy has changed and become much more complex. According to the authors, the question as to whether this can be regarded as evolution or revolution has not yet been decided. The response to this largely depends on the macroeconomic developments in the years to come.

A Review of the Conditions of Euro Area Accession*

Ferenc Tóth

Barnabás Virág (ed.):

Long-term Sustainability and the Euro: How to Rethink the Maastricht Criteria?

Magyar Nemzeti Bank, Budapest, p. 307

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The most recent publication of the Magyar Nemzeti Bank, a book entitled “Long-term Sustainability and the Euro: How to Rethink the Maastricht Criteria?” was presented at the Lámfalussy Lectures Conference held on 20 January 2020.¹ In his welcome speech György Matolcsy, Governor of the Magyar Nemzeti Bank, told the conference that the book was intended to stimulate dialogue in the profession about the future of the euro area and the development of a set of accession criteria facilitating a sustainable convergence process in the Member States introducing the euro. In 1992 Hungary did not have the opportunity to formulate a position on the further progress of European Union integration. Celebrating the 30th anniversary of the Maastricht Treaty two years from now, in 2022, will provide a good opportunity for the MNB to also express its opinion on a subject that is fundamental to our common future and highly important for achieving a strong Europe built on internal cohesion. The authors intend this volume to be their contribution to the ongoing debate about how to improve the functioning of the euro.

Twenty years after the introduction of the euro, it is worth taking stock of how well the single currency of the euro area has worked in practice; after all, the euro has been the most ambitious project in the entire economic history of Europe. Besides, a well-functioning euro is also highly important for Hungary, which made a commitment when joining the European Union in 2004 that it would introduce the euro at some later date, once it will comply with the relevant conditions, i.e. the Maastricht criteria. Significant changes have taken place in the last two decades as the global economy has become multi-polar; this crisis-laden period

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

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¹ The online version of the book is available at the following link: <https://www.mnb.hu/letoltes/longtermsustainabilityandtheeuro-1.pdf>

has highlighted problems concerning the functioning of the economies and the financial systems of the euro area. It is clear that the introduction of the euro was not merely a financial matter; there were primary political and of course economic motivations behind that decision. The introduction of the single currency was the outcome of attempts and adjustments to fix exchange rates, combined with the institutional ideas prevalent in economic thought at the time. The book evaluates these lessons and examines the underlying doctrine to understand the euro and the institutional and economic frameworks behind it, with a special focus on Hungary's euro maturity.

In Chapter 1 of the book (*'From birth to the present - the first twenty years of the Euro'*), the MNB authors describe the Maastricht criteria, the underlying assumptions and conditions, and the performance of the euro area in light of the criteria and beyond. One practical objective for the monetary union was to eliminate exchange rate risk and achieve monetary stability. However, since the Maastricht criteria for accession formulate their objectives as nominal variables, they cannot measure real economic convergence directly or guarantee financial stability by themselves. A further problem is that the budget deficit criterion fails to take the initial deficit figure into account and that few have recognised the lasting impact of fiscal policy in boosting demand; as a result, no central fiscal instrument was created to smooth the economic cycles across the euro area. Member States mostly complied with the inflation rate criterion when the euro was introduced; non-compliance subsequently increased but has been falling again in recent years. Long-term interest rates have dispersed over a wider range following the global financial crisis, but currently all the euro area Member States satisfy the long-term interest rate criterion. Yet whether the date of accession fell into a period of boom or recession is highlighted by the authors as relevant for compliance with accession criteria.

Chapter 2 discusses the *Lessons from the Global Financial Crisis of 2007–2009*, highlighting the *shortcomings of the Maastricht criteria and the directions of institutional development of the euro area*. The global financial crisis uncovered the shortcomings of the criteria and the rules, and demonstrated that it was possible for significant imbalances to develop in spite of fiscal discipline rules being in place. The problem with fiscal criteria is that they disregard the processes that occur in the private sector: high private debt was accumulated in the peripheral countries, which often led to overheating and significant imbalances as well. Crisis management was made harder by the absence of joint fiscal capacities, and therefore fiscal stimulus was left to the national governments, which were significantly hampered in this by their obligation to adhere to the fiscal criteria. Problems were further aggravated by the slow and inadequate crisis management on the part of European decision-makers. The euro area was only saved from a protracted contraction in the Member State economies and a collapse of bond

markets in certain peripheral countries through the fast intervention, rate cuts and unconventional steps of the European Central Bank.

In response to the crisis, the European Union renewed its institutional structure: the European Financial Stability Mechanism was created in 2010, followed two years later by the European Stability Mechanism based on this and operating as a permanent crisis management institution. The European System of Financial Supervision was also set up; among other things, it is tasked with micro- and macro-prudential supervision performed in cooperation with Member State authorities. Major steps were also taken in the area of the banking union: the Single Rulebook providing a single set of harmonised prudential rules was created and the Single Resolution Mechanism was introduced to ensure the orderly resolution of failing banks and minimise the adverse impacts on the real economy, the financial system and the public finances of Member States. However, the final element of a banking union, the European deposit insurance scheme, did not materialise due to opposition from several Member States. This and the overall slow progress of establishing an optimal institutional framework is attributable to the fear in certain well-functioning Member States that a number of less disciplined Member States would benefit from unilateral income redistribution at the expense of 'the good ones'. As regards institutional development, the need for a continued deepening of capital market integration is also worth mentioning.

Chapter 3 presents *the experience of specific euro area Member States*. The chapter discusses two main questions: how the *cost/benefit balance of euro introduction* has changed over time and what the *experience of new accession countries was, for and against*. The euro has improved the efficiency of trade within the euro area and simplified and reduced the cost of financial clearing. The convergence of yields has been only partial, however. Against all expectations, the resilience of the eurozone was not consistent across the Member States, and the mere fact of membership was not able to offset the country-specific factors. Without independent monetary policy, the absence of real economic convergence in the euro area led to imbalances due to the long-term presence of excessively low real interest rates. Experience has been mixed regarding the success of the euro introduction. Whereas the southern countries were faced with a number of negative impacts, the experience of the Baltic states tended to be positive. Slovakia was well-prepared for accession and its introduction of the euro was unambiguously positive. By contrast, the experience of Slovenia, a country that had previously been seen as highly successful, was negative due to the emergence of imbalances similar to those in Southern Europe. From the experience of euro area Member States, we can draw the conclusion that new accession countries must pay special attention to ensuring that they remain on a sustainable and balanced path of growth even after the euro is introduced.

Finally, perhaps the most important chapter of this book formulates the *necessary criteria for joining a successful euro area*; it is therefore worth discussing that section in greater detail here. Its starting point is that the euro area is not an optimal currency area at the moment; in contrast to the stated objectives, the Member States have not yet converged in practice. The original set of criteria is therefore in need of significant revision. In terms of institutional structure, the most important future steps would be to implement the fiscal and capital market union and the missing component of the banking union. It is clear that reaching the appropriate level of real economic development and the presence of continued convergence are among the most important criteria. In addition, a suitably high degree of harmonisation between business and financial cycles must also be a high priority. A further important matter concerns the continued improvement of the productivity and the competitiveness of market participants, especially small and medium-sized businesses, whose productivity is typically lower than at large corporates.

The book proposes the creation of a set of criteria that retains some of the original conditions, introduces changes to others and also formulates new criteria. The proposed revised criteria are the followings:

- the inflation rates of the three EU members with the lowest but still positive rates of inflation to be used as a basis for the price stability criterion,
- similarly, the benchmark for the yield criterion to be the long-term yields of the three Member States with the lowest but still positive rates of inflation,
- for the fiscal criterion, to consider certain country-specific factors such as, for example, the debt ratio and the cyclical position of the particular Member State,
- the concrete deficit target to be tied to the amount of government debt and a structural balance to provide some room to manoeuvre,
- to prove exchange-rate stability, 3 to 5 years rather than the current 2 years of ERM II membership is recommended in addition to the original Maastricht criteria,

Recommendations for specific new criteria:

- per-capita GDP and wage levels to be at least ninety per cent of the corresponding values in the euro area,
- synchronised business and financial cycles,
- small- and medium-sized enterprises to have labour productivity higher than 50 per cent of that of large corporations and a wide range of high-added-value products and export arrangements,

- the economies of the countries wishing to join to be near full employment and
- have a stable and competitive banking sector,
- the convergence of the financial sector's depth to reach at least 90 per cent of the corresponding value of the euro area,
- macro- and microprudential policy instruments to minimise the risk of asymmetric shocks and adequate resolution tools to be available,
- the structural balance dependent on government debt to range between 0 and –2 per cent of GDP and the debt target to be 50 per cent.

The next section discusses *Hungary's euro maturity* in the light of the foregoing. In spite of a balanced process of convergence, the Hungarian economy does not comply with the price stability and exchange rate stability criteria, although it has achieved interest rate convergence. While it meets the government deficit criterion, shedding previously accumulated government debt is a time-consuming process. This means that Hungary is not yet mature enough to introduce the euro under the original criteria. Although the set of criteria recommended by the MNB captures the optimal accession conditions better, we can conclude that, in spite of the numerous significant advances made in recent years, Hungary meets only some of these.

The most important question for Hungary (and all other Central and Eastern European countries still to introduce the euro) is under what conditions and based on what timing should they introduce the European single currency so that our region can continue on its path of economic convergence after it joins the euro area. Hungary's convergence and sustainable development in the next few years will be possible only if the euro area functions successfully. The most important message of this book for Hungary is that we must understand our convergence opportunities clearly before joining the euro area: accession is recommended if the euro area we are to join is functioning in a healthy and successful way, because to withdraw later would be counterproductive.

The most important added value of this publication is that it makes objective, substantiated and concrete recommendations with clarity and is thus highly important for decision-makers and the wider professional public alike; after all, it is important to give the countries of this region the opportunity to explain their position regarding a decision as momentous for our shared future as the introduction of the euro. The introduction of the euro is not an endpoint, but a key milestone on the long road towards sustainable convergence.

The Impact of FinTech on the Future of Retirement Systems*

Tamás Kristóf

*Julie Agnew – Olivia S. Mitchell:
The Disruptive Impact of FinTech on Retirement Systems
Oxford University Press, Oxford, 2019, p. 240
ISBN: 978-0-19-88455-3*

The book's authors address an important social issue. When preparing for retirement, many people require help with the proper planning and management of their savings and investments during the accumulation period as well as with developing an adequate strategy on how to use the accumulated assets during their years of retirement. In light of current market practices, financial advisors and investment fund managers currently specialising in these issues seem rather expensive and thus unaffordable to many, while their activities fail to cover all the related needs and areas. Moreover, working with financial advisors and investment fund managers is often affected by conflicts.

By contrast, using well-operating algorithms, robo-advisors generated through FinTech are able to manage retirement investments efficiently, transparently and at a much lower cost, making these services affordable to a wide range of people. They employ a personalised approach and take into account the interests and risk appetite of each customer, throughout their lifetime, which may lead to a radical transformation of the retirement savings market. While the most affected generation over the age of 50 has a significant proportion of financial instruments available for investment, so far FinTech innovation has been less targeted at older adults, many of whom are unable to develop an adequate retirement saving strategy due to a relatively low level of financial awareness. FinTech companies and solutions thus have huge market potential worldwide.

Employing broad technological foresight, mapping market developments and stakeholders' expectations, and based on a number of empirical analyses conducted in the US, the collection of studies aims to outline the breakthrough

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

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impact of FinTech on retirement saving schemes. It assesses in detail the specific characteristics of the target group and takes into account the services that robo-advisors will be able to provide more efficiently in the future. Finally, it puts forth proposals to supervisory bodies for the proper supervision of robo-advisors.

The spread of robo-advisors during the accumulation period

While social confidence regarding the ability of the public pension pillar to generate retirement income over the long term has been undermined (in Hungary, this was accompanied by major transformation of private pension funds), a significant part of the population does not have the savings required to maintain their pre-retirement standard of living. They also lack the minimum amount of investible assets expected by financial advisors and investment fund managers. Therefore, it is not surprising that there is significant market demand for affordable, reliable advice on retirement savings.

As a result of technological development, FinTech now offers data-driven, personalised products that meet customers' evolving expectations. In conjunction with improvements in customer experience, the increasing availability of data sources has paved the way for marketing new, previously unimaginable financial products. Outside the scope of personal advising, customers are now able to use various online channels, including network connections, to seek financial advice, enabling them to compare their financial position and needs with those of similar customers, thus tailoring the financial services and customer experience to their own needs.

Robo-advisors work transparently, based on modern portfolio theory, mathematics, statistics and data mining. The establishment and management of automated investment portfolios are based on empirically tested and adequately validated methods. Robo-advisors offer a digital environment that allows customers to gain a better insight into different investment options, while outlining prospective scenarios, including the likely consequences of each decision.

The authors believe that scientific development in genetics may radically change our decisions on financial planning, since genetic information can now be used to more efficiently diagnose, prevent and manage diseases and to more reliably estimate life expectancy and the factors related to life expectancy at an older age. In view of such information and turning it to proper use, the demand for financial products and services may change substantially, and thus finance, genetics and information technology may interact to transform the market. However, the possession of genetic data raises a number of ethical and data protection issues. In the age of *big data*, data can be easily disclosed and sold without customers being aware of their personal data being used. The data may be used to authorise life insurance contracts or for other illicit purposes, as shown by the film *Gattaca*, among others.

According to the authors, the primary target group of robo-advisors can be defined using the following criteria, without distinguishing between people before retirement and retired persons:

- they accept technology-driven solutions that do not require human intervention;
- lack the minimum amount of assets required by traditional financial advisors;
- are indifferent to and/or have low confidence in the traditional financial intermediary system;
- have a 'do it yourself' attitude;
- have confidence in passive, index-following investment strategies, but mistrust the added value of active portfolio management by humans;
- require less complex and inexpensive 'off-the-shelf' investment solutions.

Robo-advisors are currently a relatively new phenomenon on the investment market. However, the market is highly competitive, with traditional competitors, incumbent robo-advisors and new entrants all present, which leads to significant technological development and innovation throughout the value chain. According to the authors, that trend is expected to increase.

The role of robo-advisors during the decumulation period

There is surprisingly little discussion about the decumulation period in relevant studies and in investment practice, although it may have an even greater potential for FinTech solutions than the accumulation period. The 4 per cent rule of thumb is often applied on the market for defining the amount that can be safely withdrawn from a portfolio each year without jeopardising it. However, this does not quite match the spending patterns of the retired who tend to increase their spending immediately after retirement and then spend less later on, while during the final part of their lives, their spending increases again due to hospital treatment or elderly care.

The use of accumulated financial assets should be subject to a number of decisions, including the following:

- should financial assets be annualised and, if so, when and how;
- preparation for uncertain and unavoidable costs (e.g. hospital treatment);
- how much money can one withdraw each year without risking a premature overdraft of the invested amount;
- the order in which the funds should be drawn from various accounts.

While the right utilisation model would maximise utility throughout a customer's lifetime, it is a complex task based on various factors. While the choice among

alternatives depends on consumer preferences, decision support can offer substantial added value. The authors have identified the following automated robo-advisory services for the decumulation period, noting that no single service provider is currently able to provide these services at the same time:

- allocate the accumulated assets to the expected declining life stages;
- support annualisation decision-making;
- optimise the application for social security pension;
- optimise the choice of a health insurance fund, predict the expected health-related costs;
- rationally select and schedule withdrawals from multiple accounts;
- continuously calculate the amounts that may be spent freely and safely on consumption.

A recent survey of the relevant service providers in the US has shown that these services are currently provided (separately) by human advisors even at companies that operate robo-advisors. That, however, will soon change.

Recommendations for supervisory authorities

Since supervisory authorities intend to ensure financial stability and secure access to financial services, on the whole, the authors clearly recommend that low capital-intensive technologies and the entry of FinTech firms to the retirement savings market should be encouraged. However, based on their conclusions, this does not mean that supervisory authorities should provide forecasts concerning the potentially viable technologies. Similarly, they recommend that no top-down structural changes be imposed on the currently strong market players.

It is recommended that supervisors stipulate that where robo-advisors are employed, the service providers concerned be obliged to record, in a retrievable form similar to black boxes on aircrafts, all decisions and transactions made by robo-advisors in order to enable subsequent assessment. Similarly, supervisory authorities should draw up requirements (not data sources or algorithms!) for robo-advisors, along with the supervisory validation tests verifying their compliance. However, according to the authors, the real test for robo-advisors may be their performance during the next financial crisis.

At the same time, it should be noted that robo-advisors cannot in themselves offer a solution for the low financial awareness of the persons concerned. It must be kept in mind that, even in the 21st century, many people still have no idea why and how the value of a security changes, let alone to make decisions on the basis of modeled probability.

The Sky Won't Fall – The China–U.S. Trade War and Future Economic Relations*

Jiandong Shi

Lawrence J. Lau:

The China–U.S. Trade War and Future Economic Relations

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Lawrence J. Lau, the author, has been teaching as an economist at Stanford University since 1966. In 2004, he returned to Hong Kong to serve as the president of the Chinese University of Hong Kong. Between 1992 and 1996 he was the associate director of the Asia-Pacific Research Centre (APARC) at the Stanford University, and between 1997 and 1999 he was the director of the Stanford Institute for Economic Policy Research (SIEPR). In 2004 he became the deputy chancellor of The Chinese University of Hong Kong and he held this position until 2010. His field of research is clustered around economic development, economic growth and East-Asian economies including China. He is also known as the first developer of the econometric model of China in 1966.

He has been studying Sino-US trade relations for a long time. As early as the 1990s, he cooperated with Professor Feng Guozhao and took the lead in conducting adjustment studies on the official differences between China and the United States in the Sino-US trade balance; these results were cited by former Chinese Premier Zhu Rongji. In the 2000s, Professor Lau proposed using domestic value-added generated by exports rather than the total value of exports between the two countries to measure the trade balance between China and the United States. The study, conducted by a team of the Chinese Academy of Sciences led by Professor Chen Xikang and Professor Lau, found that the US-China trade deficit was nearly one half smaller than the original figure.

Sino-US relations are undoubtedly the most important and most critical bilateral relationship in the world today. The book is written by the author in the context of the Sino-US trade war. The author clarifies three main issues in this work. First, the

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

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author clarifies that, although the actual impact of the Sino-US trade war in 2018 cannot be ignored, it is still relatively controllable for China, and especially for the United States. Even if the US new tariffs eventually cover all products imported from China, there is no need to panic. Second, the author discusses the potential economic and technological competition between China and the United States behind the trade war, as well as the rise of populism, isolationism, nationalism and protectionism around the world, especially in the United States. Competition between China and the United States is inevitable and may become the new normal. However, the author's analysis shows that, although China's total real GDP may surpass that of the United States at some point in the 2030s, it is still far behind in terms of per capita level, and it may not be possible to side with the United States until the end of the 21st century. There is still a huge gap between China and the United States in terms of the overall level of technological development and general innovation capabilities. At a time when exclusivity is on the rise in both countries, it is the responsibility of both governments not only to use words but also to prove through action that international trade and direct investment do not necessarily lead to any damage, and that there is a large enough overall benefit to make everyone profit. Third, the author demonstrates that cooperation between China and the United States in the economic field is a potential positive-sum game, that is, it achieves a win-win situation. For the complementarity between these two major economies, this cooperation is of great benefit to both parties through trade exchanges, direct and indirect investment, especially through improved economic cooperation, and the full development and utilization of the current idle or underutilized resources of the other side. It is possible to achieve a trade balance between China and the United States, and promoting mutual economic interdependence will help build trust and reduce potential conflicts in the future.

In the book, the author first introduces Sino-US relations and the growing Sino-US trade war. The author points out that, although China and the United States are each other's largest trading partners, there are major frictions and potential conflicts in the economic exchanges between the two sides. This has caused many complaints from the US: the favourable trade balance for China, undervaluation of the RMB exchange rate, the difficulty for US companies to enter the Chinese market, unfair market competition in China, bias towards state-owned enterprises, and national security concerns. These complaints eventually led to the decision by President Trump in 2018 to impose new tariff sanctions on imported goods from China in three rounds, with a total value of USD 250 billion, triggering a trade war between the two countries. The Sino-US trade war has disturbed international trade and investment, and its impact is not limited to the Chinese and US economy, due to the global supply chain that has emerged in the past decades. The trade war has

brought enormous uncertainty to the consumption and investment decisions of corporate entities in all parts of the world, and may lead to a permanent change in Sino-US relations.

In the second chapter, the author discusses the important moments in the history of Sino-US relations, and exchanges between the two countries, which began with trade between China and the United States in the late 18th century, highlighting the explosive growth of China's exports to the world and the United States after China's accession to the WTO in 2001. Thanks to the surge in exports, a large volume of surplus labour in China's rural areas can be transferred to coastal cities and work in export-oriented light industrial enterprises, lifting as many as 800 million people out of poverty. Although China's export growth to the world and the United States has slowed significantly since 2012, the economic achievements of China's accession to the World Trade Organization cannot be underestimated.

In the third chapter, the author re-estimates the US-China trade deficit, showing that the US deficit with China in 2017 was just USD 111 billion in terms of total added value (or GDP), far from the USD 376 billion often mentioned in terms of total export value. It is entirely possible to expand US exports to China by USD 111 billion in terms of total added value, which is equivalent to only USD 125 billion because of the relatively high domestic value added (GDP) of existing and potential US exports.

Chapter four shows that the actual impact of the Sino-US trade war in 2018 will lead to a 1.12 per cent drop in China's GDP (assuming that half of China's exports to the US are stalled because of the new US tariffs). For China, which has an average annual growth rate of 6.5 per cent, this is relatively mild and controllable. The actual impact of the trade war on the US economy is even weaker, possibly causing its GDP to fall by a maximum of 0.30 per cent, while the long-term average annual growth rate of the United States is close to 3 per cent. The trade war has a negative psychological impact on China's stock market and the RMB exchange rate, but these effects may be temporary.

Chapter five presents the fact that China and the United States are highly complementary, and that trade and investment between the two countries should be very beneficial to both sides.

Chapter six discusses the inevitable competition between China and the United States, the two largest economies in the world, regardless of whether it is intentional or not. But in many ways, there is still a considerable distance between China and the United States.

Chapter seven analyses the potential technological competition between China and the United States from the perspective of economic and national security. Although China is catching up fast in the field of science and technology, there is still a significant gap between the two countries. Although China has made tremendous efforts to develop science and technology and has made remarkable achievements, it still lags behind the United States generally, except for a few subdivisions (such as high-speed trains and quantum communications). China is far away from the United States as a whole in terms of cutting-edge scientific and technological development, as confirmed by the fact that very few Chinese have won a Nobel Prize. It is very likely that at least one generation or two generations of time will be required for China to catch up with the United States' leading position in the field of science and technology.

Chapter eight points out that economic cooperation between China and the United States can be a win-win situation for both countries. Given the high degree of economic complementarity between the two countries, both countries will enjoy significant benefits by making fuller use of their resources such as American energy, land and water resources, China's human resources and savings-through mutual trade and investment. In addition, if the two countries work together, it is possible to basically achieve a long-term trade balance between goods and services within five years. The author also proposed a specific path to narrow the Sino-US trade deficit by increasing US exports of goods to China rather than reducing China's exports of goods to the United States (as well as imports of goods from the United States). In addition, there are also two different ways to allow the United States to increase commodity exports. The first is to shift American exports to other countries to China, and the second is to mobilize currently underutilized domestic resources to specialize in the production of new exports to China. The first approach is largely superficial, and even if the trade deficit between the United States and China can be compressed, GDP and jobs in the United States will not increase significantly. This generates little real net income for the United States (and therefore no benefit for China), but can be used to promote the successful reduction of the US-China trade deficit. The second approach can bring real growth to US GDP and employment, and increase the supply of goods that China needs. American producers, workers and exporters will benefit, as can Chinese consumers, producers and importers who use new imports, and both countries will be improved, which deserves serious consideration by both countries. Furthermore, by launching a project to deepen the long-term economic dependence of the two countries, mutual trust between the two sides will improve, and the probability of a potential conflict will drop significantly.

The ninth chapter mentions that one of the main reasons for the current trade war between China and the United States is not trade itself, but rather the

potential competition between the two countries for economic and technological dominance. Whether this competition is open or concealed, whether intentional or not, it did not begin with President Trump, nor will it end with his departure.

The tenth chapter looks ahead to the future of Sino-US relations. Whether it is friendly or not, the competition between China and the United States should be understood as a long-term phenomenon that is progressing and will become the new normal. Trade disputes are but one of the manifestations of potential competition between the two countries. It is also possible that this kind of competition will be transformed into an ideological battle. However, China should not want to change the institutional model of the United States, and the United States is unlikely to transform China into its own institutional model. The Chinese people may never become as individualistic as Americans. Due to reasons such as culture, history, and path dependence, democracy in China may evolve in different ways and take different forms than in the United States. What both countries should be able to do is to learn to accept and adapt to each other's particularities and exceptionality feelings.

The author believes that this is actually a good time for China to persist in promoting openness to international trade and investment (including inflows and outflows). For example, China can unilaterally reduce import tariffs on goods such as automobiles for all other countries that do not engage in a trade war, and can offer or accept concessions on trade and exchanges of all countries on a reciprocal basis. The author points out that international trade and cross-border direct investment are always win-win; domestic and international competition can improve efficiency and promote innovation, so it is possible to expand inclusiveness in international economic relations. Of course, Sino-US relations also involve issues other than the economy and must be handled cautiously by the future leaders of the two countries.

China and the United States are not destined to be enemies. They can be both strategic competitors and partners. The world is big enough to accommodate the continued growth and prosperity of both sides and to cooperate with each other in the common interests of the two countries and even for the benefit of the world. For the common benefit of both sides and all mankind, China and the United States will find ways to work together again, and the author is optimistic and hopeful.

This book analyses the background, causes and influence of the Sino-US trade war, in which the direct causes of the Sino-US trade war and the trade imbalance between China and the United States are studied in detail, and it is pointed out that competition in Sino-US relations will be the new normal in the future, which

provides a good perspective for us to understand and study the Sino-US trade war and Sino-US economic relations. This book provides a detailed analysis of the current disputes occurred between China and the United States. Readers will be convinced by his precise data and subdued by his incisive opinions, which helps readers have an in-depth understanding of new normal development of China and the United States, and how it will affect global political, economic and social development trends. This is a book not only suitable for professors and students in economy-related fields, but also for anyone who believes in a better future for the world that ought to read this excellent work carefully.

Report on the Lámfalussy Lectures Conference Held in January 2020*

Ferenc Tóth

Named after Alexandre Lámfalussy, the prominent Hungarian-born economist and reputable expert of European finance, the seventh *Lámfalussy Lectures Conference* was held on 20 January 2020, where leading global financial experts and academic researchers discussed the topic of long-term sustainable convergence.

In his welcome address, Magyar Nemzeti Bank (MNB) Governor *György Matolcsy* first greeted Lámfalussy awardee *Peter Praet*, who is a former member of the Executive Board of the European Central Bank (ECB) and a professor at ECARES – Solvay Brussels School Economics and Management at the Université Libre de Bruxelles, and *Gergely Baksay*, who has received the Popovics award and is the Director of the MNB’s Directorate for Fiscal and Competitiveness Analysis.

In his opening speech, *György Matolcsy* emphasised the need to prepare for four main challenges, which are: geopolitics, the emergence of new digital technologies, the transformation of the monetary system and climate change. These challenges have significant reciprocal impacts and also exert an influence on long-term convergence. Since 2013, Hungary has been on a path of convergence in all respects; nevertheless, we need further competitiveness and structural reforms. We must establish a new dialogue with the European Union, the IMF and the global business community. A strong and successful EU is in all our interests; this necessitates greater competitiveness and stronger cohesion. Mr Matolcsy called on all EU Member States to join forces and collectively launch new dialogue about reforming the euro area and the entry criteria. In 2022, we will celebrate the 30th anniversary of the Maastricht Treaty; this is a great opportunity for a thorough reform of the euro area. ECB President Christine Lagarde has already launched the reform of the ECB. The MNB is contributing to this dialogue with a new book, in which it proposes a transformation of existing rules so that Europe, including Hungary, can achieve long-term, sustainable development.

In his speech, *Peter Praet* expressed agreement with *György Matolcsy*, and explained that a strategic review of the ECB was already underway at the Bank;

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

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the review is expected to be completed by the end of the year. However, there is also an urgent need for a much wider review of the euro area and European Union strategy. This is a great challenge. It is important to set deadlines for reforms. In his view, hidden imbalances emerged as early as the first decade of the euro area, but these signals were perhaps overly neglected and came to the surface only during the crisis. It transpired that while monetary policy had achieved multiple good results, it was unable to function efficiently by itself without the support of fiscal and structural policies. The good news is that people consider the euro useful and are firmly behind it, as demonstrated by various polls. The ECB is able and willing to make the right decisions, and is functioning well as an institution; nevertheless, confidence in the Bank remains low, albeit improving. Citizens need to be given a better explanation of what a central bank's mission is, and what it can and cannot do. For instance, it cannot solve the problems caused by climate change or ensure a better distribution of incomes by itself. He emphasized that single currency needs the single market and vice versa. In addition, a greater degree of harmonisation is needed in corporate law or insolvency legislation.

MORNING SESSION: The new challenges of sustainable convergence within the European Union

In his introductory speech entitled 'Sound governance of the Economic and Monetary Union (EMU) for sustainable convergence in Europe' *Robert Holzmann*, the Governor of the Oesterreichische Nationalbank emphasised the need for greater stability in the European region, including a strengthening of the banking union and the capital markets union. Analysing the current challenges facing the EMU, he focused on the completion of the banking union in order to protect taxpayers by creating an unconditional European deposit insurance system. It is critical that the risks are first reduced and are shared only afterwards. This is a position also held by the central bank of Austria, the OeNB. Implementing a capital markets union would also be important, but this can only happen if households also take part in capital market financing. Currently there is a limited number of well-capitalised 'capitalists' on the market, but this is not enough to operate an efficient capital markets union. With a well-functioning banking and capital markets union, fiscal policy would need to intervene less in order to smooth the cycles, he noted; for this reason, capital markets in the United States for instance play a much greater role in this process than in Europe. He also spoke of the essential need for fiscal discipline, and the fact that it is not enough to focus on financial debt, the implicit debt burden of healthcare and pension expenditures must also be taken into account. In conclusion, he mentioned the question of Hungary's and Poland's participation in the euro area. Apparently these countries wish to give further thought to that question; no one can be forced to join, everyone must make that decision independently and the question should be debated openly.

The moderator of the ensuing panel discussion was *György Szapáry*, Chief Advisor to the Governor of the MNB. Panel participants included *Poul M. Thomsen*, Director of the European Department of the IMF, *Barry Eichengreen*, Professor of Economics and Political Science at the University of California, Berkeley, *Debora Revoltella*, Chief Economist at the European Investment Bank, *Iain Begg*, Professorial Research Fellow at the London School of Economics and *Olivier Garnier*, Chief Economist and Director General for Statistics, Economics and International Affairs at the Banque de France.

In his keynote speech *György Szapáry* showed two charts: the first concerned the euro area current account surplus as a percentage of GDP between 2012 and 2019 and he highlighted that the surplus was invested outside the euro area. The second chart, of unemployment rates in the euro area in 2019, showed that unemployment was very high in several Member States, i.e. the surplus was not distributed to where it would have been most needed.

Poul M. Thomsen described three different convergence processes. First of all, a very impressive East-West convergence process is taking place in Europe. It is similar to the outstanding economic growth of Japan and South Korea in the sixties and seventies respectively. Yet the rate of convergence has been much lower in Eastern European countries that are not EU members. The second process is convergence within the euro area: the 12 founding Member States had largely been converging prior to signing the Maastricht Treaty, but the process of convergence then started to decelerate and stall, with some southern Member States eventually falling into divergence. The third process is the subdued current convergence of the advanced European countries, which had converged quickly after World War II; these countries, even the best performers among them, are increasingly lagging behind the United States in terms of per-capita GDP.

The main question is how to reboot the convergence process. *Mr Thomsen* highlighted two of the many challenges, emphatically at national level for both: an absence of structural reforms and inappropriate fiscal policies. The consequence of the former is the increasingly wide productivity gap between north and south. Southern states are faced with near-stagnation. While growth has recently restarted in Spain, convergence based on proactivity is still absent in the other southern states. Research by the IMF indicates that the implementation of reforms can benefit the countries lagging behind the most because this is where it can have the greatest impact on the economy and levels of productivity. Structural reforms can improve the crisis resilience of Member States in an economic downturn. The further we are from the crisis, the less concerned certain countries are with implementing structural reforms. The speaker also emphasised that decisions on structural reforms should be adopted at the national level; for the most part, this is not a question for the European institutions.

Another key problem lies in inappropriate fiscal policies, especially in the highly indebted countries. Debt is at or above 100 per cent of GDP in seven Member States, which failed during the good years to raise fiscal buffers for the bad years. As a result of procyclical mistakes made even in the good years, the protracted impacts of shocks solidified into permanent on output. The most highly indebted countries underestimate the need for fiscal adjustment. During the crisis, they cut government investment instead of reducing government spending on consumption. This crowded out productive investments. In conclusion, he highlighted again that Member States should find custom solutions to these problems at the national level. The greatest concern is the lack of an appropriate fiscal policy mix and the high proportion of non-productive expenditures.

European convergence was the subject of *Barry Eichengreen's* speech as well. Nominal convergence had taken place by 2008 in terms of inflation as well as the interest rates on ten-year government bonds. Yet after that date, serious fiscal problems caused a significant rise in the difference between the interest rates of Germany and Greece for instance. The situation is even worse in terms of real convergence. In the period following the introduction of the euro, the variation coefficient of per-capita GDP at purchasing power parity first stagnated but then doubled after the crisis, resulting in divergence. The main reasons were the following: The asymmetric impact of the integration of China into the global trading system had a negative impact on (especially) the southern states. Germany and therefore Hungary benefited disproportionately from the productivity increase created by the integration of Eastern Europe into the single market. The southern countries were not able to benefit from this process. Inefficient financial and banking systems, such as that of Portugal, failed to accelerate the rise in productivity, and capital flowed to services, which are relatively unproductive technologically. Before the crisis, Portugal, Spain and Greece received high capital inflows from other parts of Europe and the world, and suffered the consequences of an overvalued currency as a byproduct of nominal convergence.

In his book 'The European Economy Since 1945', *Mr Eichengreen* describes in detail the standard explanation for Italy's underperformance, with an emphasis on its inflexible product and labour market, weak and undercapitalised banking system, and the high proportion of non-performing loans. This interpretation does not explain, however, why these product and labour markets are inflexible, and it disregards the fact that Italy's total factor productivity had already stopped growing in 1995, or that the Italian economy had been facing problems even prior to that date. He identified the issue in the deviation between the inherited system of institutions and the requirements of the new technologies. In conclusion, he noted that the convergence crisis in Europe originated from the crisis of the

system of institutions; the two crises interact and should be resolved in order to make progress.

Debora Revoltella spoke about the need to accelerate the transformation of Europe in order to achieve sustainable convergence; she called this an old challenge and a structural question. There are three key subject areas associated with this matter, namely: a) Environmental sustainability and an energy transition, which requires more investment than today; b) Speaking of social sustainability, she remarked on the rising income inequality between the richest and those on lower incomes both across the European Union and in the national economies, geographically as well as between the generations, and inter-generational social mobility has also declined; c) We also face numerous problems in terms of competitiveness and productivity. The main obstacles to investments by EU businesses include a lack of staff with the right skills, uncertainty and business regulatory issues, as well as the absence of a flexible European-level environment facilitating transformation. The European Union is lacking new global leaders and the right governance in the new sectors. The EU spends much less than the United States on research and development in most sectors except the automotive industry. As for climate research and development spending, both the US and China are ahead of the EU. There are too few new businesses setting up, their growth process is too slow. There appear to be two main problems underlying this: firstly, the absence of past success stories, which constrains the growth of new businesses, and secondly, the fragmentation of the European market and an absence of openness to disruptive technologies. The US market is much more efficient and much less fragmented. Other problems include the lack of dynamism in our system and the sustained productivity gap between leading and lagging companies. Weak infrastructure investment by governments is holding back private investment in infrastructure. Intelligent infrastructure, financial instruments and improving access to them help manage the fragmentation of the market and the rechanneling of ample liquidity. She concluded by stating that these require investments, the fight against climate change must be strengthened and the transition to zero carbon emissions accelerated. Social cohesion must be rebuilt in Europe. We should take advantage of the great technological advances being made, and governments need to rethink their investment priorities. The Green Deal may be a possible means of convergence.

In his talk entitled 'An EU Level Fiscal Capacity The 'why', 'how' and political economy', *Iain Begg* took as his starting point the design faults of the Economic and Monetary Union; these are the following: the difficulty to achieve a joint fiscal policy, the absence of safe instruments, the unfinished banking union and the deficiencies in the governance and coordination mechanisms, as well as the lack of agreement on burden sharing. He then proceeded to analyse today's problems:

monetary policy has no room to act and respond to any further deterioration of the current downturn. Structural policies are important of course, but most are slow in achieving results and some even cause disruption in the short term, before improvements can happen. The opportunities of fiscal policy are also limited, because Member States must comply with the fiscal rules and are reluctant to agree to new EU-wide mechanisms.

As for the question of 'HOW', he described proposals: there is increasing support for a kind of euro area budget, but the expectations are contradictory. France and Spain support the creation of a certain level of unemployment support. According to Germany, the budget could operate as a convergence and competitiveness instrument, but it is not a suitable tool for stabilisation. There appears to be limited ambition concerning funds earmarked for bad times. It is hard to identify support for the debt instrument and there is no consensus on the best way to shape policy.

He then switched to questions of political economy: the nations that could loosen their fiscal policy will not do so or will otherwise be faced with labour shortages. Whereas those who would need fiscal support have no room for manoeuvre. The absence of trust is attributable to the fixing of moral risks. There are concerns especially about Italy. It is difficult to break the stalemate when Germany and other lenders emphasise moral risk, whereas debtors emphasise solidarity against a backdrop of a population in revolt.

The ideal method for macro-level sustainability would be to agree an euro governance policy and to implement it in a timely manner. This would generate sustainable growth with reduced imbalances and increase the trust in deeper EMU integration. In practice, however, there might be inconsistency for instance if European governance approaches are subjected to the dominance of national priorities, if the parties are unable to resolve the dilemma of risk sharing and risk reduction, if the deviation between economic trends in the Member States hinders joint action or if the compliance with rules and processes is not satisfactory. In such cases, sustainable convergence would continue to be an overly great challenge.

In his closing remarks, he added that an economy that works for the people should go beyond slogans and easy efforts. However, this requires an appropriate level of accountability. Fiscal policy must do more; still, overly high importance has been attributed to fiscal rules, whereas joint fiscal policy has not been given sufficient weight. Essentially, a credible euro area fiscal capacity is now required.

Olivier Garnier, the only central banker on the panel, examined the subject from the perspective of monetary policy. Monetary policy has proven successful so far. Without the ECB's unconventional measures, real GDP would have grown much less in the euro area and the inflation rate would have been even further

from the inflation target. However, monetary policy cannot be the only part of the solution in an environment where the natural rate of interest is low over an extended period. There are two non-monetary questions underlying this. Firstly, the total productivity factor is rising at an ever slower rate, and has remained below 1 per cent in the euro area for more than two decades. Secondly, domestic savings and investments as a percentage of GDP started to diverge after 2009: the gap is wider than in previous periods, with much higher levels of savings than investments. The interaction between the euro area-level single monetary policy and the national fiscal and structural policies plays a limited role in preventing the emergence of inflationary processes. The new macroeconomic environment (stubbornly low inflation, low long-term interest rates) presented a challenge for the former eurozone policies; monetary policy may face an increasing challenge if it does not enjoy adequate support from other policy areas.

He then highlighted the need for a new, more integrated policy mix, one that supports long-term economic growth and boosts investment. By sharing the economic policy burden, fiscal policy should prove a more efficient instrument of stabilisation in an environment of low interest rates and should, together with structural policy, mitigate the potential harmful side effects of monetary policy on financial stability. This new, more integrated euro area-level framework of policy areas would have four components: to raise inflation towards the inflation target; monetary policy to remain supportive as long as necessary; long-term growth and investments, and increasing the r^* , natural rate of interest.

At the level of structural policies, this means completing the creation of the single market in services and digitalisation as well. In addition, national reforms are necessary to increase the total productivity factor by improving education, research and development spending and labour participation. In fiscal policy, joint fiscal instruments are needed to support climate change and digitalisation investments at the euro area level. Beyond that, efforts should be made to achieve a more growth-friendly mix of public expenditures at the national level.

The risk of reaching the effective lower bound on interest rate should be reduced in the business cycle (this would be the stabilisation function). Countercyclical fiscal policy should be given greater scope and there is a need for stronger cross-border governmental and private risk sharing.

Financial stability risk should be minimised – in an environment of low interest rates – with a combination of monetary policy instruments at the level of the euro area and by applying macroprudential policies at the national level.

AFTERNOON SESSION: Preserving sustainable convergence in a changing world/in Asia

The afternoon session started with a keynote address by *H.E. Serey Chea*, Assistant Governor and Director General of the National Bank of Cambodia. She spoke of how the world has changed since the global financial crisis and will never be the same as it was before. The damage caused by the crisis goes well beyond the financial considerations. Regarding Asia, it is clear that global banks have reduced their presence in the emerging world in order to reduce their regulatory burdens. A large number of advanced economies are suffering from their inability to achieve growth comparable to before the crisis. Having been the foundation for success in the past, globalisation is facing challenges now. One problem is that the economies conducting free trade have largely disregarded inequalities. In the United States of America, for example, the average income of the top 10 per cent of society rose threefold over the past four decades, whereas the situation of those in the lowest income category has, at best, remained unchanged since 1980.

One of the new trends is widespread protectionism in the United States. What does this mean for Cambodia? Cambodia has achieved significant growth over the past two decades (8 per cent on average), with exceedingly good macroeconomic indicators in all areas. A deceleration can currently be seen in most sectors. In an environment of global uncertainty, it is very difficult for the government to maintain even the current growth rate, which is 7 per cent at most. Previously a good performer, the financial sector is also more exposed to external shocks now. It is important to point out that 90 per cent of operations in the Cambodian economy are transacted in dollars. Cambodia will, sooner or later, feel the impact of the US-China tensions because the successes of Cambodia are dependent on the prosperity of its trade partners. Also, lower-skilled workers, whose pay is rising, are justifiably fearful that they might be replaced by robots. She highlighted four points as to how to maintain convergence in a quickly changing world:

a) Along with many Asian countries, Cambodia has doubtlessly benefited from the current world order by taking part in the global governance mechanism through its UN/WTO/World Bank/IMF memberships. This has helped it become one of the six fastest growing countries in the world. Asia's aim is to maintain the liberal order of global free trade; a globalised world has to be governed through international rules, although local considerations must also be incorporated in the system to a certain degree. She emphasised that convergence can only take place if we reach the desirable result.

b) Cambodia's largest trading partners, representing 60 per cent of its exports, are the United States and Europe. At the same time, China accounts for 45 per cent of its direct capital investment. This duality causes problems at times: it is

important for a small country to diversify its economic dependencies. Cambodia's membership in ASEAN (the Association of Southeast Asian Nations) is very helpful. Mutual interdependence is good only if the global production chains apply a fair system of distribution, as this is how to avoid conflict.

c) The fast progress of technology and big data will bring changes in almost all areas, from finances to trade. With the boom in e-commerce, cross-border transactions can redefine and change the international mechanisms of trade. Cambodia's population of 16 million has 20 million mobile subscriptions; in 2019 the country was the first in the world to introduce a system of payments using blockchain technology, which complements the instant payment system launched there back in 2016.

d) In order to maintain sustainable convergence, Asia needs to have a far-sighted, comprehensive strategy, which must go beyond the economic models and also take the consequences of geopolitics, technology and climate change into consideration.

The ensuing panel discussion was moderated by *Dániel Palotai*, Chief Economist and Executive Director for Economic Sciences and Priority Matters at the MNB. Panel participants were: *Hoe Ee Khor*, Chief Economist of the ASEAN+3 Macroeconomic Research Office, *Bernard Yeung*, President of the Asian Bureau of Finance and Economic Research and Stephen Riady Distinguished Professor at the National University of Singapore, *Eduardo Pedrosa*, Secretary-General of the Pacific Economic Cooperation Council, and *Harris Kim*, Director of Inflation Research Division at Bank of Korea.

Dániel Palotai in his lead of the panel discussion, raised some thought-provoking topics for sustainable catching up in Asia. He used diagrams to illustrate how the formerly robust global growth and the growth of emerging economies are now slowing. In Asia, the short-term outlook points to a continued deceleration of growth. Important contributing factors include global policy uncertainties and slowing growth in China. One key question in such an environment is how to escape from the middle-income trap. Only a few countries have managed to do that so far. It is clear that there are no universal solutions; however, based on experience, specialisation in high value added exports and a service orientation are key criteria. It is worth focusing the restructuring of the economy on developing education and healthcare as well as on local opportunities for growth. It is also important to consider that a high degree of indebtedness limits fiscal space and there is an broad-based slowdown in labour productivity.

Innovative methods are necessary to achieve sustainable development, such as green bonds and green loans in the area of sustainable debt financing. The

evolving risks have to be considered by the growth models. Quoting the 'World Economic Forum: The Global Risk Report 2020' publication, Dániel Palotai named the following key global risks: extreme weather; the potential climate-action failure; natural disasters; biodiversity loss; human-made environmental disasters; weapons of mass destruction; crises triggered by a lack of clean water. To conclude, he raised the question of whether we were moving towards sustainable development at all. He noted in that respect that modern growth models are facing the following new challenges: climate change; fierce global competition; rapid development and societal technologies; the need for new skills for adapting to technological and societal changes; aging population.

All this highlights the key importance of eliminating the contradiction between growth and prosperity on the one hand, and climate protection and sustainability on the other.

Hoe Ee Khor started his presentation by stating that Asia's growth catch-up over the last two decades has been remarkable. Per-capita income in the ASEAN+3 economies (ASEAN + China, Japan and South Korea) has converged in an impressive manner and pace with the income levels of high-income countries outside the region. The contribution of the manufacturing industry to growth and job creation has reached its peak in the high-income and the ASEAN-4 countries (Philippines, Indonesia, Malaysia and Thailand), but there is still scope for the lower-income Asian countries to develop in that direction.

Over time, the nature of the region's globalisation has changed, shifting to an extended production and growth strategy with a strategy of manufacturing for export. The manufacturing sector has become the driving force in the export strategy of the ASEAN+3 region. In the past two decades of prudent macroeconomic governance, complex challenges have arisen in connection with the savings-investment gap. Long-term shortcomings in savings and investment generate fundamental vulnerabilities. Sustaining funding and managing external shocks make macroeconomic decision-making more complicated and require the aggressive accumulation of currency reserves. Low-income Asian countries benefit greatly from the direct capital investments within the region, which helps fill some of the savings-investment gap, adopt technologies and improve the skills of the labour force. These countries have a labour force that is still relatively cheap but increasingly skilled.

A closer examination can reveal a key change in the engines of growth: China and the ASEAN-5 countries (founding countries: Philippines, Indonesia, Malaysia, Singapore and Thailand) balanced their economies in the wake of the global financial crisis by shifting towards internal demand. More and more domestic manufacturers have turned their attention to domestic consumption in recent

years. The fast increase in demand in the region is a strong driver of economic growth. The transition to the new economy plays an increasingly dominant role within the regional demand for ASEAN+3 countries' exports. There are clear signs suggesting that the ASEAN3 region is becoming a stronger internal demand base for the products manufactured by its own 'new economy'.

The road leading to further convergence is bumpy. Some ASEAN countries wish to diversify their growth factors to make their economies more flexible, while other countries appear to prefer specialisation in an effort to accelerate their growth. The weight of the ASEAN+3 countries within the global economy is expected to increase significantly by 2035. The national plans are ambitious, and the region-wide efforts reflect a heightened degree of solidarity in the implementation of joint development efforts. These may achieve very significant outcomes.

Bernard Yeung structured his presentation around four main topics, namely: economic/political tensions (technological progress, climate change, aging); trade tensions (increasing integration within Asia); Asia growing, urbanising and modernising in general; the need for investment, institutional development and the use of technologies.

Most countries in Asia have seen a healthy and constant rise in their GDP since 2012. Poverty rates are decreasing, the middle class is getting larger and stronger. In response to the global economic and policy tensions, Asia and the ASEAN countries have increased their integration, and strong regional economic cooperation continues in the Asia-Pacific region. Trade, foreign direct investment, equity investments, financing and tourism have all grown within the region. The main characteristics of Asia are integration, urbanisation and modernisation. In the next few decades, urban populations will increase significantly in all Asian countries, resulting in an immense demand to invest in housing and infrastructure construction. In addition, the average annual investment demanded by climate change will exceed 5 per cent of GDP in all regions within Asia by 2030. He highlighted the importance of the investment needed in the fight against environmental risks; as the OECD's records show, over a quarter of all global disasters in the period between 2010 and 2017 took place in Asia.

In response to the above challenges, Asia needs to improve its institutional structures so that it can attract investment by making it easier for businesses to operate. It needs to use technologies more efficiently in order to bridge the investment gap. It has to solve the question of financing. A more efficient distribution of financial resources will encourage inclusive growth. This requires increased liquidity, improved accountability and transparency, and greater overall efficiency in long-term financing and the related projects. More should be spent on education. The partnership between the public and private sectors must be

facilitated and governmental efficiency improved. Action must be taken against corruption.

He concluded by saying that Asia is growing significantly and its increased integration means that it is less exposed to the economic conflicts generated by the United States. It has a high investment demand due to infrastructure development and environmental risk management needs. It needs to improve its institutions and be faster. Technology helps reduce costs, improve efficiency and obtain financing. It needs to solve the problem of missing human capital. In conclusion, he expressed his wish that there should be no war.

Eduardo Pedrosa's lecture was entitled 'The role of the post-2020 vision of the Asia-Pacific region in sustaining convergence in a changing world'. Prosperity grew dramatically in the first 30 years of the existence of APEC (the Asia-Pacific Economic Cooperation). This is supported by the significant increase in trade and investment. In 2020 APEC as an institution and its region find themselves in a critical situation. It must face the existential challenges of environmental sustainability and climate change as well as rapid technological change, which may help accelerate the spread of prosperity but may also intensify social tensions and strengthen the current fragmentation trends. Moreover, there is growing scepticism in certain parts of the societies in the Asia-Pacific region towards the value of openness, which undermines the political support for regional economic cooperation.

APEC's 1994 vision and objectives can be summarised as follows: accelerated, balanced and equitable economic growth not only in the Asia-Pacific region but everywhere in the world, through free and open trade as well as investment by 2020 at the latest. He then spoke about the successful process of poverty reduction between 1990 and 2015. In terms of per-capita GDP, emerging countries have converged significantly with the industrial economies; nevertheless, the rate of economic growth has started to decrease in the Asia-Pacific region: there are increasing signs of the constraints of the liberalisation of conventional trade in encouraging growth and dynamism. He also spoke of the risk of failure. Fractures may jeopardise the future promise of new technologies. The end of mutual economic dependence threatens to undermine our shared interests in the peaceful and constructive governance of international relations. If we do not deal with the constraints on growth, the medium-income economies of APEC will not reach high income status and there is an increased risk that they will fall into the medium-income trap. Similarly, the high-income economies will not take advantage of their opportunities and will not benefit from the broader advantages of enhanced connectivity.

Harris Kim spoke about Korea's experience regarding the challenges of sustainable convergence. First, he presented the history of Korea's convergence. The Korean

economy achieved fast economic growth with a strategy, used since the 1960s, of imitation and input-driven growth. It set up conglomerates and boosted public sector investment. Population growth was high at that time, the demand for education has increased, and the expansion of public education and health insurance led to a significant improvement in human capital. External conditions also favoured an export-oriented economy: world trade and a culture of mass consumption spread fast, and living standards rose significantly in the west, including in the United States.

Nowadays, however, Korea is also facing challenges. Its convergence has slowed: as soon as its growth driven by a quantitative increase in capital and labour inputs reached its limits, its productivity growth quickly decelerated. The structural vulnerability of the Korean economy, the worsening external conditions after the global financial crisis and the inadequate efforts to develop institutions and innovative growth resulted in a growth rate that was consistently low. Demographic changes including a low fertility rate and aging populations now hold back sustainable economic growth.

In addition to product and labour market rigidity, different regulations create another hindrance before the entry of new businesses to the market. The entrenchment of labour market duality is another obstacle to labour mobility, resulting in a fall in the efficiency of human resource distribution. Another detrimental factor is the continual imbalance between households versus the corporate sector, large versus small businesses in the corporate sector, and exporting versus non-exporting companies. The external environment has also deteriorated. Drastic institutional and practical reforms are needed to prepare for sustainable growth in response to the structural changes in domestic and international conditions, in order to help create the environment necessary for innovative investments and the foundations for growth in the new industries. Structural reforms must be implemented in all areas of the economy to facilitate a better distribution of resources and greater productivity. A dynamic corporate ecosystem must be created: regulation must be improved and infrastructure must be established for innovative start-ups. The capacity of companies to develop source technologies must be strengthened: they should be given more support in their R&D investments in basic research. Risk factors such as demographic changes and the rise in household indebtedness must be managed systematically in order to ensure stable growth in the medium and long term.

He then proceeded to describe the key strategies. He explained that a smooth implementation of structural reforms requires identifying appropriate measures so that the benefits of reform can be shared with the market participants who have conflicting interests. The government should focus on incentivising voluntary innovation efforts in the private sector while mitigating market failures. It should

develop medium- and long-term roadmaps taking into consideration the policy outcomes, the conflicts of interest and the changes in domestic and international conditions. Finally, in his closing remarks and conclusions, he said that whereas Asian countries had achieved remarkable convergence to date, they were likely to need much more time to reach the level of the United States or Japan. As is shown by Korea's experience, a country relying merely on imitation and input factors will unavoidably reach its limits of growth. Sustainable convergence is possible only by executing institutional reforms that encourage innovation. In the meantime, it is essential to adopt economically sustainable and politically viable implementation strategies in order to generate social consensus and resolve the conflicts and inequalities between market participants.

In his closing summary, *György Matolcsy* thanked the participants for their interesting presentations, thought-provoking suggestions and the excellent discussion. We all need efficient, inclusive growth, he said. And in order to achieve this, we will need to improve our institutions. Further dialogue is needed among countries and continents. Dialogue can encourage our governments and institutions to launch major, comprehensive reforms. To conclude, he expressed his hope that joint thinking would continue at the Lámfalussy Lectures Conference next year.

Climate Risks and Business Opportunities – Report on the International Green Finance Conference in Budapest, November 2019*

Gábor Gyura

Financial and environmental factors are interrelated, and climate change, which already affects the economy and financial markets, may function as an increasingly important driver behind credit risks and other traditional financial risks in the future. This leads to a new risk management task for market players, central banks and financial supervisors: establishing the financing conditions for a sustainable, climate-friendly economy also represents a business opportunity for financial institutions. At the International Green Finance Conference in Budapest, organised by the MNB and the European Bank for Reconstruction and Development (EBRD), these issues were addressed in three sections by renowned Hungarian and foreign speakers, opening up new perspectives for everyone concerned.

Relationships between environmental and financial risks

From the aspect of financial stability, it is vitally important to mitigate the pace of climate change and this should be supported by market players, regulators and supervisory institutions, including central banks, each using the instruments they have available, according to *György Matolcsy*, Governor of Magyar Nemzeti Bank (MNB), in his opening statement. The first section of the conference focused on the interaction between environmental and financial risks. *Irene Heemskerck*, Advisor to the Chair of the Central Banks and Supervisors Network for Greening the Financial System (NGFS), also stressed the importance of national banks and financial supervisors assuming new responsibilities in connection with climate change. She pointed out that if we fail to curb climate change, increasingly frequent extreme weather conditions and other physical impacts will cause damage to the economy and hence to the financial system. However, if we manage to ‘decarbonise’ the economy through radical measures, financial institutions will need to be able to cope with the related regulatory, technological and social changes. Heemskerck also pointed out that the NGFS, originally established by just eight central banks, now has fifty members (for quite some time the MNB was its only member from

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

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Central and Eastern Europe) and that observers in the organisation now include the IMF and the Basel Committee on Banking Supervision.

Csaba Kandrács, MNB Deputy Governor responsible for financial supervision and consumer protection, summed up the measures taken by the Hungarian central bank to date and the planned actions to support the greening of the financial system. Some of the MNB's actions focused on the management of environmental and climate change-related risks. In the upcoming period, the central bank intends to analyse and model the climate-related exposure of banks' balance sheets and will issue recommendations on how to address environmental risks in connection with standard best practices. The central bank also intends to increase the ability of the financial system to take part to the greatest possible extent in financing climate neutrality and other sustainability-related investments worth thousands of billions of forints. Measures concerning the latter will be drawn up in several segments, the first of which will include preferential capital requirements for loans financing green (i.e. energy-efficient) buildings and energy efficiency renovation.¹ This programme is unique even by international standards. In his presentation, Csaba Kandrács emphasised that the MNB is keen on playing a pioneering role.

In the same section, *Christopher Perceval* of Trucost, representing a division of S&P specifically dedicated to environmental risks, presented the latest trends and state-of-the art methods of data analysis. ESG-based investment policies, based on a large volume of non-financial data, with a strong focus on environmental (E), social (S) sustainability and corporate governance (G), are becoming increasingly dominant on the global markets. Businesses will be increasingly required to measure, generate and disclose such data on account of the expectations of investors (and regulators).

Green lending as a new opportunity

On behalf of the Raiffeisen International Group, *Ralf Zymanek* and *Christine Würfel* focused on the conditions regulators should guarantee in order to enable banks to boost green lending. Such structural requirements include the widely accepted definition of green economic practices ('taxonomy') and the encouragement of green financing through prudential regulation (in particular the capital requirements for loans). According to Raiffeisen International, demand for sustainable investment and financial products may also rise in Central and Eastern Europe, especially in the private and premium banking sectors.

Nancy Saich, senior advisor to the European Investment Bank (EIB), gave a first-hand account of the decision made a day before by her bank's Board of Directors

¹ For more information, see: <https://www.mnb.hu/letoltes/green-retail-lending-in-hungary.pdf>

on putting their entire operation at the service of the Paris Climate Agreement and ultimately ceasing to finance fossil energy projects after 2021, while at the same time planning to mobilise green investments and lending a total of one thousand billion euros by 2030.² In the second part of her presentation, she described the new expert taxonomy of the European Union, i.e. essentially the set of criteria (encouraged by Raiffeisen International as well in their presentation), which provides a green definition of prospective green financing.

New initiatives by large global, universal banks were presented by *Luca Leoncini Bartoli* (Intesa San Paolo Group) and *Cecilia Moitry* (BNP Paribas). While they are active in different areas of green lending (renewable energy, energy efficiency, etc.), both banks support innovation to increase environmental sustainability. For example, ISP has established the Circular Economy Lab in order to improve the circular economy, whereas BNP Paribas has set up a spin-off business to collect voluntary carbon offset projects.

ESG asset management, green investments

The afternoon programme was opened by a keynote presentation by *Wang Yao*, Director General of the International Institute of Green Finance (IIGF), China's top think-tank on green finance. In addition to its research, education and analysis activities, the Institute specialises in providing assistance to Chinese government institutions, the central bank and supervisory authorities through advising and recommendations concerning public policies. The presentation covered a wide range of topics related to China's green financial regulations: As opposed to the prevalence of market-based initiatives and self-regulation typical of Western Europe or the US, government and central bank regulations play a crucial role, even though the best international practices are taken into consideration in drawing up new pieces of legislation. Wang Yao also referred to a potential green financial cooperation between China and Hungary in connection with various issues.

Investor considerations came up for discussion in the closing section. *Sergei Strigo* of Amundi Asset Management described the operation and the achievements of Emerging Green One, one of the world's largest green investment funds. He provided an insight into trends on the global green bond market, highlighting the challenges faced by emerging markets (a category Hungary is part of). Currently, only a few green bond issuances have taken place in Central and Eastern Europe. Pioneers include the PKO mortgage bank in Poland, which recently issued green mortgage bonds. (These instruments are 'more' than traditional mortgage bonds to the extent that, in addition to other process management

² <https://www.eib.org/en/press/all/2019-313-eu-bank-launches-ambitious-new-climate-strategy-and-energy-lending-policy>

and reporting commitments in accordance with international standards, they also offer green (energy-efficient) mortgage credit on par with the nominal value of the mortgage bond.) The Polish institution was represented by head of treasury *Agnieszka Zdziennicka*, who explained the rough path of the bond issue and their achievements to date.

Hungarian speakers also included *Péter Szabadhegy*, head of risk management at Susterra Capital, the company managing the Water Impact Fund (and former Ambassador to London). The Water Impact Fund finances innovative enterprises specialising in sustainable water management through equity investments. These are companies employing proven technology suitable for international distribution. A good indication of the business viability of these investments is that almost two billion people already have only limited access to clean water, while research has shown that 70 per cent of the global population will be affected by water scarcity in 10 years. State-of-the-art water management solutions will thus be in high demand and providing these firms with access to sufficient capital will clearly have a positive social and environmental impact.

On behalf of the EBRD, Associate Director *Dana Kupova* and Managing Director *Francis Malige* pointed out that public funds alone are insufficient to meet the challenges posed by climate change. Cooperation with a number of other stakeholders, firm regulatory measures and the mobilisation of private sector investments – a sector where the EBRD has significant experience – are also called for.

Central banks and financial supervisors from thirteen countries, including Austria, the Netherlands, Poland and Germany, the EBRD, the European Central Bank, the European Investment Bank, the International Investment Bank, the Global Green Growth Institute and China's Asian Financial Cooperation Association were also represented at the conference which hosted more than 250 participants. Participants included the representatives from the entire Hungarian banking system, various foreign credit institutions and credit rating agencies and governmental organisations. The MNB, working with WWF Hungary, intends to carry out a complex, long-term ecological habitat restoration project in order to offset the unavoidable environmental burden associated with the conference.

The conference presentations are available at <https://www.mnb.hu/greenfinance/english/>.

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.
- 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.
- At the bottom of the title page a footnote is to be given. The footnote contains every necessary information related to the paper (acknowledgement, relevant information etc.). This is followed by the name of the institution and position the author works at, e-mail address in Hungarian and English.
- Journal of Economic Literature (JEL) classification numbers 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 are 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 separated by comma. When citing, the exact page be indicated.
- Tables and figures are to be numbered continuously (chapters and subchapters should not contain restarted numbering). Every table and figure should have a title and the units of quantitative values are to be indicated. Tables and figures are to be made by MS Word and Excel in Hungarian and English. 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 numbering.)
- Manuscripts are to be sent to the Editorial Office of the FER only. Papers are peer-reviewed by two independent and anonymous reviewers.
- Manuscripts should be sent as attachment by e-mail in MS Word file. Figures and tables 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: <http://english.hitelintezetiszemle.hu/letoltes/authors-guide-en-1.pdf>

Thank you!

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