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Contents

Vol. 17. Issue 1., March 2018

STUDIES

István Magas:
Financial Adjustment in Small, Open Economies in Light of the "Impossible Trinity" Trilemma 5

Péter Fáykiss – Alexandr Palicz – János Szakács – Márton Zsigó:
Experiences of Debt Cap Regulations in Hungarian Retail Lending 34

Ádám Balog:
Analysis of SME Segment Lending Processes in Light of Credit Guarantees in the European Union 62

Tamás Ilyés – Lóránt Varga:
Acceptance of Payment Cards by Retailers in Hungary Based on Data of Online Cash Registers 83

Gábor Kutasi – László György – Krisztina Szabó:
Behavioural Factors in the Hungarian Retail Government Bond Market . . . 110

ESSAY

Tamás Bánfi:
The Euro and the Euro Area: Flawed Construct or Unfit Members? 137

Gábor Neszveda:
The Contribution of Thaler to Behavioural Economics 153

BOOK REVIEWS

Emília Kompaktor:
A Unique Exploration of Public Good and Public Financial Management (Mária Bábosik: Vezetés a közjó szolgálatában. Közpénzügyi gazdálkodás és menedzsment) 168

Dániel Felcser:
Map for Predicting Finances and Human Nature
(Alan Greenspan: The Map and the Territory 2.0: Risk, Human Nature,
and the Future of Forecasting) 173

Tamás Tóth – Dávid Benkő:
Inequality and Economic Growth
(Joseph E. Stiglitz: The Price of Inequality. How Today's
Divided Society Endangers Our Future) 177

CONFERENCE REPORT

Gergely Szabó:
Report on the Lámfalussy Lectures Conference held
on 12 February 2018 185

Financial Adjustment in Small, Open Economies in Light of the "Impossible Trinity" Trilemma*

István Magas

The study examines the resilience of small and open European economies to external shocks and the various types of financial integration adjustment in an empirical approach for the period between 1993 and 2016. External financial integration has been implemented in all of the examined countries, offering payment channels fully or largely open to foreign countries. The only major difference was in the level of monetary independence and foreign exchange rate stability. We were able to differentiate between two types of adjustment: in type A, financial policy was characterised by a greater level of monetary independence and a lower level of exchange rate stability, while countries that can be classified under type B practically gave up their monetary independence with their euro area membership, and opted for full exchange rate stability. But resilience to external shocks depends not only on the choices determined by the impossible trinity, but also on other macro-prudential factors, especially on the stability of budgetary processes and the repayment of external foreign currency debts. The difficulty to adjust, transcending beyond the limitations of the "trinity trade-off", was confirmed by the case of Portugal and Greece using the euro as their local currency, while the example of the non-euro area member Czech Republic illustrated a traditionally conservative, monetarily independent and successful external financial adjustment, built on flexible exchange rates and interest spreads. Hence there were many types of adjustment, where euro area membership in itself did not mean "bulletproof" protection in every respect. Hungary possibly joining the euro area would certainly improve its external financial resilience, but it would not make the existing competitiveness/development deficits disappear.

Journal of Economic Literature (JEL) codes: F33, F36, F65

Keywords: monetary policy, shock resilience, exchange rate flexibility

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* The views expressed in this paper are those of the author(s) and do not necessarily reflect the offical view of the Magyar Nemzeti Bank.

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1. Introduction

From the early 1990s all the way through to the 2007–2008 crisis, and in the following period, to what extent can the adjustment of small, open economies to the increasing flows of international capital in the global economy and specifically in the EU be considered uniform? Our short answer is that this adjustment was not uniform, and especially not uniformly successful. Following the global economic crisis, did the resilience to external shocks improve in the small European countries aligned strongly on foreign trade? Essentially yes, is our argument: after the 2008 crisis, resilience to external shocks improved somewhat everywhere. During the intensive period of financial globalisation between 1994 and 2007, according to the mainstream theorem, i.e. the impossibility trilemma proposition, the economic policy of small, open economies did not enable the simultaneous assertion of the trinity requirements of foreign exchange rate stability, monetary independence and international capital market integration. We shall examine the validity of this theorem until the year 2014 (since reliable data are only available until that year), striving to identify the various types of adjustment and where the countries of the Central and Eastern European region, in particular Hungary, can be classified. We also seek to answer whether the evolution of the trilemma indices and the experiences of other small, open economies provide any guidance for Hungary in joining the euro area. These are the fundamental questions of this study. The approach is model-based and empirical in nature, in that we present the evolution of the so-called "impossible" trilemma indices for the examined countries. We illustrate the adjustment patterns that could be identified in the small, open economies involved in the analysis, and to what extent it was possible to assert the simultaneous requirements of foreign exchange stability, monetary independence and capital market opening.

Although the theorem of the "impossible trinity" is not a strict mathematical statement that is particularly difficult to quantify, it still expresses the difficulty embodied by the conflicting ambition of simultaneously ensuring capital market integration, monetary independence and foreign-exchange rate stability well. Namely, it is impossible to simultaneously take successful action in all three areas. One of the goals must be abandoned, partially or entirely: strengthening any two goals can only take place at the expense of the third. If we nonetheless try to somehow measure the ultimate, aggregate success of such balancing of the goals, then we must define the parameters that can capture the change in the key variables of the trilemma. To this end, we use the unified trilemma index. *According to Aizenman* (*2010*) the variables most influencing the performance of the three objectives are the following: the difference between the prevailing domestic interest rates and those of the main commercial partners of the countries in question; the extent of the restrictions affecting capital transactions in the current account; and the exchange rate stability of the domestic currency.

The most important result we want to present is that one of the core requirements of international capital market integration, i.e. the offering of open capital accounts, was implemented in almost every analysed country; there were differences only in the levels of monetary independence and foreign exchange rate stability, in the size of the exchange rate stability indices. We could differentiate between two fundamental types of adjustment: one that opted for relative monetary independence and lower exchange rate stability, referred to as type A (for example Hungary or the Czech Republic); and the other (type B), which gave up monetary independence and exchange rate stability, and opted for full financial integration (such as Austria, Slovenia, Slovakia, Estonia, Portugal, Greece, and with its own currency, Denmark). After the introduction we shall briefly review the early initial theoretical frameworks, the original Mundell–Fleming (M–F) model, then its extensions, modernised and measurable versions, and finally the trilemma-index structure itself. Thereafter, in Section 3, we shall present the evolution of the so-called trilemma indices in terms of the typical, small, open EU economies for the period between 1993 and 2014. The study ends with a summary and conclusion.

2. A theoretical framework still valid today

2.1. Message of the Mundell–Fleming (M–F) model

From the turn of the millennium until the crisis in 2007 and 2008, international capital movements still enjoyed a very liberalised framework within the global economy. National measures regulating the transactions influencing capital accounts and current accounts still imposed few restrictions and generally offered friendly conditions for international capital flows. After the crisis many countries introduced restrictions on open capital accounts once again, and it was difficult to maintain the previously obtained levels of financial integration at that time. However, the possibilities of national economic policy adjustment to global financial processes and the tools of adjustment did not change after the financial crisis of 2007–2008, although the attitudes, actions and opportunities of central banks changed considerably (*Lehmann – Palotai – Virág* (*ed.*) *2017*). Even today, one of the best original theoretical frameworks for understanding adjustment problems, providing the best approach in terms of small open national economies, is the Mundell–Fleming model (hereinafter: M–F model).[1] So we shall take the version of the M–F model (bearing the names of the Canadian-American economists) assuming flexible foreign exchange rates and free movement of capital as our starting point. Let's see what this frequently cited model tells us.

The following baseline can serve as our starting point: international capital movements are fundamentally driven by differences between domestic and external real interest rates and the exchange rates of currencies are essentially determined by the market.

[1] *Mundell* (*1968*)*; Fleming* (*1971,* originally: *1962*)

Within such a theoretical framework, the monetary and fiscal measures of financial policies pursued by domestic financial authorities can only operate with limited efficiency. If the level of domestic interest rates, and parallel to this, the difference between domestic and external interest rates increases, thanks to the central bank, this increases capital inflows and impedes capital outflows, improving the balance of payments. In the theoretical scheme of the M-F model, but also in reality, two developments can be expected in a fully liberalised capital market environment:

1. For small open economies, assuming floating or flexible exchange rates, the uncertainty associated with monetary policy steps increases in terms of their ultimate results.

2. Domestic financial governments are able, though only to a limited extent, to utilise the tools of monetary and fiscal regulation to create internal and external equilibriums, without also trying to strongly and directly influence the exchange rate itself.

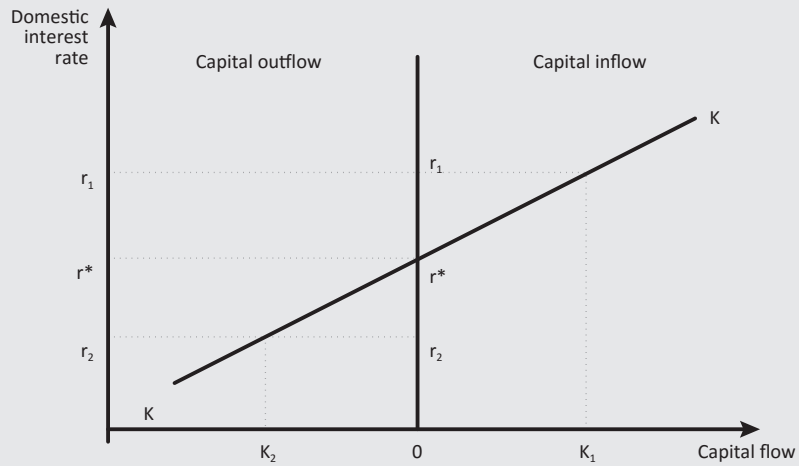
The statements covered by the above two points are general findings, which give rise to numerous theoretical and practical complications, and to some exceptional situations.

Let us now look at the details and the internal logic of the original M-F model.

The baseline assumption is that the base case in the model is a country that is sufficiently small for its own monetary movements not to significantly influence the pricing and income conditions and interest levels of other countries. The internal price level is given and fixed in the model; money supply is controlled and base interest rates are determined by the central bank. Moreover, from the perspective of a domestic investor, domestic and foreign bonds are not perfect substitutes for one another (they are imperfect substitutes, meaning that substitution is not fully ensured in bond portfolios), so whenever the interest difference changes, only some investors switch from one – domestic – bond to another – foreign – bond. Therefore, increased demand for a bond with a higher real return does not automatically trigger the disappearance of the existing yield difference. The central bank can influence interest levels with open market operations. By making purchases it can increase cash volumes and reduce the outstanding volume of bonds, while selling bonds it can reduce cash volumes and increase the yield of domestic bonds. In the M-F model, the constant interest difference results in constant capital flows (this was a fairly strong assumption at the birth of the theory in terms of reality, when the extent and the speed of capital flows were only a fragment of today's rates; this was immediately criticised by many, but did not weaken the strength, still recognised today, of the original logical structure. Let us assume that the domestic central bank of the small country increases its base rate (since the price level is fixed, this will always entail an increase in real yields). In this case, foreign investor demand for

domestic bonds increases, and as long as the difference persists, foreign investors continue increasing the share of domestic bonds within their own portfolios (*Figure 1*).

Figure 1
Interest rates and capital flows in the M-F model



Note: r denotes the foreign interest rate.*
Source: Edited, based on Kenen (1989)

The KK line shows the correlation between capital movements and levels of domestic and foreign interest rates. The examined variables are domestic and foreign interest rate levels shown on the vertical axis, and capital inflow and outflow shown on the horizontal axis. The functional relationship shown on the figure is strongly simplistic because it assumes linearity, which rarely exists in reality. The assumed function continuity is not realistic either. Yet despite these simplifications, the "textbook core logic" initiating financial flows between countries still stands up today, i.e. substituting securities (government bonds in the base case) bearing different returns, but with practically the same risk and maturity in the typical portfolios.

If the foreign interest rate is $0r^*$ and domestic interest rates are $0r_1$ and $0r_2$, we can talk about $0K_1$ capital inflow and $0K_2$ capital outflow as a function of the interest differences. So, if $0r_1 > 0r^*$, then we have a capital inflow, and if $0r_2 < 0r^*$, then we have a capital outflow. The steepness of the KK slope depends on the degree of substitutability between domestic and foreign bonds. If the substitution is almost perfect, then the KK line is close to horizontal. However, assuming perfect substitutability the central bank would lose its control over interest rate levels. The higher the degree of substitutability the more central bank involvement is needed to maintain the existing interest difference and thereby capital inflow. The degree of substitutability depends on investors' risk aversion.

There is no mention of foreign exchange rate risk in this simple model since the structure assumes national bonds and deposits in an identical currency, but earning different interest in each country, such as the bonds of euro-area member states. We will naturally relax this simplification later on (allowing countries using other currencies to enter and permitting covered interest parity, according to which the degree of expected appreciation/depreciation of the domestic currency is identical with the pro rata degree of the nominal interest differential).

2.2. Exchange rate flexibility, money and commodity markets

How do capital movements influence exchange rates? The short answer is: the more capital movement is sensitive to interest differences and to future expectations, the more sensitive the reaction of exchange rates will be and the more we can feel the economy's openness on the commodity markets and in the balance of payments. This, in itself, creates an instability factor in adjustment since managing a suddenly weakening exchange rate will not be unambiguous, the central bank cannot just follow domestic equilibrium objectives. So it must also be considered that the effects of the disturbed exchange rate may have a strong influence not just on the balance of payments, but also on the formation of severe domestic imbalances. This central bank policy, i.e. always vigilantly watching the exchange rate, but generally not intervening, is perhaps the key message of the M-F model still valid today. This original foreign-domestic balance dilemma, which later expanded into a trilemma, has essentially remained unchanged until today.

Previously, prior to the upswing of financial liberalisation, the question as to why an internal macro balance cannot be exclusively maintained with fiscal measures seemed justified. Without reviewing the related details and complications, we can say that under a regime with intensive international capital flows and flexible exchange rates, fiscal policy is increasingly losing ground as the main effective instrument in influencing the domestic business cycle.

The concept of balance appearing in the M–F model is rather strict. Those responsible for a domestic economic policy harmoniously adjusted to the global money markets must pay attention to three objectives at the same time, but following them simultaneously is very difficult. What is more, it is almost impossible at the theoretical level. The three objectives to be followed simultaneously are as follows:

a) A *national monetary policy* that is sufficiently *independent;*

b) A relatively *stable foreign exchange* rate that can be influenced through own monetary measures;

c) Integration of international capital markets: access to external borrowing, lending and related foreign savings opportunities offered by the open financial capital account.

The simultaneous assertion of these three monetary policy objectives – i.e. monetary independence, foreign exchange rate stability and open capital accounts – is simply not possible. So this dilemma has been named the "impossible trinity" in literature.

It is worthwhile briefly explaining this impossibility issue: promoting any two objectives of the "trinity" can only happen at the expense of the third objective. For example, capital market openness and an autonomous monetary policy are only possible if we give up exchange rate stability; monetary independence and a stable foreign exchange rate are only possible with capital flow limitations; while exchange rate stability and liberalised capital flows rule out an independent monetary policy.

2.3. Financial stability and resilience to external shocks

The huge volume growth per se in international bond investments, especially government bonds – the "sovereign" segment – increased the chance of negative risks spreading like shocks, and even two decades ago foreshadowed the increased vulnerability of countries exposed to large foreign exchange debt, if they were considered small compared to the overall size of the bond market. The reasons for the financial crises in South East Asia in 1998, in Argentina in 2001, in Hungary in 2008 and in Greece, Ireland and Portugal in 2010 varied, and the courses of events were also different; the responses of the banking systems and central-bank policies differed too, but everywhere the crises strongly correlated with the weaknesses of government budgets (i.e. with difficulties in financing sovereign debt). The expressions "external financial shock" and "contagion threat" became part of everyday language, but more importantly: improving resilience became a primary task.

The methodology for measuring resilience to shocks has also improved considerably over the past two decades. The measurement itself became more standard, greatly aiding comparability. Yet the starting point and the most important components are still defined today by a country's ability to use its own resources, foreign currency reserves and short-term loans to finance the – external – pressure, increased to extreme levels in some cases, to sell the bonds held by non-residents in the case of sudden external shocks and high volume capital movements.

The methodological developments are well demonstrated by the resistance index – constructed by *Rojas-Suarez* (*2015*) – which is also considered authoritative by the IMF for emerging economies. The index comprises seven components, which are the following:

1. Current account deficit as percentage of GDP; X_1

2. Total external debt as percentage of GDP; X_2

3. Short-term debt to foreign-exchange reserves; X_3

4. Annual budget deficit as percentage of GDP; X_4

5. Government debt as percentage of GDP; X_5

6. Error of inflation targeting (deviation from target); X_6

7. Change in financial fragility based on credit cycles. X_7

Only factors 6 and 7 can be regarded as explicitly new variables in the index compared to previous perceptions, which also take into account the success of the inflation targeting and the role of the credit cycle. The success in attaining the inflation target is measured by taking the square of the differences between the target and the actual figure in a given period. The financial fragility potentially emerging in credit cycles is defined as the product of the difference between the upper limit (cap) of the credit growth rate that can still be maintained in the boom phase of the economy and the real credit growth realised during the examined period, and the difference between the credit growth rate realised in the bust period of the economy and the still acceptable (lower limit) of the credit growth rate. We can describe this in a formula as follows:

$$\text{FinFrag} = (dRC^{boom} - dRC_t) \cdot (dRC_t - dRC^{bust}), \quad (1)$$

where dRC^{boom} is the upper limit of the change in credit production and dRC^{bust} is its lower limit.

The resistance index itself is a composite indicator, where +1.5 is the best attainable value and –1.5 is the worst. Based on *Rojas-Suarez (2015, pp. 15–18)* the index structure follows the methodology below.

First, they standardise the seven variables described above, which means that for each of the 21 countries sampled they take the difference between the sample average and the actual data of the given country, then divide it by the standard deviation of the sample. So for example, in the case of country number i, we obtain the constructed standardised variable of X_1^{i}* as follows:

$$X_1^{i*} = (X_1^{i} - AVGX_1) / \sigma_{x1} . \quad (2)$$

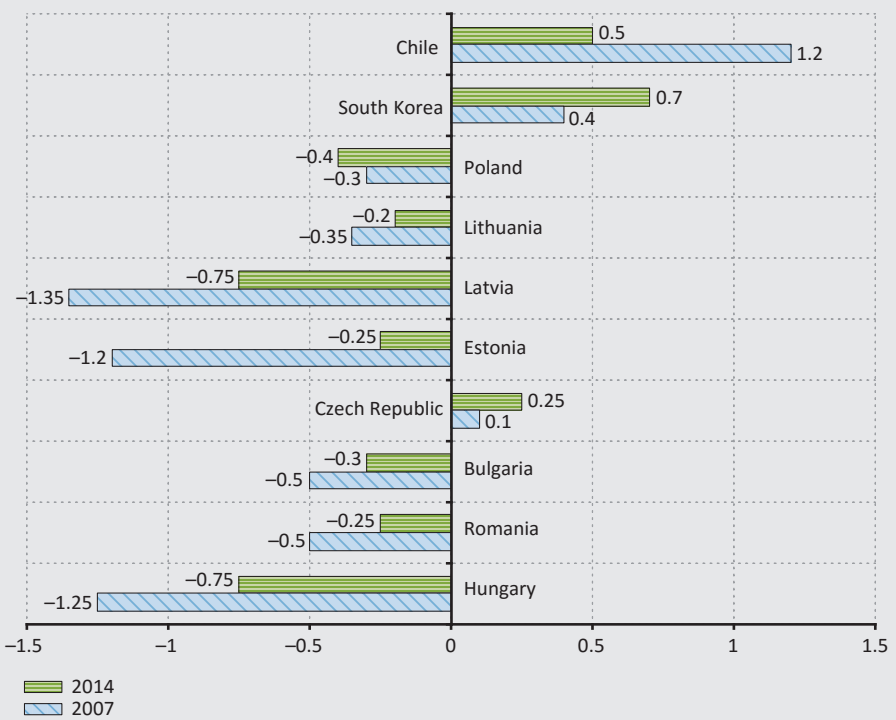
If the increase in any given variable reduces resilience, i.e. it increases fragility, then we multiply it by minus 1. For example, variables number 4 and 5, budget deficit/GDP, sovereign debt/GDP, behave like this, so in their case the procedure follows this method. Finally, the standardised measure showing the financial resilience of a country is the simple arithmetical average of the seven indicators, i.e. the measure of resilience to external shocks in the case of country number i is as follows (Shock resistance index, SRI):

$$SRI^{i} = (X_1^{i*} + X_2^{i*} + X_3^{i*} + X_4^{i*} + X_5^{i*} + X_6^{i*} + X_7^{i*})/7. \quad (3)$$

Figure 2 displays the change in the financial resilience against external shocks of some small open economies in Central and Eastern Europe that were especially vulnerable

during the 1998 global financial crisis, based on the calculation used by *Rojas – Suarez* (*2015).* For comparison purposes, a medium-sized country with a fairly large internal market, Poland, and 2 small open non-European economies, South Korea and Chile, are also shown, which were able to demonstrate a very strong crisis resilience in 2007 and thereafter. As shown on *Figure 2*, on the (+1.5) – (–1.5) scale the higher positive number denotes a higher shock resilience. From the small open economies of Central Europe, the Czech Republic clearly stood out, producing positive values both in 2007/2008 and in the period following the global economic crisis. Latvia, Estonia and Hungary proved to be especially vulnerable during the years of the crisis with values even lower than (–1). Yet by 2014 the resilience of all three countries improved; in the case of the two Baltic states, their euro-area accession (internal devaluation performed in time and their previous sacrifices) helped considerably in improving their resilience. It is worthwhile noting that even the Polish economy with its large internal market displayed a strongly negative, low resilience, and a strongly negative exposure, with its relatively low figure of close to (–0.5) according to the index. But Chile and South Korea stood out as positive counter-examples; these countries had a developed capital market and moderate sovereign debt, and operated as small open economies with good resilience to external financial shocks.

Figure 2
Change in financial resilience in small open economies following the 2007 crisis



Source: Edited based on data of (Rojas-Suarez 2015)

Overall we can conclude that the statistics describing the degree of shock resilience varied greatly in terms of both capital and money market adjustment and the general resilience to external shocks. However, we can also deduce that higher central-bank foreign exchange reserves, lower sovereign debt levels and more advanced capital markets provided more protection. In this sense we can therefore say that there is nothing new under the sun. So the question naturally arises as to whether opting for the trinity clearly defines the degree of resilience to external shocks and its different modes? The answer is no. We cannot talk about a clear-cut economic policy success or failure associated with a path managing only the trilemma, i.e. the impossible trinity. But this statement is far from trivial, so let's look at a more thorough statistical overview of the evolution of the trilemma indices.

2.4. Modern extensions and the measurability of the "trinity"

How can we quantify the relative success, or at least some extent thereof, in the adjustment to the three different economy policy targets, and with it, the success of international adjustment? This topic had already been studied by many prior to the 2008 crisis, including *O'Neill* (*2001*). *Aizenman et al* (*2013*) were the first to offer a measurement technique elaborated in every aspect, suitable for continuous empirical use and built on modern theoretical grounds. We also use the trilemma index they defined and its public database for our analysis.

First though, we briefly have to clarify the issue of measurability, which, as we may suspect, is not high-precision calculus. Let's delve into the devilish details!

2.4.1. Issues of measuring independence and international financial integration. Can we actually measure the impossibility of the "trinity"?

The quantitative analysis of two of the three objectives is fairly simple. Monetary policy can be followed by international prime rates of interest. Although nominal interest rates do not carry any information themselves regarding the monetary independence of a small open economy, in comparison with the interest rates of a larger dominant partner economy, the degree of correlation between the two, i.e. the interest rate levels of the small country and its main partners, can be a good indicator of the degree of independence. We can measure foreign exchange rate stability with the degree of change in the exchange rate. In this case, one of the critical questions is to figure out what is the amount of change over which period that we should consider stable. Comparing the variables of the interest rate difference and the time interval is a difficult task in itself, partly, for example, because although the value set of the correlation is limited (can be between –1 and +1), the value set of the exchange rate change is far from limited. So we must perform transformations on the variables to make them easily comparable.

But financial integration, the liberalisation of the financial (capital) account, does not have a clearly quantifiable variable. Hence the restriction of capital flows can mainly

be accepted as a binary "variable" (it either exists or it doesn't). When restricting the movement of financial capital with varying maturities, these binary variables take the value of 1 when there is no restriction, and 0 when there is a restriction for the given capital type in any given country. But it is more fortunate to work with continuous variables, i.e. ones that can be interpreted even between the two values. To capture the trilemma quantitatively, the ideal scenario would be if all three variables took a value between 0 and 1 (variables normalised to 1). *Joshua Aizenman, Menzie Chinn and Hiro Ito* (*2013*) created a model for this concept. They named the created variables trilemma indices. We used these indices – updated until 2014 on our own website – to analyse the financial adjustment of small open economies between 1993 and 2014.

2.4.2. Structure of the trilemma indices

Monetary independence

The index measuring monetary independence takes the annual correlation of the monthly prime interest rates as its basis by mapping the relationship between the money markets of the analysed country and of the reference country. The index transforms the obtained correlation in the given way:

$$MI = 1 - \frac{corr\left(i_i, i_j\right) - (-1)}{1 - (-1)}, \tag{4}$$

where index *i* denotes the analysed country and *j* denotes the reference country.

Thanks to this transformation, the variable obtained in this way will fall between 0 and 1. The greater the value of the variable, the greater the country's monetary independence. Reference countries are defined based on the country with which the monetary (interest rate) dependency is the strongest. These reference countries have been defined in the work of *Shambaugh* (*2004*). Australia, Belgium, France, Germany, India, Malaysia, South Africa, the United Kingdom and the United States are found among the reference countries. In the cases where Shambaugh was unable to determine reference countries, the model defines them based on the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER).

Foreign exchange rate stability

The basis of the index measuring foreign exchange rate stability (ERS) is the annual standard deviation of the monthly exchange rates. It transforms the standard deviation of the exchange rate between the analysed and the reference country in the following way:

$$ERS = \frac{1}{1 + \frac{stdev\left(exch\_rate\right)}{\left|dlogE_t / dt\right| + 0.01}}, \tag{5}$$

where *stdev*(*exch_rate*) is the standard deviation of the exchange rate, while $|dlogE_t/dt|$ is the absolute value of the change in the exchange rate, year after year, using exchange rates for December. Higher values represent a higher degree of satisfaction of the trilemma objective, i.e. a higher figure indicates greater exchange rate stability.

Financial integration

From the binary variables, transforming the degree of financial integration into a continuous variable is maybe the most difficult of the three variables. The created index was examined in a separate study (*Chinn – Ito 2008*) and was named the Chinn–Ito index after its creators; it is referred to as KAOPEN when used as a variable. The index uses the IMF's Annual Reports on Exchange Arrangements and Exchange Restrictions (AREAER).

The binary variables describe the presence of restrictions on international capital movements. Capital movements can be classified into four large categories:

- Presence of several foreign exchange rates (k_1)
- Restriction of current-account transactions (k_2)
- Restriction of capital account (financial account) transactions (k_3)
- Deposit obligation of export revenues (k_4)

Given the need to be consistent with the previous two indices, the meaning of the binary variables has also been reversed: the index takes the value 1 if the economy is fully open, and 0 when it is completely closed. As a consequence, a higher value represents a higher level of integration. Moreover, we look at the five-year average of variable k_3 (the average of k_3 in the given year and in the previous four years):

$$SHAREK_{3,t} = \left(\frac{k_{3,t} + k_{3,t-1} + k_{3,t-2} + k_{3,t-3} + k_{3,t-4}}{5} \right). \quad (6)$$

Then we take $k_{1,t}$, $k_{2,t}$, $SHAREk_{3,t}$ and $k_{4,t}$. The first standardised main component of these will be $KAOPEN_t$, that is, the openness of the capital account, while its first own vector will be $(SHAREk_3, k_1, k_2, k_4)$, which shows that it is not exclusively $SHAREk_3$ that defines the index (*Chinn – Ito 2008*).

Distortions of the variables

Due to their structure, all three trilemma indices may take values between 0 and 1. According to the trilemma assumption, any economy may reach only two of the three objectives simultaneously. For this reason the "theoretical sum" of the variables should be exactly 2 for any given country. But in this transformed, abstract form, these variables are partly misleading. Despite being normalised in a closed [0;1] interval, suggesting that the achieved states of exchange rate stability,

monetary independence and financial market integration "can be forced" into a range described as constant, as if this was a strict mathematical law, in reality we unfortunately cannot expect such rigorous restricting assumptions from the indices. However, the historic analysis of the trilemma indices could still help in developing a sufficiently "meaningful" pattern characterising the external financial adjustment.

3. What do trilemma indices show?

The trilemma indices elaborated with the methodology of Aizenman – Chinn – Ito *(Aizenman et al. 2013)* are accessible on the authors' website[2], updated until 2014. We used these data available in Excel format when analysing the adjustment of developed, and mainly small, open European economies during the period 1993 to 2014 (but for the sake of comparison we also included Israel in the sample observing the 12 countries). In terms of adjustment to international financial integration we should differentiate – fundamentally but certainly not comprehensively – between two types; type A and type B (*Table 1*).

Table 1
Versions of the impossible trinity and financial adjustment in some small, open developed economies

Consequences of financial openness	Characteristics of type A	Countries Type A	Characteristics of type B	Countries type B
Foreign exchange rate stability	No	Hungary, Czech Republic, Israel, Chile, South Korea, Denmark*	Yes	Austria, Slovenia, Estonia, Slovakia, Portugal, Greece
Monetary independence	Yes		No	
Level of financial integration/ Openness of capital account	Yes		Yes	

*Note: *Denmark, in reality, is a real borderline case in that its monetary policy is only quasi-independent since it has long been aligned with ECB policy, and its foreign-exchange rate stability was considerably higher than that of other countries classified in the type A group, so it could even be part of the type B group.*

Source: Edited based on the database of the Aizenman et al. (2013) trilemma index.

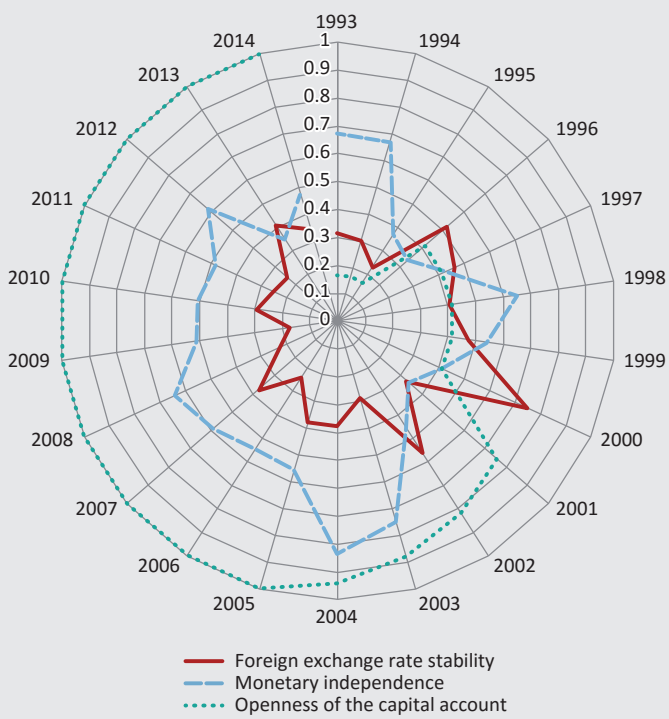
Between 1993 and 2014 the adjustment of *type A* countries was characterised by a capital account initially opening gradually, then subsequently fully open, relative monetary independence and foreign exchange rate stability of varying degrees. Hungary, the Czech Republic, Israel, Chile, South Korea and Denmark belong to the type A group, opting for relative monetary independence (though Denmark is a rather special, borderline case). In these countries the total adjustment picture shows an almost identical pattern. *Figures 3* to *5* show the "adjustment patterns" of the first three countries from the six small open economies mentioned above

[2] http://web.pdx.edu/~ito/trilemma_indexes.htm

(and *Figure A.1* in the Annex shows the adjustment pattern of Israel). The pattern characterising these countries shows that after 1999 the capital account opened up only gradually, and became fully open only after 2005, while the degree of monetary independence/dependence varied; overall though, the level of independence rather decreased, instead of increasing, as we approach 2014. (As a reminder, a higher number indicates greater independence, while a smaller number closer to zero indicates progression towards the end of independence).

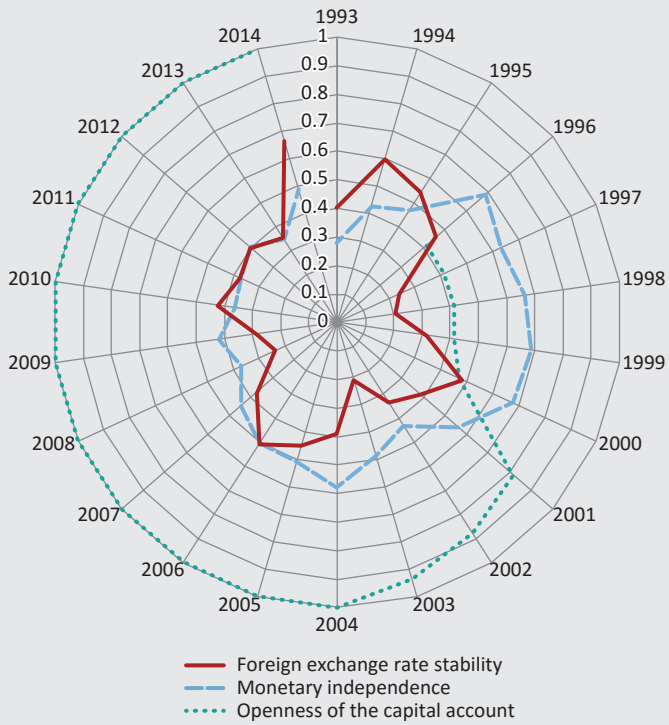
Hungary had the greatest monetary independence in 2004 (*Figure 3*) and the lowest in 1996 during the period under review. Moving forward in time (clockwise on *Figure 3*), the forint's exchange rate stability tended to decrease, in other words tending towards the middle of the circle. *Figure 6* and *Figure 7*, a few paragraphs below, can help us gain a deeper understanding of this process, and simultaneously of the fundamental direction of the Hungarian and Czech exchange rate policy. These provide an overview of developments in nominal and real effective exchange rates over the entire observed period extended until today, i.e. 1994–2017.

Figure 3
Trilemma-indices, Hungary, 1993–2014



Source: Aizenman et al. (2013) edited based on indices and IMF AREAER 2015, 2016

Figure 4
Trilemma indices, Czech Republic, 1993–2014

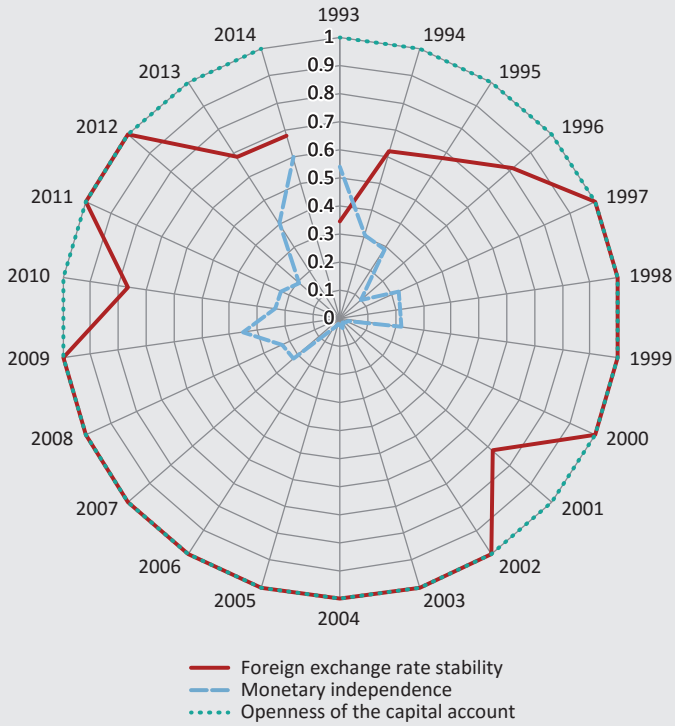


Source: Aizenman et al. (2013) edited based on indices and IMF AREAER 2015, 2016

In comparison to Hungary, the Czech Republic exhibited similar adjustment trends based on the trilemma indices (*Figure 4*), with the difference being that the total capital account opening only began in 2004 and the exchange rate of the Czech koruna had already surpassed 0.6 by 2014, shifting towards greater stability. Yet monetary independence in the Czech Republic already started decreasing at a faster rate from 2005, at least compared to Hungary, indicating the adjustment trajectory that its euro-area accession may become a reality sooner, as justified based on the trilemma indices.

Denmark (*Figure 5*) differed slightly from the typical flexible exchange rate transformation adjustments in that it was able to shadow the ECB through its monetary policy with relatively low monetary independence, maintaining an open capital account with its own currency and relatively high exchange rate stability (except in 2009–2010). This required very developed money and capital markets and a high degree of international competitiveness, alongside a sufficiently consolidated general government. So it is not surprising to say that the Danish trajectory is not for everyone, with the Danish "recipe" for successful adjustment suited only to small, open economies which are financially very robust and already have high income.

Figure 5
Trilemma indices, Denmark, 1993–2014



Source: Aizenman et al. (2013) edited based on indices and IMF AREAER 2015, 2016

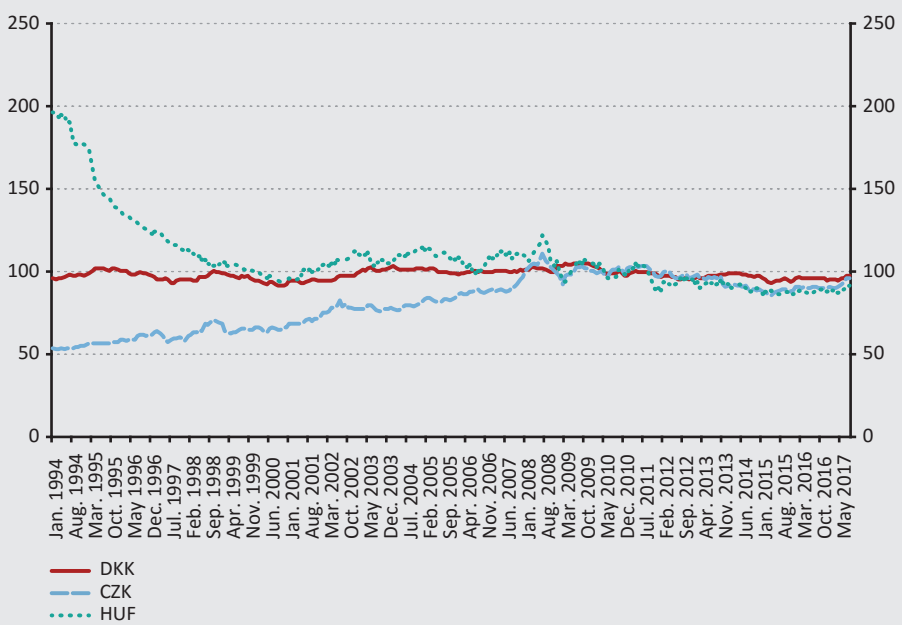
Israel also followed a different path; in this case it is worth observing that its monetary independence decreased substantially compared to the second half of the 1990s (*Figure A.1* in the Annex). The capital account of this Middle-Eastern country fully opened right before the crisis, in 2006. The exchange rate stability of the shekel was unable to remain persistently above 0.5, and exhibited substantial fluctuations after 2010 as well, depreciating significantly compared to the major currencies (EUR and USD).

Depreciation adjustment through the exchange rate was therefore not the path for the very developed but nevertheless export-oriented Denmark. It was, however, the road for small Central and Eastern European countries. Later on we will discuss this other case through the example of the Czech Republic and Hungary. Prior to that though, we will present a brief overview of the nominal and real effective historical exchange rate curves for the Hungarian forint and the Czech koruna and the Danish krone for the period 1994–2017 based on the official BIS exchange rate database (*Figures 6 and 7*). First and foremost, we need to clarify the definition of nominal and real effective exchange rates.

The nominal effective exchange rate is obtained by calculating the geometric mean of the bilateral foreign currency exchange rates weighted using the foreign trade turnover with the country's main trading partners (i.e. the square root of their product) expressed as an index with one base year=100. A number over 100 signifies appreciation, while numbers below 100 signify a weakening/depreciation.

According to *Figure 6,* which shows the changes in the nominal effective exchange rate for 1994–2017 compared to the base year 2000, from 1994 until the base year (2000), the Hungarian and the Czech economies, i.e. the forint and the Czech koruna, exhibited contrasting exchange-rate adjustments: while the Czech Republic's currency tended to appreciate compared to its key foreign trade partners, the Hungarian forint exhibited strong depreciation. The Czech koruna appreciated even further between 2000 and 2008 and the Hungarian forint switched between brief periods of appreciation and depreciation of 2 to 3 years, albeit small in size (5–8 per cent) However, after the 2008 crisis and for the entire period until the present day, the forint once again suffered marked nominal depreciation within an approximate range of 10–12 per cent. Meanwhile, the Czech koruna attempted a similar downwards adjustment, i.e. through depreciation, albeit in a much narrower range of 3–5 per cent. That said, *Figure 6* clearly shows that the stability of

Figure 6
Developments in the nominal EER, 1994–2017 the Czech koruna, the Danish krone and the Hungarian forint
(the year 2010 = 100)

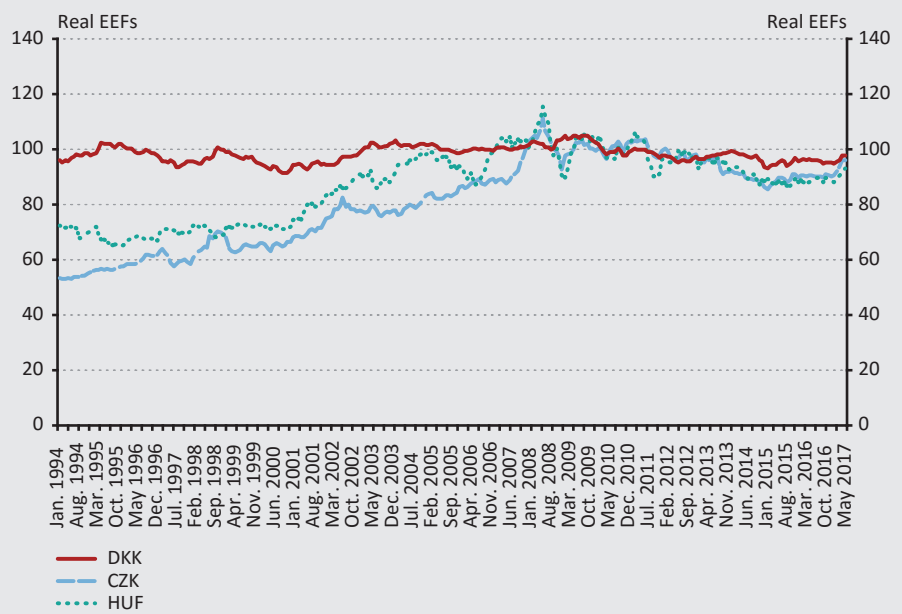


Source: Edited based on the BIS database

the Danish krone compared to the two central European currencies was impressive, and even when it depreciated, it only weakened by a relatively small 1–4 per cent and always appreciated back towards the base value.

If we look at real effective exchange rate indices, i.e. the Effective Exchange Rate (EER) index expressing changes in price levels compared to main trading partners, which adjusts the nominal index with the proportion of changes in price levels, we see that based on this index the external adjustment trajectory followed by the Czech Republic and Hungary are much more similar: by the end of 2008, both currencies underwent a real appreciation followed by a real depreciation trend. This means that foreign currency markets overshot in terms of price setting in both countries compared to the level regarded as purchasing power parity. One of the reasons for this overshooting – albeit difficult to clearly and unequivocally separate – is that changes in the real exchange rates of the currencies at issue always reflect demand for financial instruments and property, albeit implicitly. Therefore what was beneficial for exports and made imports more expensive on the commodity market had the opposite effect on the property market: in other words, Hungarian and Czech instruments became relatively cheaper for the non-resident sector, while purchasing external assets became more expensive for resident foreign currency investors, at least from the perspective of exchange-rate developments.

Figure 7
Real EEFs the Czech koruna, the Danish krone and the Hungarian forint, 1994–2017
(the year 2010 = 100)



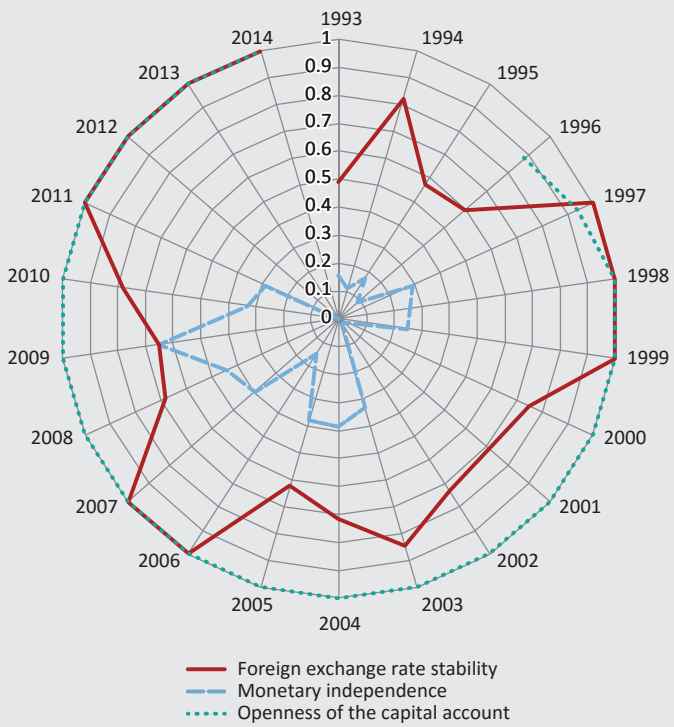
Source: Based on the BIS database

By and large, from the perspective of the above and our own main topic, *i.e. in relation to the sustainability of the trilemma, flexible exchange-rate development was most certainly able to foster external adjustments with its own strength, but it was naturally unable to solve fundamental issues of structure, indebtedness and international competitiveness, at best alleviating them slightly.* In countries where there were no such issues regarding main trading partners (for example Denmark), exchange rate stability as an objective was attainable relatively easily.

The other subtype of external financial adjustment, version *B*, is represented by countries who are already members of the monetary union: Austria, Slovenia, Slovakia, Estonia, Portugal and Greece. Slovakia and Estonia are most relevant for this study, so our investigation will focus on these countries. The trilemma figures for the other countries are found in the annex for the sake of brevity (*Figures A.2, A.3, A.4, A.5*).

Countries that joined the euro area gradually had to relinquish their monetary independence, keeping financial integration within relatively narrow constraints. Thus for instance, the financial openness and exchange rate stability metrics of

Figure 8
Trilemma indices, Estonia, 1993–2014

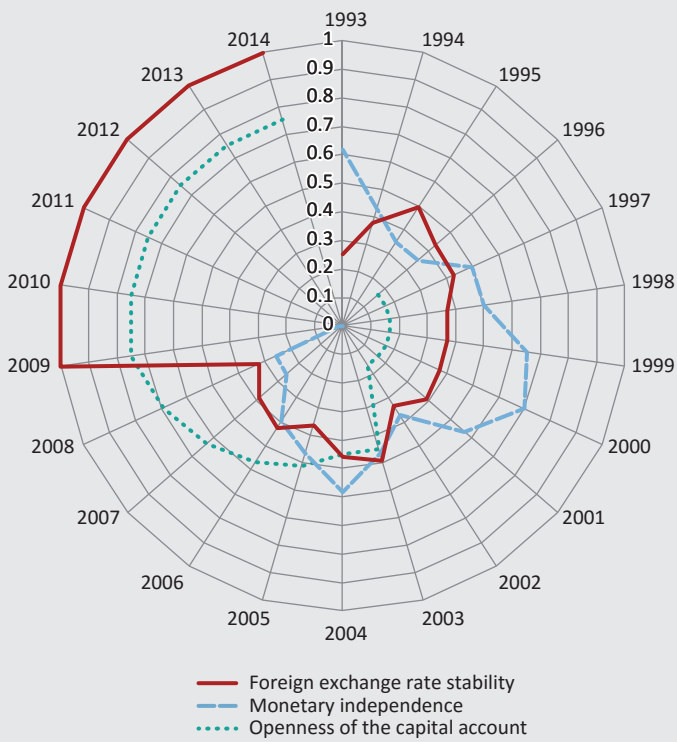


Source: Aizenman et al. (2013) edited based on indices and IMF AREAER 2015, 2016

the Estonian economy trended outwards towards the perimeter of the circle early on, by the second half of the 1990s; the country gradually lost its monetary independence, which pulled in the opposite direction towards the middle of the circle before disappearing. This adjustment process was a precondition for joining the euro area according to the mandate, with the foreseeable end point of losing monetary independence completely.

As shown in *Figure 8*, deeper international financial integration with an open capital account started relatively early in Estonia, in 1998, and the former USSR member country exhibited quite a stable exchange-rate stability index of 0.7–0.8, despite its small size, and adopted the European single currency by 2011, abandoning its monetary independence.

Figure 9
Trilemma indices, Slovakia, 1993–2014



Source: Aizenman et al. (2013) edited based on indices and IMF AREAER 2015, 2016

Slovakia's adjustment process to the euro area started in 2004 and became complete in 2010, with the interesting difference that its capital account did not become fully open, even after the introduction of the euro.

Austria's adjustment perhaps shows the most enviable version (*Figure A.2*) given that it fully opened up its capital account early on, in the second half of the 1990s, after pegging its own currency the Schilling to the German mark. This enabled the country to be in a sufficiently strong condition when joining the euro area, so giving up its own currency and monetary independence did not cause any major adjustment difficulty for it. Becoming a member of the euro area entailed no disadvantages for Austria, on the contrary, it helped to deepen its commercial relations with its main EU partner states and helped create a surplus in its current account.

Slovenia's external financial adjustment (*Figure A.3*) resembles the Austrian path the most, with the difference that for the former Yugoslav state this process, just as with joining the euro area, took place considerably later and after 2009 its capital account did not remain fully liberalised either.

Portugal's capital account (*Figure A.4*) gradually opened up from 1991 onwards, and became fully open by 1997. In 1999 it became a – founding – member of the euro area, and by doing so gave up its monetary independence. As the result of the US subprime mortgage crisis that unfolded in 2007 and 2008, and the ensuing euro crisis in 2010–2012, which unfortunately coincided with Portugal's own budgetary overspending, and the overstretched lending of its domestic banking system enabled by favourable euro interest rates, Portugal drifted close to a state bankruptcy. Portugal was only able to issue new euro debt very expensively, with a substantial CDS spread. It was bailed out on several occasions by the IMF and the European Stability Mechanism with some flexible loans considered cheap at the time of the crisis. Its resilience to external shocks became extremely low and it enjoyed protection only as a member of the euro area. Yet by the end of 2017 Portugal managed to keep its budgetary processes on track and the country's CDS spread also decreased substantially; the government's financing became balanced and relatively cheap thanks to the near zero interest rates internationally.

Greece's case (*Figure A.5*) with the euro and the EU itself represents a separate category. Even considering its protection mechanisms against external shocks it represents a separate class, in that its giving up of monetary independence introduced such restrictions in money creation and the operation of the banking system that the relatively underdeveloped Greek government, chronically and repeatedly "undisciplined" in its fiscal policy, was unable to manage. Its budget was struggling in the areas of tax collection, transfer payments, the pension system and the stimulation of the economy – as early as accession and for a long time thereafter – with a substantial shortfall compared to the more developed part of the EU. The sudden and lasting deterioration of the state's external financial perception, and the fate and the soundness of the debt held by third-party countries did not depend on the chosen instruments for alleviating the shock, but much more on the "distorted" internal fiscal processes. This seems to be supported by the fact the fiscal tightening

measures prescribed by the conditions of the last loan facility have already brought tangible results: by the end of 2017 Moody's sovereign debt classification for Greece had also improved, and was even given a positive outlook (CAA2).

However, what is crucially important for the purposes of our topic is that the Portugal and Greece case demonstrates that *the trilemma indices do not uncover all of the possible and actual difficulties of external adjustment*, they gloss over the very difficult adjustment process. All this means that *on their own, the trilemma indices cannot offer a full description of the external financial adjustment, they can only do so together with the fiscal processes.*

4. Summary and conclusion

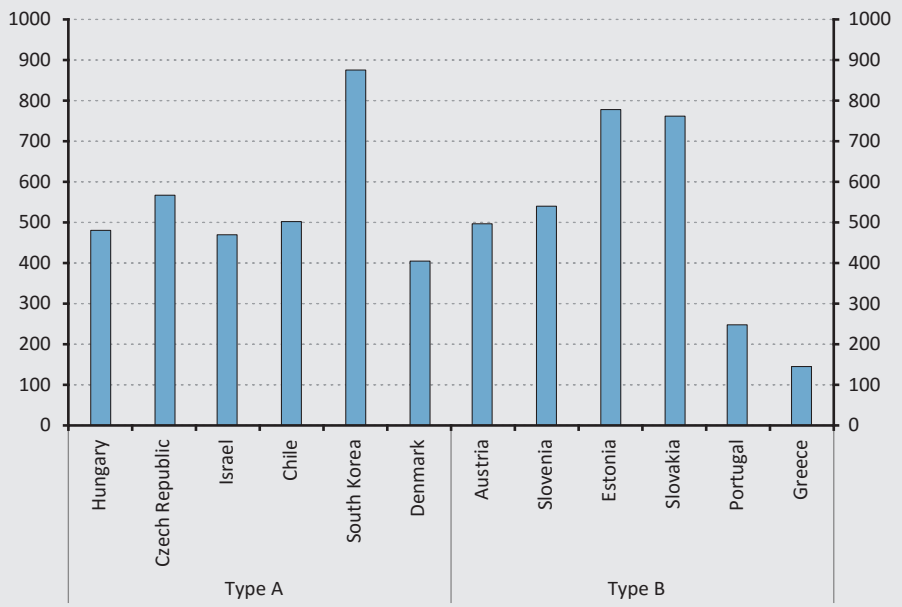
To what extent can we say that the external financial adjustment of small open economies was uniform in the global economy in general and in the EU in particular, during the period from 1990 to 2014? The study argues that although the impossible trinity theorem, i.e. the impossibility of simultaneously asserting integration, exchange rate stability and monetary policy independence was valid, for the countries involved in the analysis we observed many different versions of the adjustment to external shocks and financial integration.

One of the results we intended to show is that in almost all of the examined countries, one of the core requirements of international capital market integration, the availability of open financial (capital) accounts, was achieved relatively soon. There were major differences only in the levels of monetary independence and foreign exchange rate stability, in the size of the stability indices. We were able to differentiate between two fundamental types of adjustment: one that opted for relative monetary independence and lower exchange rate stability (for example Hungary, the Czech Republic and Denmark of the EU Member States, and Israel as a non-EU member), and the other one that gave up monetary independence and also exchange rate stability, and opted for full financial integration (such as Austria, Slovenia, Slovakia, Estonia, Portugal and Greece). The exchange rate regime chosen for external financial adjustment is not decisive per se in terms of the ultimate success. The work of *Bohl et al.* (*2016*) based on an econometric model performed on a substantially larger G-20 country sample also confirms this opinion.

We did not intend to decide *which type of adjustment can really be considered a success* or failure, *since this dilemma can only be reassuringly answered following the analysis of other, additional macroeconomic variables (fiscal processes, debt service trends, and change in net foreign investment positions*). Yet if we want to identify concise but revealing data through statistics, jointly showing the external and internal adjustment steps of small, open Central European economies leading to the final outcome, then *Figure 10* provides some supporting evidence. It contains constant GDP per capita growth figures based on purchasing power measured in

constant 2011 US dollars, shown in identical currencies, for the period between 1995 and 2016. From this comparison we see that during the 21 years examined there was outstanding growth in both groups: i.e. group A, which kept its own currency such as South Korea, and group B using the common currency, the euro, such as Slovakia and Estonia, were able to produce the highest annual average, constant GDP/capita growth measured in USD: countries regularly producing outstanding growth were able to register nearly 1.5 times the per capita growth of the middle-range countries, where per capita growth was in excess of USD 400 per year. As to what extent the common currency, the euro, has helped the growth dynamic is not clear of course, and it is difficult to quantify. However, we can probably conclude that the common currency itself was not an obstacle to growth.

Figure 10
Annual average per capita growth measured in 2011 (constant) US dollars, for the period between 1995 and 2016



Source: World Bank: https://data.worldbank.org/indicator/NY.GDP.PCAP.PP.KD?year_low_desc=false

When analysing the data it also becomes clear that financial resilience to external shocks improved everywhere in the eight years following the 2007–2008 financial crisis, while the financial resilience of the Czech Republic, initially in the positive resistance range too, displayed marked growth. The same was observed in the case of three small, open non-European economies, all of them with different structures, i.e. Israel, Chile and South Korea. But *improving shock resistance cannot simply be explained by the evolution of trilemma variables for any country, because fiscal processes* – the change in the government's ability to take out loans, the evolution

of long-term foreign-currency debt classifications – *are just as important when assessing the final balance of external financial adjustment*. Exchange rate stability is a good thing, but is not a source of success in itself (Denmark), because a sufficiently flexible exchange rate (see the Czech crown) can also greatly facilitate adjustment. Moreover, Greece and Portugal, with a "stable", internationally shared common currency, i.e. the euro, were not able to avoid resorting to massive external help either, because during the external shocks experienced in 2008–2010 their internal capital buffers were not sufficient and their sovereign debt issuing capacity also became shaky. So there was no single recipe or royal road for adjustment, and the trilemma indices per se do not give guidance in terms of the actual financial strength and sustainable external payment processes, as demonstrated by the work of *Bohl et al.* (*2016: 203–207*).

And the even more difficult question, i.e. the specific quantifiable benefits or drawbacks for Hungary of fully giving up monetary independence and joining the euro area can only be answered by making reference to the cases of the countries presented above: *full financial integration per se along with membership of the euro area definitely do not represent any disadvantage for adjustment. On the contrary, they represent a greater level of protection*, as emphasised by *Nemény – Oblath* (*2012*) too. The cases of Austria, Slovenia, Slovakia and Estonia seem to confirm this. Yet a country can fall into a deep crisis even when using the euro, as in the case of Greece, and a country can develop excellent shock resilience even without the euro, as shown by the example of the Czech Republic. The disappearance of suggestibility regarding export competitiveness levels related to the depreciation of the foreign exchange rate can indeed bring some negative effects, if the countries within the euro area can only rely on the instruments of internal depreciation mechanisms, when needed. But compensating for competitive disadvantages or making them disappear simply through weaker foreign exchange rates is not recommended in the long run, not even on a theoretical level. *Financial stability and macroeconomic stability in general are defined by the levels of state indebtedness, foreign exchange reserves, the predictable nature of public finance management and the sustainable deficit-financing capacity of the budget, not by one of the favoured, currently selected versions of trinity theorem adjustment* (type A or type B). Therefore we dare to say that next to the considerably more stable Czech Republic, which is more resilient to external shocks, Hungary will also be able to reap more benefits in the euro area than the restrictions it would be forced to suffer with its financial independence, as explained by *Vígvári* (*2013*). Assuming, of course, that Hungary's productivity and income levels will be considerably closer to the EU average when joining the euro area than they currently are. One thing is certain: in the Economic and Monetary Union we will have to find clear institutional solutions to resolve our existing international competitiveness issues, going way beyond the strength of current monetary and exchange rate policy measures.

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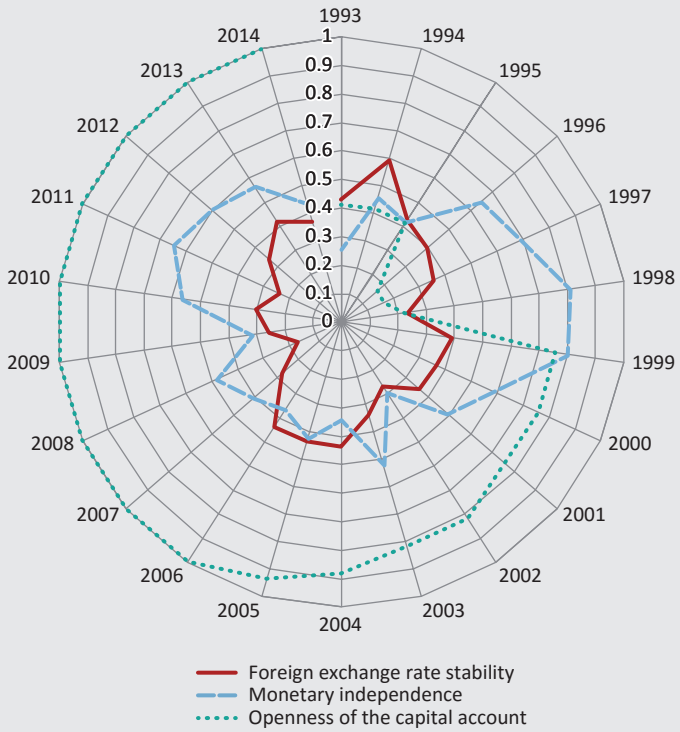
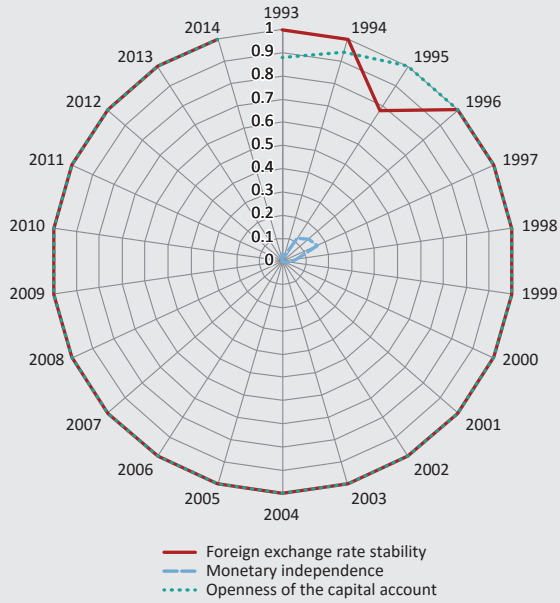
Annex

Figure A.1
Trilemma indices, Israel, 1993–2014



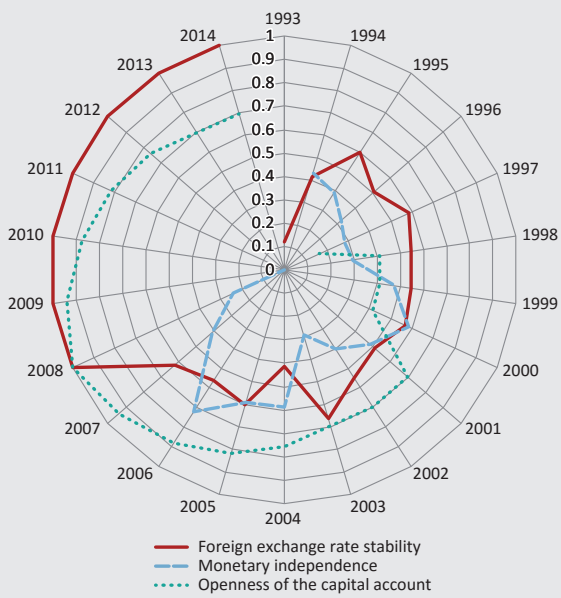
Source: Aizenman et al. (2013) edited based on indices and IMF AREAER 2015, 2016

Figure A.2
Trilemma indices, Austria, 1993–2014



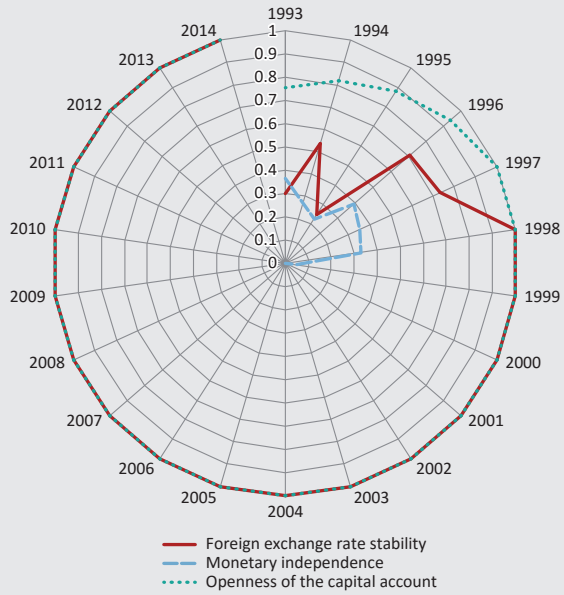
Source: Aizenman et al. (2013) edited based on indices and IMF AREAER 2015, 2016

Figure A.3
Trilemma indices, Slovenia, 1993–2014



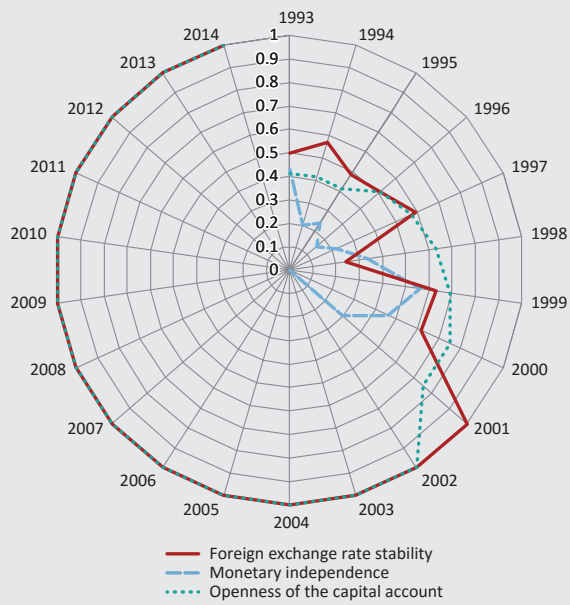
Source: Aizenman et al. (2013) edited based on indices and IMF AREAER 2015, 2016

Figure A.4
Trilemma indices, Portugal, 1993–2014



Source: Aizenman et al. (2013) edited based on indices and IMF AREAER 2015, 2016

Figure A.5
Trilemma indices, Greece, 1993–2014



Source: Aizenman et al. (2013) edited based on indices and IMF AREAER 2015, 2016

Experiences of Debt Cap Regulations in Hungarian Retail Lending*

Péter Fáykiss – Alexandr Palicz – János Szakács – Márton Zsigó

The 2008 financial crisis underlined that, on the one hand, the operation of the banking sector is highly procyclical and, on the other hand, household borrowers are unable to assess their long-term ability to repay realistically. The resultant excessive risk-taking and inadequate risk assessment by banks brought, in Hungary as well, substantial losses for banks and a high rate of distressed customers. Through the enforcement of debt cap rules, the MNB as a macroprudential authority has been limiting the recurrence of excessive household indebtedness in a preventive manner since 2015. Focusing on international practices and the results of Hungarian regulations in the first two and a half years, we reviewed the Hungarian experiences with regard to the debt cap rules. Although we can only draw preliminary conclusions due to the shortness of the period elapsed since the introduction of the debt cap rules, our analysis demonstrates that, in line with their calibration, Hungarian debt cap rules currently do not restrict sustainable lending processes, and contribute significantly to promoting a healthy lending structure by restraining excessively risky loans.

Journal of Economic Literature (JEL) codes: E32, E58, G21, R31

Keywords: financial stability, housing market overheatedness, excessive lending, macroprudential policy, debt cap rules, loan-to-value ratio, payment-to-income ratio

1. Introduction

The 2008 financial crisis clearly showed that the banking sector operates in a highly procyclical manner. Owing to market frictions in the banking sector and to diverse risk perception levels, there may be excessive risk-taking among banks and their customers in certain periods, and if this gives rise to a financial crisis afterwards, risk acceptance becomes overly low. The operation of the banking sector tends to reinforce economic and financial cycles, and in doing so it may give rise to real

* The views expressed in this paper are those of the author(s) and do not necessarily reflect the offical view of the Magyar Nemzeti Bank.

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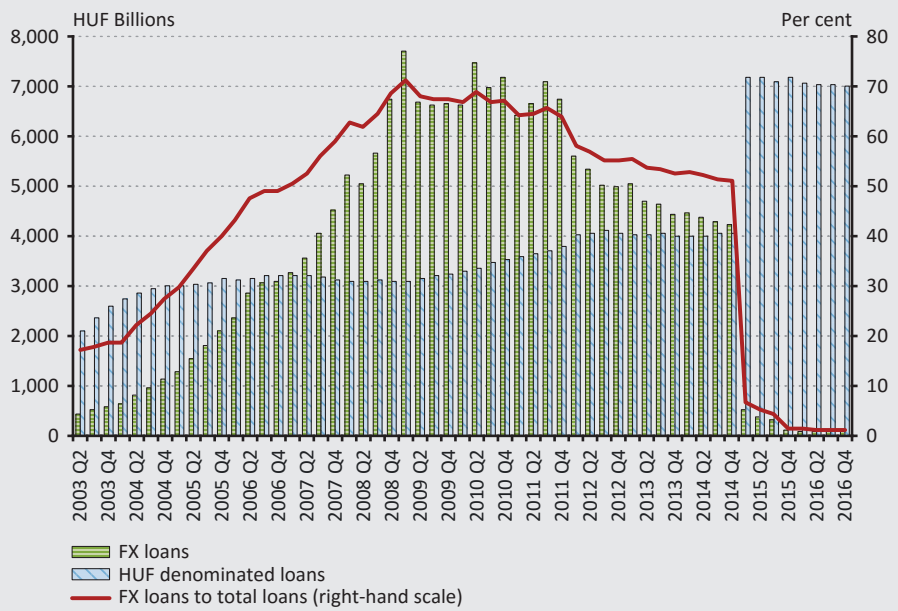
economic losses; therefore, one of the primary tasks of macroprudential policy is to mitigate the procyclicality of the banking system. In addition, it became clear that household borrowers are not always capable on their own of realistically assessing their long-term debt servicing capacity in the changing macroeconomic environment; thus in order to ensure a level playing field, policy instruments may also have to be applied to curb excessive indebtedness. In spite of the fact that the period of the more intensive application of macroprudential tools is relatively short in many countries, several empirical studies have recently been published with the encouraging conclusion that a more active application of macroprudential policy may not only help mitigate the volatility of GDP growth, but *ceteris paribus* it may facilitate stronger growth in the long run too (see, for example, *Boar et al. 2017*).

Figure 1
Denomination structure of household loans

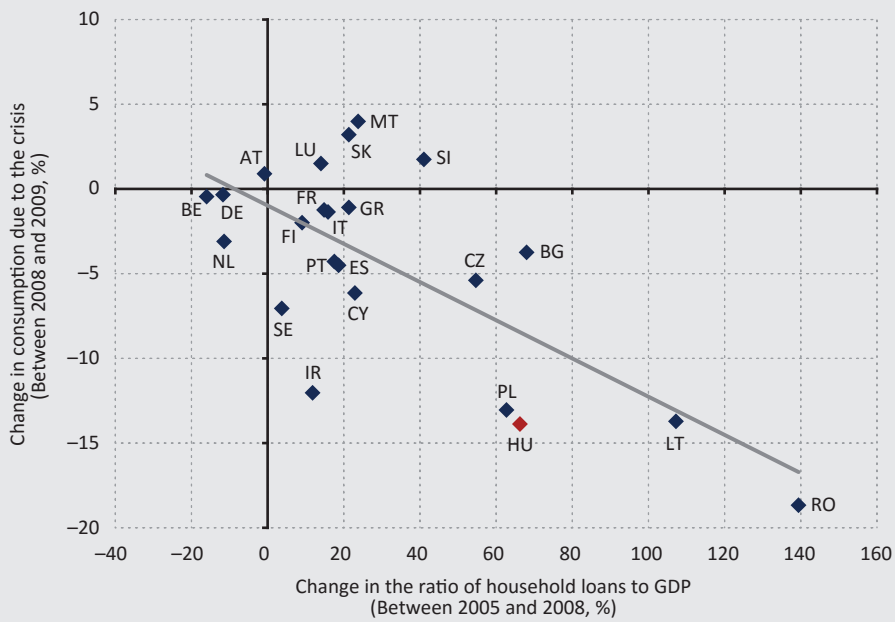


Source: MNB

The potential adverse effects of excessive risk-taking are aptly demonstrated by the consequences of pre-crisis lending in Hungary. Excessive lending occurs when lending conditions are more relaxed than warranted by the actual credit risk of borrowers. In pre-crisis years, both the increase in outstanding borrowing and the proliferation of foreign currency loans in Hungary *(Figure 1)* indicate that the systemic acceleration in lending took place with excessive indebtedness on

the customer side, and excessive risk-taking on the side of the banking sector. In addition, the risk expectations of market participants were too optimistic in general. Consequently, the number of customers facing payment problems rose to an alarming level after the outbreak of the crisis. As the number of non-performing loans rose dramatically, banks' impairment losses became so substantial that they required a series of capital injections between 2008 and 2015. Provisioning reduced banks' disposable capital with a parallel, dramatic decline in their willingness to take risks in view of the economic outlook, and consequently, a drastic fall in new loan disbursements. This acted as a brake on the already restrained consumption and investment during the crisis (*Figure 2*, *Bauer et al. 2013*).

Figure 2
Downturn in household lending and consumption during the crisis in specific countries



Source: ECB, Eurostat, national statistical offices

By enforcing debt cap rules, the MNB as a macroprudential authority has been limiting the recurrence of excessive household indebtedness in a preventive manner since 2015. The mandatory requirements formulated according to a comprehensive system of criteria are applicable at the transaction level; thus they can mitigate risks arising from excessive lending in a targeted manner and hence, strengthen financial stability. The primary objective of the limits set by the MNB is to ensure that outstanding borrowing grows in a healthy structure and in a sustainable manner, and to mitigate

the risk of excessive credit outflows emerging in the event of a future overheating scenario. In view of the possible wide-ranging effects of the debt cap requirements, it is worth summing up the relevant experiences of the past period.

Below, we first explore the relationship between household lending and a significant contributor to household indebtedness, real estate bubbles. We then examine the applicability of debt cap type requirements as macroprudential tools designed to mitigate the risks of excessive credit expansion, and the estimates of their effectiveness on international samples, before presenting an overview of the experiences of the debt cap rules adopted in European countries so far. Finally, we take account of the results of the first two and a half years of the Hungarian requirements, focusing on developments in domestic lending trends, the effects of the limits so far, and their possible side-effects.

2. Excessive household indebtedness and asset price bubbles

Excessive household indebtedness may have particularly severe consequences if it is accompanied by a housing market bubble; in other words, a general, sustained, and often explosive overvaluation of housing prices. If the price adjustment that follows the overvaluation is accompanied by excessive indebtedness of the population, it may trigger a severe real economic recession, and a financial and banking crisis. Several studies confirm that economic recessions associated with house price busts following a real estate bubble fuelled by a credit boom tend to be deeper and potentially longer than recessions amplified by other types of financial imbalances (see, for example, *Claessens et al. 2009*; *Crowe et al. 2013*; *Jordà et al. 2015*).

Residential property accounts for a significant part of households' assets, while household mortgage loans comprise a large portion of the banking sector's assets. An *en masse* default of housing loans undermines banks' profitability through impairment, which deteriorates the banking sector's lending capacity due to banks' declining capital levels. As a result of depreciating housing prices, households and – through decreasing collateral value – banks suffer significant losses on their assets, although this does not trigger an immediate effect in the case of households. Hungarian households may be particularly vulnerable to this effect, as home-ownership is typically high among households, irrespective of income status (nearly 86.3 per cent in 2016[1]); in addition, residential property tends to be the only very dominant wealth component among low-income households (see *Boldizsár et al. 2016*). Relying on loans for the financing of housing is a substantial commitment for most borrowers, which may tie up the portion of household income that is available for consumption or for saving over the long term, even after the depreciation of the home's value ("debt overhang problem") and, through the decline in collateral value, may confront borrowers with an even tighter liquidity constraint.

[1] For more detailed data, see: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ilc_lvho02&lang=en.

Intensive housing loan outflows may exacerbate real estate market imbalances. Some real estate market mechanisms hamper the sustained maintenance and fast retracement of the equilibrium price even without the emergence of excessive credit outflows. Examples include problems arising from information asymmetry, relatively high transaction costs and the adjustment constraints of the supply side owing to the specificities of the construction industry and regulatory features. Housing market transactions, however, typically require substantial borrowing on the buyer's side. The expansion of credit outflows paves the way for a heightened demand for real estate, which contributes to the appreciation of real estate prices. With the increase in household assets and collateral values, the appreciation may amplify credit outflows, which may be reflected in an upsurge in housing market demand and also in an increased utilisation of real estate collateral for consumer loans (see, for example, the ground gained by home equity loans before the crisis). As indicated by the summary shown in *Table 1,* the interaction between lending and real estate prices has been confirmed by literature in several cases, although the authors may arrive at slightly different conclusions with respect to the short and long-term direction of the interaction. The contribution of the construction sector and the second-round contribution to GDP may increase temporarily. However, if the amplification mechanism leads to an asset price and credit boom that proves to be unsustainable in the long run, the excessive expansion in the construction sector and the affiliated activities translate into a suboptimal allocation of resources, the negative legacy of which may cast a long shadow over the growth potential of the economy after the bursting of the bubble (see, for example, *Borio et al. 2016*).

Table 1
Overview of literature on the interaction between housing prices and credit

	Long-term interaction			Short-term interaction		
Author	**house prices ↓ credit**	**house prices ↑ credit**	**house prices ↕ credit**	**house prices ↓ credit**	**house prices ↑ credit**	**house prices ↕ credit**
Hoffmann (2003)	*					*
Hoffmann (2004)	*					
Brissimis and Vlassopoulos (2009)	*					*
Gerlach and Peng (2005)	*			*		
Oikarinen (2009a, 2009b)		*			*	
Fitzpatrick and McQuinn (2007)			*		*	
Berlinghieri (2010)			*			*
Gimeno and Martinez-Carrascal (2010)			*			

Note: Asterisks indicate the cases where the studies identified effects between house prices and credit.
Source: Anundsen – Jansen (2013)

Empirical literature provides evidence that excessive household indebtedness increases the probability of real estate market imbalances and the evolution of severe financial crises. Some analyses distinguish between two types of asset price bubbles: processes fuelled by easy credit and those financed by stock market speculation ("irrational exuberance") (*Mishkin 2008*). In the international sample of *Crowe et al.* (*2013*), real estate bubbles were accompanied by intensive credit outflows in the vast majority of cases. *Cerutti et al.* (*2017*) arrived at a similar conclusion: the authors found that only about one-fifth of the international house price booms were imbalances without excessive credit outflows. It should be mentioned that around sixty per cent of the real estate booms reviewed by the authors exhibited intensive credit outflows not only in mortgage credit but also among a broader range of household loans. Note that real estate market amplification mechanisms do not necessarily operate with the same strength in all asset markets. *Schularick and Taylor* (*2012*) identified credit growth as the most powerful predictor of financial crises; however, the authors did not find its interaction with stock price changes significant in increasing the probability of a financial crisis. Based on the literature, the aggregate debt service ratio is typically one of the most useful early warning macro variables of banking crises, along with the variables that capture credit outflow dynamics and levels somewhat earlier (*Drehmann – Juselius 2014*; *Drehmann et al. 2017*).

Although excessive credit outflows may lead to severe financial crises, lending that supports the real economy in a sustainable manner is an important factor at the level of the national economy. Using an international sample, *Gorton and Ordoñez* (*2016*) compared periods where the ratio of credit growth-to-GDP exceeded a certain level in every case, but some of these credit booms ended in financial crises, while others did not. All boom periods that ended without a crisis displayed – both in developed and emerging countries – more dynamic average economic and investment growth and an improvement in productivity (both in terms of labour and total factor productivity). Accordingly, in light of a series of other indicators and criteria it is imperative for macroprudential policy to be able to identify dynamic periods that are not adequately supported by fundamentals.

3. Debt cap rules as macroprudential instruments preventing excessive household indebtedness

3.1. Impact mechanism of debt cap rules

The two main types of debt cap rules are variables that limit the maximum credit amount available to borrowers and debtors' maximum debt service costs. The loan-to-value ratio (LTV) defines the maximum credit amount in proportion to the market value of the underlying collateral. The second main group of debt cap type requirements regulates the loan-to-income ratio (LTI) and the payment-to-income ratio (PTI). The first rule sets the maximum credit amount available to the debtor in proportion to the debtor's disposable income – which, in general, is steadily available to the debtor on an annual basis –, whereas the second limits the debtor's maximum monthly debt service costs based on the debtor's monthly income.

Debt cap requirements are primarily intended to restrain excessive household lending. Besides households, this macroprudential instrument may be theoretically extended to corporate lending as well; however, due to the calibration difficulties this would entail, such application of the debt cap rules is uncommon. Indeed, there is no clear definition for corporations' stable, disposable income and it is extremely difficult to determine the market value of the underlying collateral in their case.

Collateral and income-based requirements may significantly restrain the cyclicality of real estate prices and household lending. The requirements affect both credit demand and credit supply. LTV limits primarily curb the maximum credit amount that can be granted by creditors in order to prevent potential losses from housing price corrections, while income-based requirements limit the maximum debt service that can be undertaken by debtors or the maximum credit amount available to them. Restrictions on both indicators collectively restrain excessive lending to households and encourage banks to compete through product pricing and the provision of extra services rather than through easing their lending conditions. Consequently, the regulations serve as targeted tools to reduce the systemic risks inherent in excessive household indebtedness and to support the sustainable provision of credit to the economy (*ESRB 2014*).

Table 2
Transmission of debt cap rules

	Direct adjustment channels	Effects inside the banking sector	Effects outside the banking sector	Aggregate effects
LTV↓ PTI ↓	Regulatory arbitrage	Role of foreign credit may increase	Non-bank institutions may assume an increased role in lending	**With the dampening of the credit cycle and the reduction of PD and LGD values the resilience of the banking sector increases, post-crisis downturns become less severe and the real economy recovers faster**
	Credit market	Credit demand ↓ Credit supply ↓	Decreasing volatility in real estate prices	
	Expectations	Stricter risk management PD↓ and LGD↓		

Source: MNB (2016)

Debt cap rules improve the shock-resilience of creditors and debtors simultaneously, thereby mitigating the negative repercussions of a potential financial crisis. On the one hand, the loan-to-value requirement ensures that banks' claims can be satisfied by disposing of the underlying collateral even in the case of a sharp decline in real estate prices; on the other hand, income-based requirements ensure some room for manoeuvre for debtors in the case of an increase in debt service or a decline in their income. In addition, debt cap rules should be calibrated in view of the current state of the financial cycle. Accordingly, the rules should be tightened in periods of excessive risk acceptance and eased in times of financial crises, although, owing to the smaller volatility of household incomes, income-based requirements may be more effective throughout the entire cycle than the loan-to-value regulations (*Szombati 2017*). Moreover, since real estate prices increase faster than household incomes and savings when credit markets and real estate prices are highly overheated, maintaining the level of the loan-to-value ratio requirement will contain excessive lending in the housing market (*ESRB 2014*) in itself. At the same time, a countercyclical adjustment of the cap might become necessary to counteract the overheating more vigorously.

From a broader perspective – besides the macroprudential target system – the positive consumer protection effect of the debt cap rules should be assessed as well. In addition to their macroprudential significance, the debt cap rules also play a role in consumer protection, as they not only restrain excessive credit expansion in the household segment as a whole, but also protect each individual borrower from excessive indebtedness. The transaction-level requirement reduces the probability of social problems recurring that stem from defaulting debtors in the aftermath of the crisis.

During the calibration of debt cap rules, the possibility of regulatory arbitrage should also be restricted. *Nouy* (*2017*) distinguishes between three types of regulatory arbitrage[2]. The first can be described as "cross-jurisdiction" arbitrage, which takes advantage of the differences in the regulations of individual countries. The second involves cross-sectoral business activities, while the third type of arbitrage is the exploitation of loopholes within the regulatory framework. The operation of the first two types in the case of debt cap rules is illustrated by *Table 2.* If the scope of debt cap rules is limited to domestic banks and institutions, when the limits are tightened, lending by domestic banks may be replaced by cross-border or branch office lending by non-resident institutions, or lending by non-bank financial enterprises and other institutions engaged in non-bank lending. The third type of regulatory arbitrage is discussed in detail in *Chapter 5.3.*

3.2. Effectiveness of debt cap requirements based on international experience

Based on the initial and relatively limited experience so far, debt cap rules effectively mitigate the risks associated with excessively fast credit outflows, and may also dampen the housing market price hikes fuelled by the credit expansion. Before the 2007–2008 global crisis, the active, regulatory-level application of debt cap rules was not common. However, the application of this regulatory tool became increasingly popular during the years following the crisis worldwide, which, in addition to a growing awareness of the importance of macroprudential regulations, may also be motivated by current systemic problems arising in the low interest environment typical of developed economies (e.g. sharp rises in real estate prices often with strong regional heterogeneity). Estimating the effectiveness of the debt cap rules, however, is a challenging endeavour in view of the relatively short time that has elapsed since its introduction; moreover, lending activity continued to expand below the equilibrium level in several countries after the crisis, which restricts the applicability of any advanced measurement approach. On the other hand, by nature, the short-term costs of applying macroprudential policy may arise immediately, whereas its benefits (e.g. moderation of the significant negative impacts of a future crisis) will materialise much later and are more difficult to measure.

Nevertheless, based on empirical experiences so far, debt cap rules have proved to be one of the most promising regulatory tools available (*Table 3*). Meanwhile, the results also demonstrated that beyond the diverging inspection methods, the effectiveness of various debt cap tools may vary across economies and periods with respect to their impact on specific regulatory outcome variables.

[2] Regulatory arbitrage refers to an adjustment in banks' business conduct with a view to circumventing the impact of a regulation without a corresponding reduction in the underlying risk.

Table 3
Studies investigating the effects of PTI and LTV rules

Variable targeted by the regulation	Author(s) (geographical scope) [other details about the dependent variable]	PTI (& LTI)	LTV
Studies conducted using international samples			
Housing or mortgage loan portfolio (growth)	Kuttner and Shim 2013 (57 countries worldwide)	significant and material	not significant
	McDonald 2015 (17 countries worldwide)	significant	significant
	Akinci and Olmstead-Rumsey 2015 (57 countries worldwide)	significant and material	significant and material
	Jácome and Mitra 2015 (5 East Asian and East European countries)	n.a.	significant
	Morgan et al. 2015 (10 countries in Asia)	n.a.	significant
Loans to the private sector (growth, real)	Lim et al. 2011 (49 countries worldwide)	significant	significant
	Geršl and Jašová 2014 (11 countries in Central and Eastern Europe)	significant	
	Cerutti et al. 2017 (119 countries worldwide)	significant	significant
House price-growth	Crowe et al. 2013 (21 countries worldwide)	significant	not significant
	Vandenbussche et al. 2015 (16 countries in the CEE and South-East European region)	not significant	not significant
	Kuttner and Shim 2013 (57 countries worldwide)	not significant	significant
	McDonald 2015 (17 countries worldwide)	significant	
	Akinci and Olmstead-Rumsey 2015 (57 countries worldwide)	significant and material	significant and material
	Cerutti et al. 2017 (119 countries worldwide)	not significant	not significant
	Carreras et al. 2016 (19 OECD countries)	significant	significant
Review of individual countries			
Delinquency ratio	Baek et al. 2013 (South Korea)	significant	significant
Housing or mortgage loan portfolio	Igan and Kang 2011 (South Korea) [household credit growth outside of metropolitan areas]	significant	significant
	Kim 2013 (South Korea) [quarterly growth]	significant	significant and material
	Lee 2013 (South Korea) [real level]	not significant	not significant
	Price 2014 (New Zealand) [national growth, counterfactual estimate]	n.a.	significant
	Wong et al. 2014 (Hong Kong) [estimated supply and demand]	n.a.	significant
	Neagu et al. 2015 (Romania) [growth]	significant	
	Kuncl 2016 (Canada) [level, and impact on residential investment]	n.a.	significant

Table 3
Studies investigating the effects of PTI and LTV rules

House price	Craig and Hua 2011 (Hong Kong) [quarterly growth]	n.a.	significant and material
	Igan and Kang 2011 (South Korea) [growth, metropolitan area]	not significant	significant
	Kim 2013 (South Korea) [quarterly growth]	significant	significant and material
	Lee 2013 (South Korea) [real level]	not significant	not significant
	Price 2014 (New Zealand) [annual growth, counterfactual estimate]	n.a.	significant
	Kronick 2015 (Canada)	n.a.	not significant

Note: YELLOW cells indicate the significant effects identified by the studies; WHITE cells and ORANGE cells respectively indicate non-significant results and estimates where the quantitative effect of the simulated regulatory interventions relative to the rest of the regulatory interventions reviewed (e.g. capital instruments, fiscal instruments, etc.) was prominent. GREY cells indicate instrument(s) that were not included in the given study. Cells that are not split in the middle indicate studies where the effect of the two different instrument types was not inspected separately.

Source: Fáykiss et al. (2017)

Unfortunately, owing to the limited experience, efforts to estimate the real economic costs and benefits of the regulation are fairly rare in international studies. *Boar et al.* (*2017*) used one of the largest samples in the literature to analyse the effect of macroprudential policies on the long-term volatility and growth rate of GDP. The authors do not distinguish between the various cyclical macroprudential instruments and accordingly, they use a single estimate to measure the effect of debt cap rules and, for example, the effect of capital buffers. They found that the application of cyclical macroprudential tools in general reduces long-term output volatility and does not even curb growth significantly; indeed, they might even boost output growth. However, the tools may be less effective in financially more developed economies compared to the average.

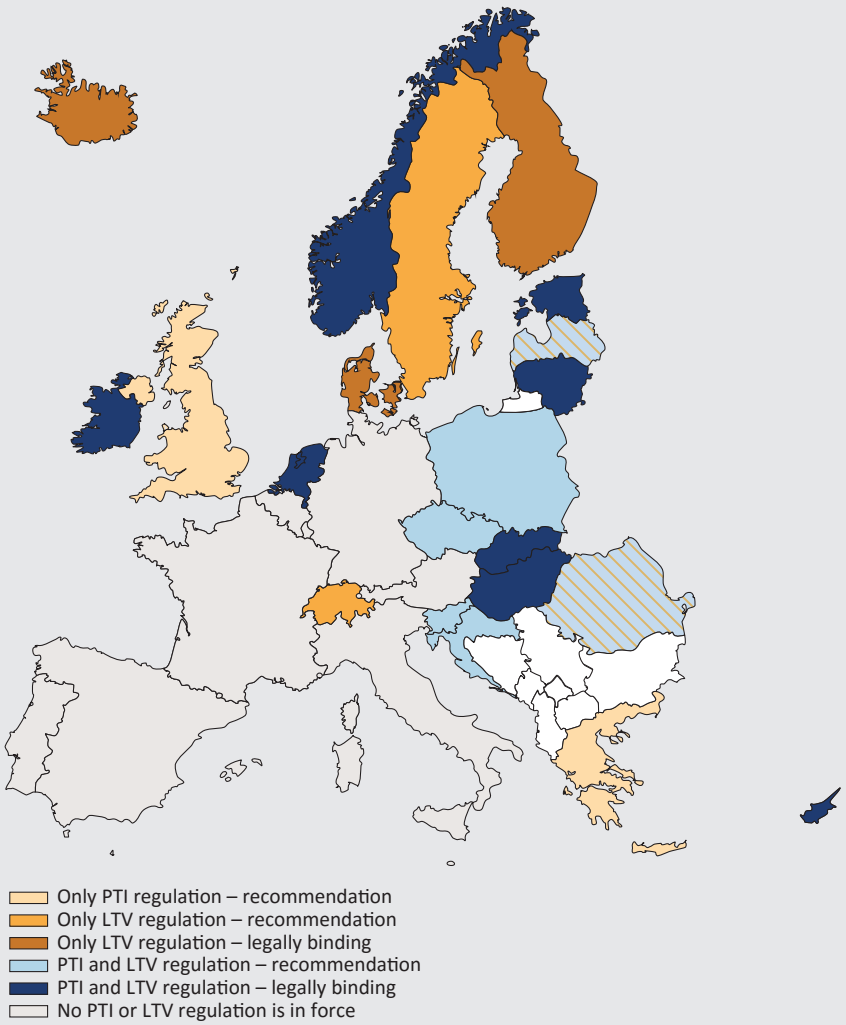
4. Application of debt cap rules across Europe

The use of debt cap rules has become increasingly widespread across Europe as well. Central and Eastern European and Northern European Member States are more frequently present among the countries applying the rule, whereas this type of regulatory activity is negligible in the core countries of the euro area (*MNB 2016*). As regards the calibration of individual national regulations, we should note that while the loan-to-value ratio (LTV) is set up identically in individual countries for the most part, two main indicator groups can be identified for factoring in the repayment capacity of debtors. One of them includes payment-to-income (PTI)[3]

[3] Also known as debt-service-to-income (DSTI).

type ratios, which cap maximum monthly payments relative to the debtor's income, while the second group comprises loan-to-income (LTI) indicators, which define the maximum credit amount available to debtors based on their annual income (*Figure 3*).

Figure 3
Debt cap type requirements across the states of the European Economic Area



Note: In the case of Romania and Latvia, the LTV regulation is mandatory, while the PTI limit is based on a recommendation.

Source: MNB (2017b)

The application of the limits in individual regions can be summed up as follows:

- *Central and Eastern European countries:* Besides Hungary, Slovakia adopted mandatory LTV and PTI limits, while the rest of the countries in the region either issued recommendations (Czech Republic, Poland, Slovenia, Croatia) or adopted mandatory provisions with respect to the LTV limit only, and – in addition to the mandatory LTV regulation – address the PTI limits in the form of a recommendation (Romania).
- *Northern countries:* LTV regulations were adopted as a recommendation in Sweden and as a regulation in Denmark, Finland and Iceland. In Latvia, besides the mandatory LTV limit, the PTI limit was set as a recommendation, while Estonia and Lithuania apply mandatory PTI limits and Norway adopted mandatory LTV and LTI limits.
- *Southern countries:* In these Member States, only Cyprus adopted mandatory PTI and LTV regulations, whereas Greece issued a recommendation with respect to the PTI limit only.
- Other European countries: The Netherlands introduced mandatory LTV and PTI rules and Ireland applies binding LTI and LTV regulations, whereas the United Kingdom issued a non-mandatory recommendation regarding the maximum credit amount available to borrowers relative to their annual income.

Despite the ostensible proximity of the thresholds of debt caps introduced across the EU, their comparability is significantly hampered by the detailed rules applicable. For example, as regards the debt cap rules that remained a national matter, for the calculation of the payment-to-income ratio individual Member States define the debt service and income components differently (e.g. with regard to sustenance costs), and different rules are applied to the management of co-debtors and higher-income debtors, the *de minimis* limits, and the inclusion of bullet loans and floating rate schemes. Instead of the PTI indicator, several Member States apply the LTI indicator, which limits the maximum credit amount in proportion to annual income. As regards the loan-to-value ratio, different provisions apply for the definition of the market value in several countries. Accordingly, requirements applicable to overstretched incomes and to the disposal of collateral are hard to compare at international level. Therefore, even though the levels shown in *Table 4* are often close to one another, it is fairly difficult to determine the "tightness" of the given requirement based on the level of the regulatory limits.

Table 4
Debt cap rules in Europe

Country	PTI and LTI*	LTV	Note / Exceptions
CH	-	90%	
CY	80%	80%	**PTI:** 65% for FX loans **LTV:** for financing the primary permanent resident of the borrower, otherwise 70%
CZ	40% PTI, 8 LTI	80%	**LTV:** 15% of lending may be performed with a limit of 90%
DK	-	95%	
EE	50%	85%	**LTI:** for 80% of lending – if the interest rate is low, with stressed interest level **LTV:** for 85% of lending, it can be 90% for loans supported by a state guarantee
FI	-	90%	**LTV:** 95% for first-time buyers
GR	30-40%	-	
HU	50%	80%	**PTI:** between 10% and 60%, differentiated according to income and currency **LTV:** tighter for FX loans or new vehicle loans, up to 30%
IE	3,5 LTI	90%	**LTI:** for 80% of lending for first-time house buyers and for 90% of lending for non-first-time buyers **LTV:** for 85% of lending
IZ	-	85%	**LTV:** 90% for first-time house buyers
LT	-	90%	**LTV:** it can be 95% for loans supported by a state guarantee
LV	40%	85%	**PTI:** 5% of lending should be performed with a 60% limit, compliance with a 50% interest rate stress limit is also mandatory
MT	-	70%	**LTV:** for household mortgage loan exposures with a risk weight of 35%
NL	-	100%	
NO	5 LTI	85%	**LTI:** for 90–92% of lending, depending on region **LTV:** for 90–92% of lending, depending on region, 70% for home equity lines of credit (HELOC) type products, the cap is 60% for secondary homes in Oslo
PL	40%	80% for household loans, 75% for commercial property loans	**PTI:** 50% for higher-income borrowers **LTV:** 90%, but can be raised up to 80% if the part above 80% or 75% is collateralised or insured
RO	-	85% for housing loans, 75% for consumer credit	**LTV:** between 80% and 60% for FX loans depending on the currency and the hedging of the FX risk, 95% if the loan is backed by a state guarantee
SE	-	85%	
SI	50%	80%	**PTI:** 67% for higher-income borrowers but only a specific portion of the income can be included in the eased limit
SK	80%	80%	**PTI:** calculated with an interest shock of 2 percentage points, for floating interest rate loans, up to 1 LTI, 100% **LTV:** 40% of lending may exceed it up to 100%, but max. 10% can be above 90% and, up to 1 LTI the LTV limit is also 100%
UK	4,5 LTI	-	**LTI:** for 85% of lending

Note: If the limits above refer to LTI regulations, this is separately indicated; otherwise the % limits refer to PTI-type regulations.*

Source: ESRB (2017)

Several differences can be identified with respect to the regulatory tools applied in individual countries:

- *Institutional scope:* In the case of certain countries (such as the Netherlands and Hungary) the rule has a broad-based institutional scope, covering not only credit institutions but also non-bank creditors, which reduces the possibility of circumventing the regulation.
- *Eligible incomes:* In addition to Hungarian regulations, it is only in Cyprus, Estonia and Slovakia that prudent certification is required for the validation of after-tax incomes. In all other countries applying mandatory regulations, banks are permitted to define the range of eligible incomes.
- *Differentiation by risk dimensions:* In an international comparison, LTV requirements differentiate according to denomination (Romania) or real estate value (Ireland), whereas a similar differentiation of PTI requirements is not applied apart from in Hungary.

In order to ensure that the requirements are targeted as specifically as possible, several EU Member States apply exceptions in the debt cap rules:

- *Allowances for specific borrower groups:* To ease less risky borrower groups' access to credit, some countries permit, to some extent, the disbursement of loans with LTV values in excess of the limit (the Czech Republic, Ireland and Slovakia). Countries with high real estate prices support young, first-time home buyers by applying preferential LTV requirements for example (e.g. Ireland, Iceland). Baltic States have also defined preferential LTV caps with respect to housing loans backed by a state guarantee with a view to facilitating home purchases for first-time buyers.
- *Exceptions as a percentage of the total portfolio:* Sometimes policymakers allow creditors to disburse loans, up to a certain percentage of the total disbursement, with PTI or LTI values in excess of the regulatory limit, if the borrowers' outstanding repayment capacity can be certified (e.g. Estonia, Lithuania and the United Kingdom).

5. Debt cap rules in Hungary

5.1. Operation of Hungarian debt cap rules

The MNB was among the first in Europe to adopt legally binding, comprehensive debt cap rules. Entering into force on 1 January 2015, the rules are intended to prevent the overstretching of debtors' incomes and collateral values alike: the amount of new household loans may not exceed 80 per cent of the collateral value (loan-to-value ratio, LTV) and, as a general rule, the total debt service of borrowers

may not exceed 50 per cent of their regular, legal income (payment-to-income ratio, PTI). In order to offset the different risks, the Hungarian regulation is stricter for foreign currency loans and more relaxed for high-income borrowers[4] *(Table 5).*

Table 5
Hungarian PTI and LTV requirements

		HUF	EUR	Other currency
PTI	Under HUF 400,000 net monthly income	50%	25%	10%
	Equal to or more than HUF 400,000 net monthly income	60%	30%	15%
LTV	Mortgage lending	80%	50%	35%
	Car loans	75%	45%	30%

Source: MNB

In calibrating the debt cap rules, the current state of the financial cycle should also be considered. Requirements should be shaped countercyclically, in line with the changes in the cycle: while a period of overheatedness may warrant the application of tighter LTV and PTI limits to prevent excessive indebtedness, in times of crisis and at the bottom of the credit cycle where there is a risk of a credit crunch or the credit crunch has taken hold already, there is generally room for easing the existing tighter limits. The primary objective of the adoption of debt cap rules – in view of the existing state of the financial cycle – was to put a "brake" in place that can be "hit" later in order to prevent excessive credit outflows (*Szombati 2017*).

Hungarian debt cap rules were calibrated by covering a broad range of criteria, along the lines of various risk dimensions.

i. The debt cap rules can be comprehensive both in terms of the affected credit products and the protection of market participants. Hungarian debt cap rules cover all credit products offered to households; their application is mandatory for all creditors and consequently, the possibility of circumventing them is limited. The rules protect creditors and borrowers simultaneously: in the case of the PTI limit, the primary objective is to mitigate the risks arising from customers' excessive indebtedness, while the LTV cap is primarily intended to reduce potential losses from the collateralised loans disbursed by banks.

ii. The requirement mitigates the risks of indebtedness in foreign currency by way of tighter limits in the case of both regulatory tools. An exchange rate depreciation may substantially raise both the monthly instalment amounts and the principal

[4] For the justification of this provision see, for example, *Balás et al.* (*2015*).

value in proportion to the collateral, which should be covered by an additional buffer included in the limits[5].

iii. The calibration of the regulation should differentiate according to customers' disposable income. Since the growth rate of consumption typically falls behind the growth rate of income (see *Hosszú 2011* for example), a higher portion of the income can be allocated to debt servicing. The model calculations of *Balás et al.* (*2015*) performed on the data of a questionnaire-based survey also confirm that higher-income customers should enjoy more latitude in applying for a loan, as the same PTI levels might be too tight for higher-income customers, and too relaxed for low-income customers.

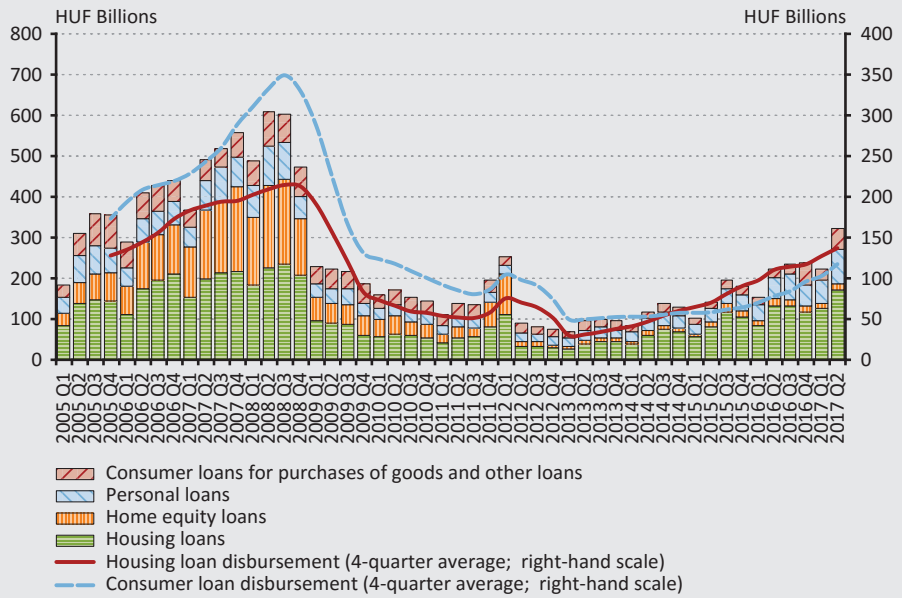
iv. To facilitate prudent lending, only legal, certifiable income may be considered during the application of the debt cap rules. Since legal, certifiable income is deemed to be more stable than any other form of income, only these income components should be considered in PTI calculations. This requirement encourages households with an intention to borrow to report their incomes; therefore, in addition to facilitating responsible lending, another positive result of the MNB Decree is promoting the whitening of the economy. This, however, may exclude from the group of borrowers the segments that previously obtained credit from "grey" income, without certification.

5.2. Experiences so far with regard to application of debt cap rules in Hungary

A lending turnaround has recently taken place in the case of the household portfolio, while the dynamic acceleration of the disbursement of new household loans continued. Since the trough observed in the first quarter of 2013, the level of new disbursements has increased dynamically, reaching the values recorded in early 2006 by the first half of 2017. Housing loans exhibited the greatest growth in the past year and a half: by 2017 Q2 their disbursement grew to HUF 171 billion from the HUF 85 billion registered in early 2016. The disbursement of consumer credit more than doubled during the same period. This expansion was driven by the robust disbursement of personal loans and trade credit, while home equity loans continued to have a negligible share (*Figure 4*).

[5] During the calibration of the required buffer, VaR (Value at Risk) or ES (Expected Shortfall) analyses may prove to be useful. They can assist in defining a PTI limit that ensures the PTI value does not exceed the regulatory limit applicable to forint loans even in the event of an extreme exchange-rate shock.

Figure 4
Gross credit disbursement by credit institutions in the household segment by product type

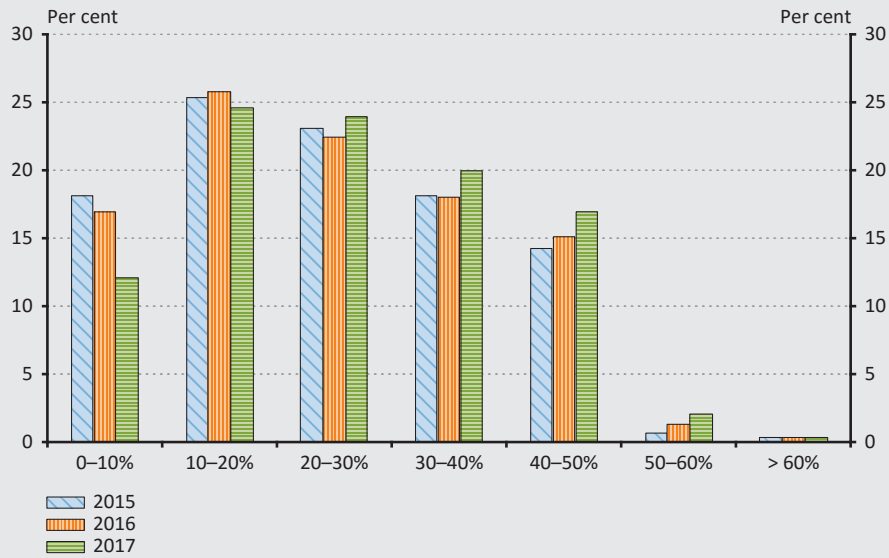


Note: Excluding loans to sole proprietors.
Source: MNB

So far, the dynamic acceleration in lending has not entailed significant indebtedness of households, which is also confirmed at the macroeconomic level by the negative credit gaps[6]. Although borrowers appeared to be somewhat more overstretched in the past two and a half years as in the first half of 2017, one fifth of the loans were disbursed to more indebted customers with a PTI value of 40–60 per cent, this rate exceeds the figure observed in 2015 by only 5 percentage points. This year's high real wage growth, however, may slacken or curb further growth. Accordingly, although the limits may be activated for more borrowers, they are still not visibly concentrated around the regulatory caps (*Figure 5*). At the same time, contrary to pre-crisis years, the risk associated with housing loans and consumer credit has become significantly lower owing to the adopted or tightened prudential requirements and to the increased risk aversion of market participants (typically forint denomination, significantly lower LTV levels, etc.). Therefore, the dynamic credit expansion supports the recurrence of equilibrium lending and for the time being, cannot be considered excessive.

[6] In this regard, see, for example, *MNB* (*2017b*).

Figure 5
Evolution of the distribution of newly disbursed loans according to PTI over time

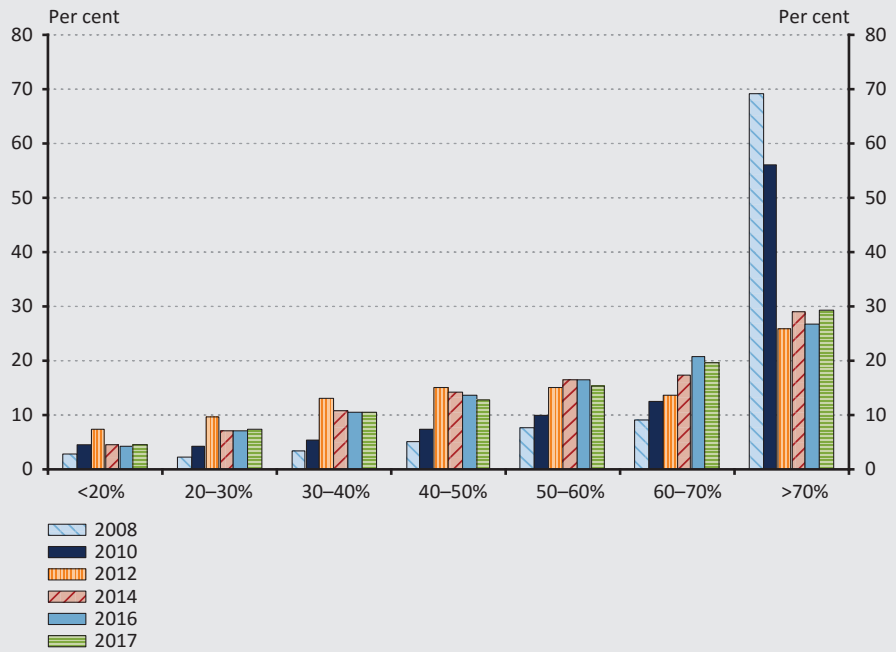


Note: Distribution by number of contracts. Data for 2017 refer to the first half of the year.
Source: MNB

At present, the upswing in housing loans does not threaten a build-up of systemic debt problems. Housing loans disbursed in the recent period are denominated in forints; their maturity just reached 16 years in the second half of 2017 compared to the 19–20 years observed before the crisis, their LTV values are significantly lower and individual transactions are not visibly concentrated in the proximity of PTI limits. The probability of future debt problems associated with housing market processes is reduced further by the fact the borrowing is linked to no more than half of all housing transactions (*MNB 2017a*). In addition, the encumbrance of the real estate collateral behind housing loans remains low, although it exhibits a slow up-slope trend. Parallel to rising real estate prices[7] and dynamically increasing housing loans, debtors are more likely to finance their real estate purchases from borrowing; therefore, loans granted with collateral encumbered by more than 70 per cent of the market value represent an increasing share in total housing loan disbursements. At the same time, the share of these loans is still far below the levels observed before the crisis *(Figure 6).* Therefore, the dynamic expansion in the housing loan portfolio over the past three years took place in a far more sustainable manner than in the pre-crisis period.

[7] For a more detailed analysis of housing market risks, see the Housing Market Reports of the MNB.

Figure 6
Evolution of the distribution of newly disbursed housing loans according to LTV over time



Note: Distribution by volume. Data for 2017 refer to the first half of the year.
Source: MNB

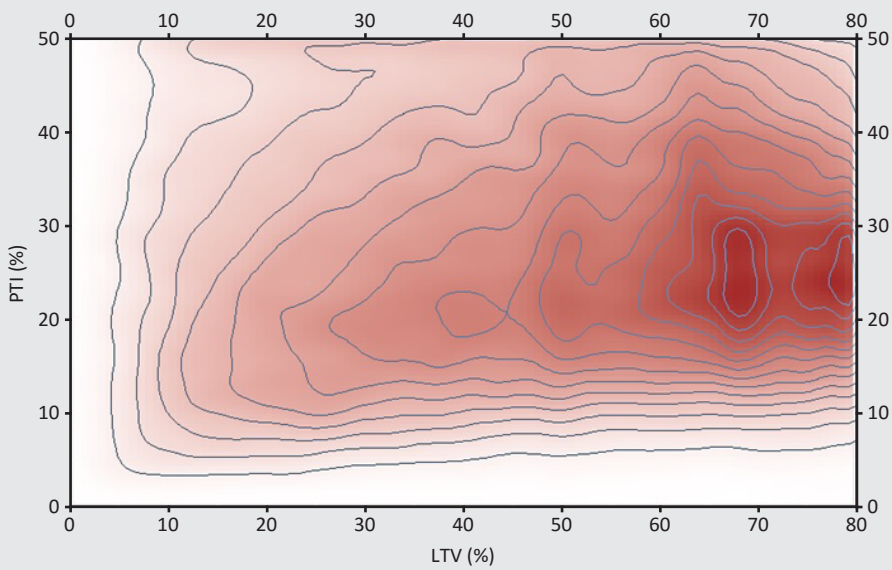
So far, the robust increase observed in real estate prices in Budapest has not resulted in the population's excessive indebtedness. Although Budapest real estate prices rose by around 70 per cent compared to their end-2014 level over the past three and a half years, excessive indebtedness has failed to materialise so far among households. On the one hand, Budapest real estate prices remain in the vicinity of the level warranted by fundamentals[8]. On the other hand, no significant difference can be identified between the indebtedness processes of Budapest and countryside citizens, even with regard to the regional effectiveness of the debt cap rules. Despite the surge in real estate prices compared to disbursements outside of Budapest, the share of loans with an LTV value of over 70 per cent is only four percentage points lower and the volume of the contracts affected by both limits is only 1.5 percentage points higher in Budapest. Considering the higher income levels of the capital city, this confirms that excessive indebtedness cannot be observed for the time being. It should be noted that *Table 3* also confirms that, according to experience, debt cap rules are primarily effective in mitigating excessive household indebtedness and

[8] For more detail, see the MNB's Housing Market Reports: https://www.mnb.hu/en/publications/reports/housing-market-report

exert a more limited effect on housing market processes. Consequently, they can mainly dampen real estate price surges fuelled by excessive lending.

In accordance with the above, based on the distribution of mortgage loan transactions by PTI and LTV values, a higher level of concentration around the regulatory limits can be observed with respect to the LTV value *(Figure 7).* Of the debt cap requirements, however, the PTI requirement generated the larger portion of the estimated effect with respect to the loans restrained by it. Indeed, based on the distribution fits used for the purposes of the impact estimate, compared to PTI values the regulatory limits pertaining to LTV values required adjustment with respect to fewer borrowers (*MNB 2017b*).

Figure 7
Distribution of housing loans disbursed between 2016 Q1 and 2017 Q2 by PTI and LTV values



Source: MNB

5.3. Potential adverse effects of debt cap requirements

Although the effect of debt cap rules at the transaction level significantly curbs the possibility of regulatory arbitrage, depending on the specific formulation of the rules, debtors and creditors to some extent may also adjust to the requirements through channels not affecting credit outflows, which may predict the limits' increasing effectiveness. *Table 6* summarises these adjustment options.

As shown by the table, possible adverse effects may materialise principally in the case of rules that impose limitations in proportion to income, which may be

partly attributed to the fact that LTV values can be calculated with less complex methods. Another reason is the fact that PTI rules are applicable to all disbursed loans, whereas the LTV limit poses a constraint only in mortgage lending. Nudging borrowers towards less regulated, non-bank intermediary channels may be relevant in the case of both requirement types. This is addressed appropriately by the Hungarian regulation as its scope is not limited to bank lending. Although the requirements do not pose a constraint for loan transactions between private individuals, the significant proliferation of these transactions via online platforms or personal relationships has not been observed in Hungary.

Table 6
Debtors' potential adjustment options to the debt cap rules

	PTI	LTV
Borrowing through non-bank intermediaries	relevant but addressed by the regulation	relevant but addressed by the regulation
Maturity extension	relevant but currently not prevalent	not relevant
Selection of a shorter interest fixation period	relevant but currently not prevalent	not relevant
Selection of a currency with a more favourable interest rate	relevant but addressed by the regulation	relevant but addressed by the regulation
Unsecured borrowing	not relevant	relevant but addressed by the regulation

Source: ESRB, MNB

Since the size of debtors' monthly instalments is determined by the triumvirate of principal, interest and maturity, adjustment to the PTI requirement is possible, without changing the principal amount, by modifying the interest and the maturity:

- *Schemes with more favourable interest rates:* Two typical methods involve the selection of loans with a shorter interest fixation period or a currency with a more favourable interest rate level. Owing to the recent negative experiences of FX lending both among creditors and borrowers, foreign currency loans are not typical in Hungary at present. The debt cap rules, in turn, restrict higher risks through tighter limits. Although the share of more indebted borrowers is somewhat greater in the case of floating rate schemes compared to loans with interest rates fixed for longer periods, the difference is immaterial, and adjustment through the length of the interest period is restricted, overall, to an extent corresponding to the difference between the interest rate levels. The benefit provided by shorter interest fixation periods is offset by the fact that, in the calculation of the PTI value, the instalment for loans with an interest fixation period of at least 5 years has been calculated with a preferential weight of 85 per cent since May 2016; therefore, the higher instalment amount associated with the same principal amount is not in conflict with the PTI limit.

- *Longer maturity:* The impact of a longer maturity on the instalment amount diminishes in line with the extension of the maturity, while it increases the total payable amount significantly. Since the adoption of the debt cap rules only housing loans have been affected by a modest increase, but this can mainly be attributed to the general surge in house prices and the resulting credit amount increase.

One adverse effect of the LTV requirement could be an upswing in uncovered loans. If borrowers do not have sufficient savings, they could adjust to the own funds requirements demanded by the LTV rules by applying for uncovered loans. Although such borrowings may precede applications for housing loans in the case of collateral encumbered at a high rate, only a small fragment of debtors in the Hungarian credit market choose this form of adjustment to the LTV rules. In addition, this effect is also limited by the PTI requirements, as the maximum portion of the debtor's income available for debt service is restrained. The effectiveness of the PTI limit is buttressed, in such cases, by the fact that the interest rates on uncovered loans are far higher, which renders this form of adjustment very costly.

6. Summary

With the adoption of the debt cap rules, a regulatory framework has been put in place that allows for quick and efficient responses to mitigate the risks arising from excessive household lending. At present, the requirements do not restrain lending considerably; they are expected to exert their impact in periods of excessive credit expansion. Data recorded in the recent period do not point to a significant concentration of debtors in the vicinity of the regulatory limits, and no noticeable adjustment has been identified so far on the part of consumers. Therefore, in line with its purpose, the regulation only restricts excessively risky loans, ensuring a healthy structure for the recovery of household lending in the aftermath of the crisis.

Obviously, additional challenges may materialise in the future with respect to the trends in lending, which can be managed – after moderate fine-tuning – with the existing debt cap rules. On the one hand, asset price overheatedness may also emerge on a regional scale. Compared to the rest of the country, surges in real estate prices may prove to be stronger in some economically developed regions – typically around the capital city or major cities – due to greater demand for real estate and a more restricted supply. Numerous countries have adopted differentiated debt cap rules to dampen overheated regional real estate prices, but for the time being, trends in lending do not call for such differentiation in the case of Hungary. On the other hand, the high rate of floating rate schemes may also pose a challenge in the future. The instalment amount of floating rate loans follows

potential changes in the interest rate environment either instantaneously or with a small lag, and a strong increase in interest rates might prompt debtors to make drastic consumption adjustments. International regulatory practice offers several solutions to incorporate the interest rate risks associated with floating rate schemes into the debt cap rules. Great Britain and Romania issued a recommendation; the initial recommendation was replaced by mandatory regulations in 2015 in Norway and in March 2017 in Slovakia; loan assessments must assume cross-cycle interest rate levels in Estonia,[9] while no more than one third of all disbursements can be floating rate schemes in Israel.[10] Finally, the efficiency of debt cap requirements can be improved further by introducing a mandatory positive credit registry and by providing the conditions for voluntary, central income queries. To define the PTI value, creditors should be able to determine – clearly and in a credible manner – the existing debt service and income of debtors. Although various credit registries are available to estimate the debt-service burden, their efficiency can only be maximised if they include all loan contracts linked to a single debtor and if creditors can query the database even without the debtor's consent. Another operative difficulty of PTI determination is the precise definition of eligible, stable and certifiable incomes. Indeed, some income types are far too periodical and their inclusion in the calculation may therefore be problematic; other income types might be too difficult to certify. One possible solution to this problem may be establishing a central database for income queries available to banks, subject to the debtors' consent.

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[9] For a collection of the relevant regulations see the ESRB's database at https://www.esrb.europa.eu/national_policy/shared/pdf/overview_macroprudential_measures.xlsx?5eee1aeb10edcf3ab515977928325dd4

[10] For more detail, see the website of the central bank of Israel: http://www.boi.org.il/en/NewsAndPublications/PressReleases/Pages/21-08-2013-loans.aspx

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Analysis of SME Segment Lending Processes in Light of Credit Guarantees in the European Union*

Ádám Balog

Funding as a problem has ranked much lower on the list of SMEs' most daunting challenges since 2011, according to the ECB's SAFE survey. The accommodative monetary policy of the central banks in advanced markets coupled with the low interest rate environment has contributed to the fact that financing conditions have been considerably relaxed at global level since 2010. In the EU, 80–85 per cent of SME borrowing is realised through bank loans, thus entailing the risk that companies' access to finance may be constrained in conditions of financial turbulence, which threatens the development of productivity. Increasing the role of credit guarantees is an important tool in mitigating the impact of these trends, and it assists financial institutions in helping the SME sector with funds in a recession with greater certainty and lower risk.

Journal of Economic Literature (JEL) codes: E32, G15, G21, O16, O19

Keywords: credit guarantee, SME, banking system

1. Situation of European SME sector and its access to finance

According to the rules of the European Commission, small and medium-sized enterprises can be categorised as follows (*Table 1*):[1]

Table 1
EU definition of small and medium-sized enterprises

Size	Staff headcount	Turnover	Balance sheet total
Micro	< 10	< € 2 million	< € 2 million
Small	< 50	< € 10 million	< € 10 million
Medium	< 250	< € 50 million	< € 43 million

Source: European Commission

* The views expressed in this paper are those of the author(s) and do not necessarily reflect the offical view of the Magyar Nemzeti Bank.

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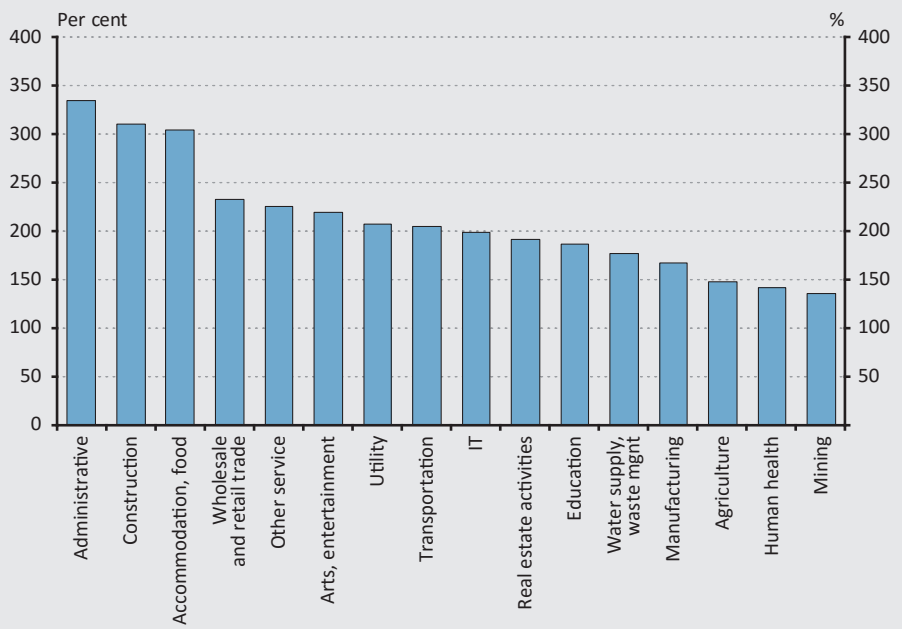
[1] SME definition: http://ec.europa.eu/growth/smes/business-friendly-environment/sme-definition_en. Downloaded: 05 May 2017.

All companies with a headcount below 250 employees and an annual turnover below EUR 50 million fall into the category of small and medium-sized enterprises (SMEs). In the European Union, these firms are dominant in the industry, construction and commerce segments, which are the most capital-intensive sectors. Thus maintaining funding to these businesses is a priority not only from the perspective of their own growth and operation, but also for the whole economy. *Figure 1* shows that leverage is the highest in the above-mentioned sectors, therefore they are the most sensitive to changes in interest rates and fluctuations of the business cycle. Since SMEs account for a large proportion of companies with higher levels of leverage, and these sectors (e.g. construction) are strongly correlated with the shifts in GDP and are impacted heavily by the development of consumption (retail and wholesale trade), the way they access funds is key.

Figure 1
Total debt-to-equity ratio of private-sector SMEs in 10 European countries



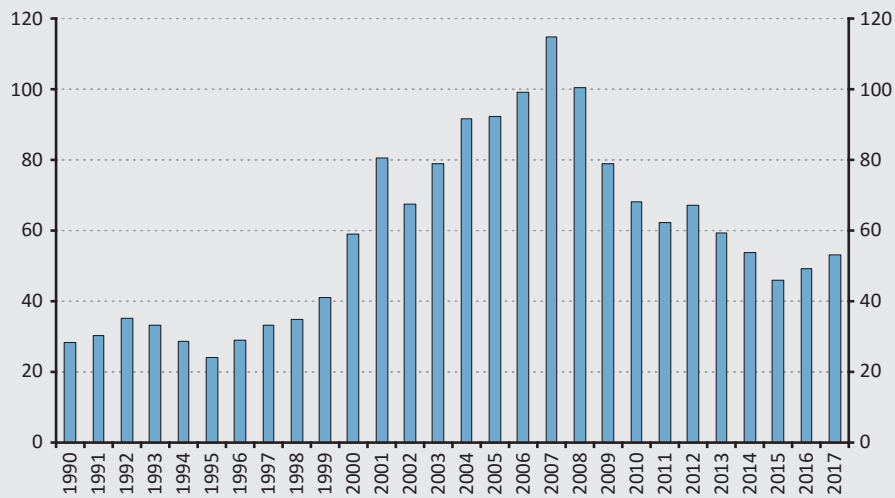
Note: The 10 European countries are Austria, Belgium, Czech Republic, Germany, Spain, France, Italy, Poland, Portugal and Slovakia.

Source: Banque de France (2017)

In the European Union, 80–85 per cent of SME borrowing is realised through bank loans. This is exactly the opposite to practice in the United States (US), where similar companies obtain 80–85 per cent of their funds from the capital markets (*WSBI-ESBG 2015*). The main forms of this include corporate bonds, private equity, venture capital, crowdfunding or hybrid solutions (*Firoozmand et al. 2015*). With

respect to corporate bonds, issuances in both the EU and the US have declined considerably compared to the mid-2000s. According to European Central Bank data, non-financial institutions issued corporate bonds amounting to EUR 50 billion until September 2017 (see *Figure 2*). To put that into perspective, securities (corporate bonds) worth USD 1,100 billion were issued until September in the US.

Figure 2
Bond issuances by non-financial corporations in the European Union between 1990 and September 2017 (EUR billion)



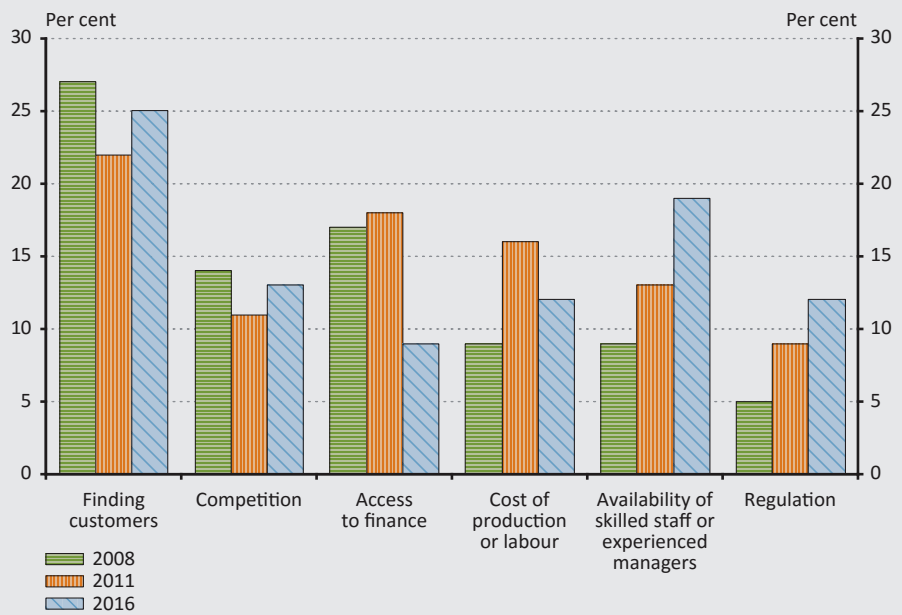
Source: European Central Bank (ECB 2017b)

From the perspective of economic development, SMEs play a central role in the EU as they account for 60 per cent of the continent's GDP, and employ around 90–100 million people, approximately 70 per cent of the workforce. Currently, 22 million small and medium-sized enterprises operate in the EU. If these firms do not have appropriate access to the desired amount of funding in the appropriate structure, this may entail a drop in investments, postponed acquisitions and declining innovation. Lending activity contributes to economic growth through heightened investment activity. Appropriate external funding means entrepreneurship may be strengthened, new companies may be established, and businesses' economies of scale may also improve. In the rising phase of business cycles, risk is perceived to be lower by both borrowers and lenders driven by the improving labour market conditions and the greater propensity to consume. Companies can mitigate the short-term fluctuations in their profits through external funding, which may entail less variation in investments (*Bodnár et al. 2014*).

In the latter case, it is important that market participants believe in the temporary nature of the downturn. If the business cycle loses steam, it may lead to a drop in business activity, lower profits and thus growing unemployment and declining consumption. These all increase risk and entail more subdued activity by the actors. Since this can turn into a spiral, the intervention – or more precisely the smoothing of volatility in the cycles – is crucial.

Since the 2008 crisis and thanks to central banks' near-zero interest rate policy and other measures, SME access to finance has been adequate (*Figure 3*), it is now not among the most pressing issues in the sector (*ECB 2017a*). This has not always been the case: in 2008 and 2011, financing issues proved to be the third (or, when disregarding the "Other" category, the second) gravest concern in the life of European SMEs, but since then it has been overtaken by the cost of labour, the lack of unskilled labour and the compliance with, and the complexity of, industry regulations.

Figure 3
Most typical problems of the SME sector between 2008 and 2016



Source: Survey on access to finance of enterprises (ECB 2017a)

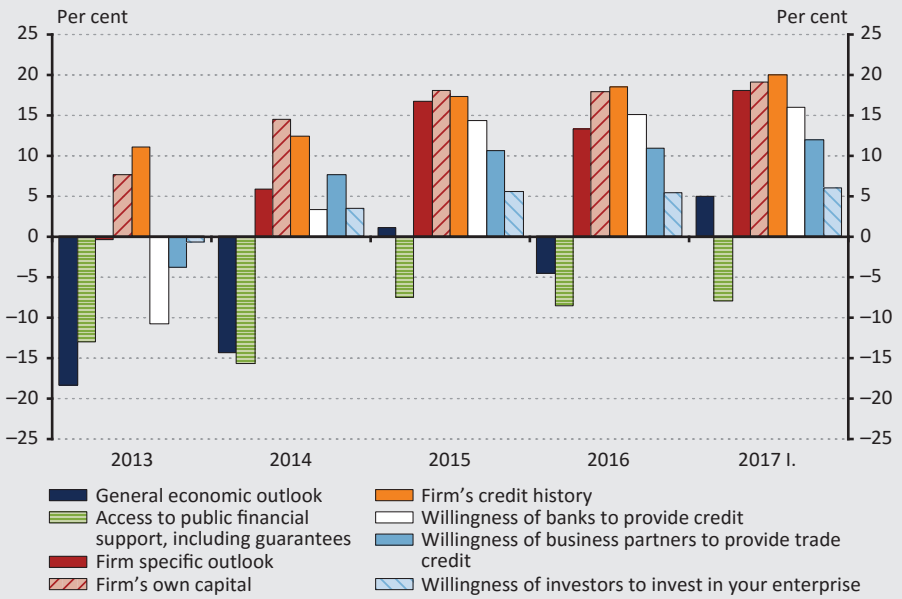
Economic recessions and the problem of access to credit or finance usually go hand in hand, in fact, they can even strengthen each other. However, in order to address the economic downturn as soon as possible, this is exactly the period when countercyclical measures – that can help mitigate the impact of the slump – should be implemented.

Monetary easing and the zero interest rate policy served exactly this purpose in the wake of the 2007–2008 crisis, albeit they achieved the desired effect in different ways across countries, depending on the maturity of the market. Since bank loans are much more dominant in the European Union, measures boosting lending in a recession may exert a positive impact over the economy of the whole continent.

The aim of the guarantee schemes related to SME borrowing is to provide access to credit even to firms that would otherwise be ineligible due to their past or inadequate collateral. In addition, guarantee schemes can provide SMEs access to credit even at the trough of the business cycle, thereby positively affecting GDP or mitigating the downturn. A recent survey covering guarantee institutions operating within national borders reveals that from the perspective of their own functioning, even these institutions themselves believe that the credit guarantees provided to the SME sector have the greatest potential, with 71 per cent of them responding along these lines (*Chatzouz et al. 2017*). Another important aspect may be that most entrepreneurs can provide less capital to their business than they would like (*Evans – Jovanovic 1989*).

The SAFE analysis by the European Central Bank (*ECB 2017a*) identifies eight factors that significantly influence credit supply and demand. All of these have improved in recent years, but according to the SMEs surveyed, the economic conditions and prospects only became favourable in the first half of 2017, and the availability of credit guarantees is still perceived negatively, which has not changed much since 2015. Substantial improvement can be seen in individual, firm-specific prospects, as well as in the willingness to lend on the part of banks, trading partners and external investors (see *Figure 4*). According to the SMEs surveyed, the conditions of credit guarantees have not improved recently, which suggests that companies would use this opportunity, but its availability or terms are not appropriate.

Figure 4
Changes in factors affecting lending among European SMEs between 2013 and first half of 2017



Source: Survey on access to finance of enterprises in the euro area (ECB 2017a)

2. Types of SMEs by regions

The guarantee schemes in the different countries are important because even though there are efforts to manage the situation at EU level, different types of SMEs can be found in the various regions (*Moritz et al. 2015*). Six main groups can be differentiated (*Table 2*):

1. Mixed-financed companies, where SMEs use a wide range of financing; they comprise the second largest group (16.7 per cent of the total). They utilise loans from friends and family, retained earnings and external loans for financing. They can most typically be found in construction, and they innovate more than the average. Such firms can overwhelmingly be found in northern regions.

2. State-subsidised SMEs mainly have state-subsidised loans. Merely 7.2 per cent of all the SMEs belong here. They are small and medium-sized, usually family-owned firms that are widespread in the southern regions, and they dominate in industry.

3. Debt-financed SMEs rely almost exclusively on bank loans. This group is characterised by low growth and low innovation, and covers 16.1 per cent of

the whole sector. Short-term loans and working capital loans are typical. They are also widespread in the southern region.

4. Flexibly financed SMEs make up 13.2 per cent of the sector, and they mostly obtain trade credit and bank overdrafts. They are usually microenterprises with a single owner, and they are typical in western regions. They exhibit average growth and usually low turnover.

5. Trade-financed SMEs cover 15.3 per cent of the sector. They are mostly family-owned small enterprises, characterised by low growth and an exposure to the commercial sector.

6. Internally financed SMEs, which are mainly typical in the eastern region and post-communist countries, usually solve their liquidity problems from internal sources of finance (e.g. retained earnings). At 31.4 per cent this is the largest group. It contains young, usually family-owned businesses mainly active in the services sector.

Table 2
Cluster analysis of European SMEs by financing

Source of financing	Mixed-financed SMEs	State-subsidised SMEs	Debt-financed SMEs	Flexibly financed SMEs	Trade-financed SMEs	Internally-financed SMEs
Retained earnings	28%	23%	21%	15%	26%	14%
Subsidised loans	15%	100%	2%	0%	2%	0%
Bank overdraft	45%	54%	56%	100%	6%	0%
Bank loans	36%	55%	95%	0%	0%	0%
Trade credit	41%	32%	41%	21%	70%	0%
Other loans	73%	1%	0%	0%	0%	0%
Leasing	28%	24%	30%	20%	41%	0%
Capital	24%	4%	0%	0%	0%	0%
Other (e.g. bonds)	17%	0%	0%	0%	0%	0%
No external finance	0%	0%	0%	0%	0%	100%
Number of SMEs in the group	**2,060**	**887**	**1,981**	**1,627**	**1,888**	**3,869**
Share of group	**16.7%**	**7.2%**	**16.1%**	**13.2%**	**15.3%**	**31.4%**

Source: ECB (2017a) and Moritz et al. (2015: 25)

As can be seen from *Table 2*, there are overlaps between the clusters, they are not entirely distinct categories. Most companies use at least four of the nine forms of financing outlined here (except for internally financed SMEs).

Table 3
Geographical distribution of European SMEs by financing

	Mixed-financed	State-subsidised	Debt-financed	Flexibly financed	Trade credit	Internally financed
Eastern Europe	14.4%	6.3%	11.4%	9.8%	12.3%	45.8%
Northern Europe	23.7%	3.5%	11.2%	11.6%	22.6%	27.4%
Southern Europe	16.1%	9.8%	17.3%	12.4%	17.5%	26.8%
Western Europe	15.6%	6.2%	20.2%	17.4%	10.8%	29.8%

Source: Moritz et al. (2015:25)

With respect to geographical distribution (see *Table 3*), Eastern Europe is overwhelmingly dominated by internally financed SMEs (with 45.8 per cent of the total belonging to this group), while Northern Europe is more balanced because the latter has a share of 27.4 per cent. They are followed by mixed-financed companies (23.7 per cent), then trade credit-financed firms (22.6 per cent). The proportion of state-subsidised businesses is higher in southern parts of Europe than in the European Union as a whole. Western Europe is characterised by internally financed and debt-financed SMEs.

The distribution suggests several things: for example, the banking system is stronger and more mature in the west and the north, therefore these regions reflect a higher proportion of loan financing and lower state involvement. According to other analyses, in the regions where the banking system is more mature, companies are more likely to use trade credit. The high proportion of mixed-financed firms suggests that the capital market of the given region is mature; even though this is the case in the west (the capital market is more mature), the share of such businesses there does not differ markedly from the average (15.6 per cent compared to the 16.7 per cent average). In the case of mixed-financed firms, capital market financing can be observed, i.e. companies can also obtain funds in the form of shares and corporate bonds.

The higher-than-average state involvement in the southern countries points out another unique feature. In Italy, Spain, Greece and Portugal, not all non-performing loans have been resolved since the crisis, therefore the state's engagement is greater.

In Eastern Europe, the extreme share of internal financing is due to the fact that the banking sector and the capital markets of post-Soviet countries are less mature than in Western Europe. In such a situation, it is much harder to access external financing (bank loan, trade credit), thus most companies rely on friends and family and previously generated profits. It is important to note, however, that in the long run, improving financial development increases potential growth, but only to

a certain extent. An excessively large financial system does not have a positive impact (*Cecchetti – Kharroubi 2012; Arcand et al. 2012*).

The countries damaged more severely by the crisis are also different. There has been a significant downturn in southern countries since 2008, so banks there shed their risky assets, firms' access to credit deteriorated considerably, while operating costs soared. As a result, businesses in these regions relied on trade credit and state-subsidised loans instead. Analyses show that state involvement has a positive effect on companies' access to credit. In the UK, SMEs that were unable to access state funds also had a more difficult time obtaining external financing on the market (*Murray – Lott 1993*). The same holds true for the SME sector in the US (*Mina et al. 2005; 2013*). State-subsidised firms receive funds from credit institutions more easily, even if the overall financial conditions are not optimal. It also has to be noted that if lending activity contracts, firms increasingly turn towards other forms of financing, such as factoring or leasing (*Moritz et al. 2015*) to offset the declining credit supply. This may be facilitated by credit guarantees.

3. Anomalies affecting external financing

Economic turbulence aside, many banks are not eager to extend loans to certain SMEs, even if the economy is prospering. This is because acquiring information on the creditworthiness of mostly young companies is expensive or almost impossible due to the lack of relevant data. In this case, regional banks may provide a solution to some extent (*Lang et al. 2016*), as such institutions are more familiar with the regional companies. Another disadvantage is that these firms have no assets that could serve as collateral for loans. So many SMEs that otherwise have appropriate and viable projects or developments cannot realise them due to a lack of funds.

The latter is usually referred to as the SMEs' financing gap, and it is claimed that the inefficient lack of external financing is caused by the information asymmetry (*Chatzouz et al. 2017*). This asymmetry can lead to inappropriate borrowers being picked by banks when they cannot differentiate between good and bad projects, or to banks setting higher lending rates as they do not have sufficient high-quality information about the given SME (*Pozzolo 2004*). According to the analysis by *Stiglitz et al.* (*1981*) the low transparency and inadequate collateral of SMEs increased the information asymmetry and the risks arising from that (moral hazard). In some countries, this was the incentive behind the creation of credit guarantees. Moral issues also emerge, since the limited liability in the case of a bankruptcy may encourage borrowers to engage in excessive risk-taking (*Farhi – Tirole 2011; Holmstrom – Tirole 1997; Kuniyoshi – Tsuruta 2014*).

The collateral used for securing the loan is not always adequate during borrowing. On the one hand, smaller firms cannot always provide adequate collateral, and

on the other hand, the collateral is usually worth more to the company than the bank, which is also a real problem. According to a survey by the European Central Bank and the European Commission (second half of 2016), the lack of adequate collateral is one reason why SMEs do not have access to an appropriate amount of external financing. While for large enterprises, inadequate collateral was cited as a reason in merely 0.5 per cent of the cases, the same figure was 5 per cent for SMEs. The collateral for the loan may reduce the bank's risk arising from the information asymmetry. However, providing collateral also increases the cost of the loan, as it entails additional legal and administrative expenses. According to a study by *Chen* (*2006*), one major source of collateral is real estate owned by SME owners. During a recession, property prices tend to fall, so borrowers are less likely to obtain new collateral, which may lead to the liquidation of the collateral. The procyclicality of property prices and the inefficient liquidation process may further deepen the recession. The time it takes to sell the collateral and the collateral's value are important because the established value (e.g. determined by a valuer) does not necessarily coincide with the fair market value.

Inadequate credit supply may also be due to the fact that monitoring smaller firms and obtaining appropriate information about them is more difficult. While a publicly traded company's every move is accurately documented and is accessible by investors, this is much more difficult in the case of SMEs. Data are available on SMEs as well of course, but their quality may be questionable due to inappropriate accounting and record-keeping systems. Another issue is economies of scale, since it is by no means negligible whether a bank invests energy in the loan application process of a small company or the financing of a large enterprise, i.e. unit costs are crucial. Another issue in connection with SMEs is that many of them are young businesses without a history that can be used by the lender to draw appropriate conclusions regarding the future.

Although financing issues have become marginal in the life of SMEs in recent years, two factors have emerged that may impede companies' access to credit. The high concentration of the banking sector, i.e. when a large portion of the market is controlled by only a few banks, leads to SMEs being crowded out from lending. In light of the European banking consolidation in recent years, this may be a real problem in the life of smaller companies. The other factor is the potential fall in property prices, which may set SME financing back as many firms offer real estate as collateral in exchange for the loan (*Chen 2006; Ryan 2014*).

One aspect of the above-mentioned problems, i.e. the information asymmetry, can partly be resolved by regional banks. Local banks have stronger ties to local SMEs, therefore the necessary information can be obtained more swiftly and cheaply. According to an EIB finding based on an Italian example, local banks know the given

region better, and the link between the bank and the borrower is also stronger (*Lang et al. 2016*).

4. Credit guarantee

Within the framework of a credit guarantee agreement, the guarantor institution offers a demand guarantee to the financial institution with respect to the loan granted to the given company. In such a scenario the bank runs a lower risk, since in the event of a default by the client the guarantor institution honours a predetermined portion of the outstanding amount towards the bank.

The credit guarantee fund is an independent third party between the bank and the borrower when the latter does not meet all the conditions that are necessary for the bank. Thus the guarantee fund provides some sort of security to the bank, and indirectly enables the firm to obtain a loan. Guarantee institutions are usually established with state involvement, both in developed and developing markets. They are usually non-profit institutions, but they have some obligation to be self-sufficient.

Guarantee institutions can provide guarantees against their capital for an amount exceeding it several times, so their leverage can be as high as 20–25 (*Davies 2007; Levitsky 1997*). The amount of the guarantee is usually around 30–80 per cent of the loan. After 5 years of operation, an appropriately functioning guarantee fund can reach leverage levels equivalent to 5 times its capital, then after 7–10 years this figure can be as high as 10. If counter-guarantees are permitted as well (like in Japan or Germany for example), leverage can be over 20 (*O'Bryan 2010*). The credit guarantee scheme can be extended to most loans, which can affect the establishment of new firms, the acquisition of new machinery and equipment or the supplementation of working capital, however, there may be differences in this respect between individual countries and guarantee institutions.

The guarantee can be provided in several ways: in a retail (individual), portfolio or wholesale system. In the retail (individual) system, the individual firms, their credit applications and projects are assessed on a case-by-case basis, then the decision on providing the guarantee is taken. This procedure generates huge costs and takes many working hours. For a portfolio-level guarantee, similar loans are pooled when the decision on providing the guarantee is made, i.e. bank administration is not burdened by individual assessments and the approval process. Based on the framework determined in advance with the guarantee institution, the bank alone decides on what to put in the portfolio. In the wholesale system, there is no direct relationship between the credit guarantee institution and the lender/borrower. The credit guarantor's task is to provide a guarantee to non-bank intermediaries; one typical example of this is the Central Guarantee Fund in Italy.

Normally the lender is responsible for the debtor's credit appraisal, and the same applies for a credit guarantee, too, although this task can be performed by the guarantor and the lender as well. Usually the lender has the appropriate infrastructure for coordinating the process. Nevertheless, the principal/agent problem may arise between the credit guarantor and the credit institution, which may imply excessive risk-taking and underinvestment in the credit appraisal process (*Chatzouz et al. 2017*).

In certain cases, banks can use credit guarantees to mitigate their RWA exposure. Within the framework of Basel III and the CRR/CRD regulation, banks can reduce the capital requirement on loans secured by a credit guarantee. This is determined by the CRR/CRD or by EBA standards. All this became truly interesting for banks after the crisis, since financial institutions faced considerable capital write-offs, and in the past 10 years, both the regulation and capital requirements have become more stringent, thus the operation of banks has become more secure, but also more complicated and costly.

The establishment of Western European credit guarantee institutions began in the mid-1990s, they are partly state-owned, non-profit companies but they have an obligation to be self-sufficient (wholly private guarantee institutions can be found only in France and Italy), there is no restriction on their leverage and they enjoy tax holidays. They mostly target SMEs in order to increase lending activity in that segment. They offer guarantees to banks, leasing companies and other financial institutions, mostly in the case of working capital loans, investments and trade credit. The fees related to the guarantee are paid by the borrower, and they depend on the amount of loan. Coverage ranges from 34 to 81 per cent and is for 10–15 years. The distribution of losses is usually *pari passu* (*Chatzouz et al. 2017*).

Of course, credit guarantees also entail costs, typically consisting of an annual fee and an upfront fee, which reflects the riskiness of the projects. The guarantor may also charge an administrative fee, and determine whether the fees should be borne by the lender or the borrower. However, it has to be noted in this context that risk-based pricing is not always used; it is not typical in Hungary for example.

Guarantee schemes can be examined from the perspective of specific countries or the EU. In the latter case, the COSME, the SME Initiative and the InnovFin programmes are designed to foster SME financing. The same holds true, to a smaller extent, for the Cultural and Creative Sector Guarantee Facility, which provides opportunities to SMEs that are engaged in the cultural and creative sectors, or the EaSI – Employment & Social Entrepreneurship, which seeks to bolster the labour market and facilitate mobility within Europe with its guarantee scheme.

The COSME runs with a total budget of EUR 2.3 billion until 2020. Its aim is to help SMEs access funds more easily, promote entrepreneurship, and provide an environment conducive to launching new companies and to growth. Within the scheme, the guarantee may be up to 50 per cent of the principal, and it can be used by companies employing up to 249 people, i.e. micro, small and medium-sized enterprises can all participate in it. One major advantage of the scheme is that it is free, and that it reduces banks' RWA exposure if the guarantee is not conditional. The latter is important because thanks to the guarantees, one financial institution can finance more companies than if it did not avail of this opportunity.

The goal of InnovFin is to help innovative SMEs access appropriate funding. The scheme can be used in the case of loans between EUR 25,000 and EUR 7.5 million (with maturities between 1 and 10 years), and by firms with up to 499 employees. It provides credit guarantees to SMEs that develop some innovative product or grow rapidly (where the headcount or revenues have grown by 20 per cent annually in the past 3 years). The scheme's cost is an annual 0.5–0.8 per cent, it covers up to 50 per cent of the extended loan in the case of losses, and it also reduces banks' RWA exposure. For start-ups, a credit guarantee is important because access to credit is also hindered if the company has no "track record".

The above-mentioned guarantee institutions operate at international level, in contrast to the guarantee institutions in individual countries that mainly perform activities within the borders of the given country. The most important actor in international credit guarantee services is the EIF, which is part of the EIB Group. It includes the SME Initiative, InnovFin as well as COSME. The EIF offers guarantees for SME loans and leases, and may also offer counter-guarantees for portfolios of local credit guarantee institutions.

5. Credit guarantee and European practice

Credit guarantees do not completely eliminate the anomalies of external financing, and therefore cannot address the root cause of the problem either; but they can contribute to the smoother functioning of the credit market. In addition to state involvement, the credit guarantee is the tool that can give companies an opportunity to access appropriate funding even in an unfavourable economic climate. Ultimately, this could also mitigate the extent of the economic downturn. The only question is whether the credit guarantee truly helps mitigate a downturn.

Underlining the importance of guarantee funds as frequently heard among SMEs, an examination of 50,000 corporate loans in Italy showed that banks demand relatively more collateral from SMEs than when lending to large enterprises (*Pozzolo 2004*). Bigger companies also access external funds much more easily, therefore the SME sector may be at a disadvantage due to its size (and thus also due to

its riskiness) (*Beck et al. 2005*). Economies of scale are important here as well, since it is important to a bank whether it finances the project of a small firm or a multinational corporation.

The EIB analysis notes that the guarantee scheme can only be beneficial to the economy if it is implemented carefully (*Kraemer et al. 2017*). Since the state is among the owners in most cases, the fallout from any default is ultimately borne, to some extent, by the taxpayer. And this has been an extremely sensitive issue since the 2008 crisis, in fact, the EU prohibits "bailouts", i.e. when a financial institution in, or on the verge of, bankruptcy is rescued by the state. Between 2008 and 2012, the EU spent EUR 568 billion on saving banks close to bankruptcy, and the bill was footed by taxpayers. Instead, the so-called "bail-in" should be used, under which the financial institution is recapitalised by shareholders, bondholders and ultimately even the largest depositors. This was first employed in practice with the crisis management in Cyprus in 2012–2013.

The administrative burden associated with guarantee schemes has diminished considerably in recent years, and the process has been expedited in several places, therefore these schemes can still be considered the primary tools in the hands of the state for facilitating access to credit for SMEs. This is the case even though the spectre of moral hazard is still present. However, it can be avoided or mitigated through the exact definition of loss sharing and the coverage ratio. Loss sharing can be *pari passu*, where losses are fixed irrespective of the amount. The collected debt is allocated based on the predetermined distribution between the lender and the guarantor. In the case of subordinated debt, the lender's claim is satisfied first, before the guarantor. At the portfolio level, under a "first-loss" scheme, the full burden of the default is borne up to the predetermined amount of the loss, while under a "second-loss" guarantee, the guarantor only covers the second part of the loss. Moreover, if the coverage ratio is high, the lender may feel encouraged to neglect the debtor's monitoring and the assessment of its risks.

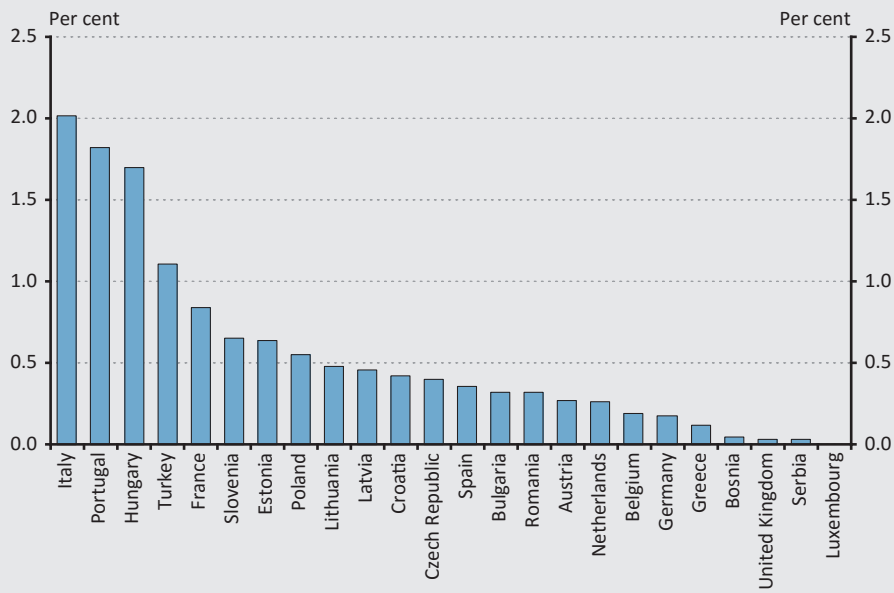
The OECD has found that the overwhelming majority of guarantee schemes target young and innovative firms to reduce unemployment and increase productivity (*Kraemer et al. 2015; Kraemer et al. 2017*). The advantage of guarantee institutions is that they are present in the lending process as a third party, thus the disbursement of the funds is ultimately assessed by a market-based institution, i.e. the bank. Credit guarantee institutions mostly operate within national borders, which makes the geographical distribution appropriate and enables regional banks to serve the needs of the companies operating in the given area much more efficiently.

It is clear that credit guarantees can help transfer the default risk (so it is similar to derivative and futures products, which have also been developed for the appropriate management of risks), but it can also realise industry or geographical diversification.

Risk analysis may also be strengthened, since the credit guarantor takes part in the process too, and regulatory arbitrage can also emerge as the credit guarantee may help enable the lender to meet the regulatory requirements.

The operation of, and data on, guarantee institutions in the EU and neighbouring countries are summarised by the AECM (European Association of Guarantee Institutions). According to the latest data, in the EU the value of the guarantees offered relative to GDP is the highest in Italy, Portugal and Hungary. While in most EU countries the guarantees offered amount to 0.2–0.5 per cent of GDP, the ratio is approximately 1.7–2 per cent in the first three countries (*Figure 5*).

Figure 5
Credit guarantees issued in countries as a percentage of GDP between 2015 and 2016



Source: AECM (Kraemer et al. 2015 and Kraemer et al. 2016)

- According to 2016 data from the AECM, in that year the 42 members provided guarantees amounting to approximately EUR 30 billion in 26 European countries to 2.8 million SMEs, helping create 400,000 new firms. On average, banks ran 30 per cent of the risk, while the rest was covered by credit guarantee institutions (*Kraemer et al. 2017*).

Credit guarantee schemes have been expanded considerably in recent years, especially as a result of the response to the crisis. The guarantee institutions

operating within national borders stepped up their activities during the crisis, but there was extremely sluggish demand for loans by SMEs, therefore these schemes were unable to mitigate the impact of the recession. Institutions mostly bolstered working capital loans, since companies needed most help here on account of the crisis. Yet the increased activity in providing credit guarantees also posed a challenge to institutions, as this required more capital. Historical data show that 22 per cent of guarantee institutions received the necessary capital, while 50 per cent could only access it temporarily (*Chatzouz et al. 2017*).

According to the most recent EIB survey (*Chatzouz et al. 2017*), 91 per cent of the surveyed banks in the EU use credit guarantees, however, their share is insignificant compared to banks' total SME loans: merely 20 per cent of the banks reported that at least 10 per cent of their total SME loans are linked to a credit guarantee. Banks mostly use credit guarantees because SMEs' collateral is inadequate and riskier than the average, but another important factor is that risky assets can be reduced in this manner, which puts financial institutions in a favourable position under the stricter regulations implemented after the crisis.

According to the survey, banks are also convinced that the advertisements of guarantee institutions do not target the SME sector, therefore potential borrowers do not even know what opportunities are open to them if they do not have adequate collateral or their project is risky.

60 per cent of banks believe that credit guarantees have no impact on whether a particular loan becomes non-performing or not, while 35 per cent believe that the guarantee increases the likelihood of default. *Cowan et al.* (*2015*) argue that the chance of the loans of companies participating in a guarantee scheme becoming non-performing in the first 24 months is 1.67 per cent higher than that of those who do not have a guarantee, although the authors admit that credit guarantees do facilitate SME financing.

Few studies are available in the EU about the impact exerted by credit guarantees on the economy and SME lending. The reason behind this is that reliable and available data are scarce. The 2015 study by the European Commission and the EIF examined, using the "difference in difference" method, the various economic effects of a multi-year programme for companies, in particular small and medium-sized enterprises (SMEs), exerted on the participants in the programme and the control group between 2005 and 2012 (*Asdrubali – Signore 2015*). The analysis covered 10 countries from Central and Eastern Europe, and 0–10-year-old companies with 1–250 employees. According to the findings, the SMEs that participated in the programme increased their headcount by 17.3 per cent in the first five years, and their revenue grew by 19.6 per cent as compared to the control group. The boost in employment was the most significant in Romania and the Czech Republic. The

analysis also shows that micro and young companies enjoyed the greatest advantage in the programme: while the smallest firms managed to raise their headcount by 18 per cent and their turnover by 25 per cent, the corresponding figures for the young companies, i.e. less than 5 years old, were 34 per cent and 27 per cent.

Nonetheless, in the short run (0–3 years), the productivity of the businesses in the programme dropped (by 9–11 per cent), and this difference disappeared only over the medium term. The authors claim that this was because of the potential misallocation of the capital and funds received after the guarantee. Moreover, as most such companies did not have loans in the two years prior to the guarantee, the disadvantage may also have been caused by adjusting to the new situation, for example the management of the newly emerging leverage.

However, the operation and perception of credit guarantees may depend largely upon the economy's overall performance. The Polish LDF guarantee fund provided several well-performing guarantees in the rapid growth phase of the business cycle (1998–2000). In the recession after the 2000s, as non-performance ratios increased, it refused to accept offers, therefore it had no reason to be interested in mitigating the economic downturn (*Bennett et al. 2005*).

The amount of credit guarantees relative to GDP is the highest in Italy, and most SMEs that obtained credit guarantees also operate here. In fact, according to the AECM database, there were over 1.3 million such firms in 2016 (*Kraemer et al. 2017*). The examination of the Italian SME sector showed that depending on the type of collateral provided by the borrower, i.e. physical or personal collateral, such as a credit guarantee where a third party intervenes in the case of a bankruptcy/default, the borrower's probability of default with physical collateral was no different from zero (*Pozzolo 2004*). Therefore the claim that banks require more collateral to reduce moral hazard is false (*Boot et al. 1991 and 1994*). By contrast, the probability of default is positive and significant in the case of credit guarantees, i.e. banks use credit guarantees as an incentive in the case of moral hazard. With physical collateral, there is a positive correlation regarding the relationship between the bank and the borrower and its duration, while the correlation is negative in the case of a credit guarantee. The borrowers that have been in contact with the given financial institution for over 20 years are much more likely to provide physical collateral, simply because in such a case it is more likely that the bank will "lend a helping hand" in financial difficulties.

The analysis also found that banks demand more collateral from small firms than from large companies. The physical collateral offered by the smallest 20 per cent of businesses was over three times as high as that of the largest corporations. The gap was not that wide with credit guarantees, since in that case the collateral for the loans of the smallest firms was 1.2 times that of the largest businesses.

6. Conclusion

The role of credit guarantee institutions in the financing of SMEs in the EU became increasingly important in the mid-1990s when the first such entities appeared. Their role is crucial because, in contrast to the US, the SME sector obtains 80–85 per cent of its external funds from banks and bank products (loans, factoring, trade credit, etc.). In an economic downturn, the dynamics of bank lending decline, and both borrowers and lenders become risk-averse. Thus SMEs do not obtain adequate funding, which can further deepen the recession, as investments fall, companies' profits nosedive, unemployment rises and the propensity to consume decreases. The question is to what extent can credit guarantees (whether international or domestic) reduce this slump, or smooth the fluctuations that interrupt the rising business cycles. The international studies and analyses show a mixed picture, and the latter are also incomplete, since accurate and available data sources are rare.

The overview demonstrates that although there are international solutions in the EU for credit guarantees, the differences between the regions call for local, domestic funds. The cluster analysis of the companies in the individual regions illustrates that different conditions should be expected depending on, for example, the source of finance used or the financial system's level of development.

The banking system has been subject to strict regulation since the 2008 crisis, and is now more costly to operate. Credit guarantees can thus not only facilitate the SME sector's access to funds, but may also be an appropriate tool for reducing banks' risky assets, in compliance with regulatory requirements. Yet the overall economic situation affects guarantee funds too, since when there are lots of non-performing loans, the funds may back out instead of improving the economic situation through their activities.

Bolstering the SME sector would have several effects. Since these businesses employ around 70 per cent of the economically active population in the EU and generate around 60 per cent of the continent's GDP, strengthening them would greatly improve Europe's economic situation and prospects. The increased activity of credit guarantee institutions in a recession could reduce volatility in the SME sector's profits and operations, thereby making the labour market situation, and thus also consumption indirectly, which is a cornerstone of economic growth, more stable. In addition, investments would become more balanced and predictable, which is also a decisive factor in GDP growth.

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Acceptance of Payment Cards by Retailers in Hungary Based on Data of Online Cash Registers*

Tamás Ilyés – Lóránt Varga

In our study we examined payment card acceptance in the Hungarian retail sector based on a receipt-level, detailed dataset derived from online cash registers. The main objective of our research was to identify the primary explanatory variables and to test conventional card acceptance hypotheses. For the purposes of our analysis, we relied on anonymised online cash register data provided by the National Tax and Customs Administration (NTCA) for the year 2016. Covering an extremely broad section of the Hungarian retail sector, with nearly 3.8 billion data points the database provides a basis for complex and robust analyses. We tested store-level monthly aggregate data with county and network attributes. Based on the robust results of the research, we found that store size can be considered the most important explanatory variable behind card acceptance decisions; however, the correlation is not linear. The marginal effect of size is negligible among small and large-sized stores, but there is a strong positive correlation among mid-sized stores. We also analysed the effect of the store's customer base and other attributes, and although numerous effects proved to be statistically significant, they wielded negligible influence in card acceptance decisions. On the other hand, being open on Sundays – a subjective variable that was used as a proxy for store ownership – had a significant negative effect on card acceptance decisions.

Journal of Economic Literature (JEL) codes: C44, G20, D22

Keywords: payment transactions, card acceptance, payment methods, decision models, logistic regression

1. Objective

The objective of this study was to explore the aspects considered in the card acceptance decisions of retail merchants and to provide an exact estimate of their discrete effects. Given the broad range of businesses, no analysis has been produced

* The views expressed in this paper are those of the author(s) and do not necessarily reflect the offical view of the Magyar Nemzeti Bank.

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so far that examines the bases of card acceptance decisions across the entire retail sector. Since neither the payment service providers nor card companies have a database that also covers "cash only" merchants, all previous analyses of this kind relied on questionnaire-based surveys. However, the Hungarian online cash register database made available to us by the National Tax and Customs Administration (NTCA) allowed us to inspect the entire retail business from the aspect of payment card acceptance. Thanks to the large sample size, we were able to reliably identify even narrow segments and negligible effects. Our main research questions were the following:

- Based on international experiences, the decision on card acceptance is influenced to the highest extent by the size of the merchant's annual turnover. To what extent does this observation apply to the domestic retail sector?
- Did the size of the anticipated card turnover influence the decision on card acceptance in Hungary?
- To what extent do factors other than the annual turnover of stores contribute to card acceptance?
- Can we distinguish between small, medium and large stores with and without card acceptance according to the same aspects?
- Is there a significant difference between independent shopkeepers and chain merchants in terms of their card acceptance decisions? In network decisions, is it the size of the network or rather individual store sizes that affect card acceptance the most?

In the first section of our paper we review relevant international literature on card acceptance, and describe the data available, in addition to the online cash register database constituting the basis of our analysis. Some of the variables used in our analysis were derived directly from receipt-level data, while others were used as proxies.

In *Section 3* we define the methodology of the analysis and the variables used, and expound on the method applied in determining our sub-samples. We then provide a detailed description of our findings in *Section 4*, and check the robustness of the results from various perspectives.

2. Processing the literature

Exploring the acceptance of payment cards is primarily a theoretical area of research in payment services. The research focus is the impact of the interchange fee on card acceptance, and an assessment of the ways we can define an equilibrium fee value in the oligopolistic market of bank cards. In the first analysis on this topic, Baxter (*1983*) argues in favour of the interchange fee. This model was also criticised by

Rochet – Tirol (*2003*) and *Wright* (*2003*), who significantly enhanced the original model, however, the conclusion remained the same, i.e. that without surcharges the interchange fee exerts a neutral impact on the market. In their article from *2007*, *Rochet and Tirole* created an empirical test to determine whether the level of the applied interchange fee is higher than the equilibrium value. An analysis was also performed in Hungary based on this test (*Keszy – Harmath et al. 2012*), whose results indicated that regulating the interchange fee is justified. However, the theoretical models provided only minor cues for a cross-sectional understanding of card acceptance, since in the simplified framework the merchants usually only differed from one another in terms of unit cost.

Parallel with the theoretical models, a significant part of empirical literature also focused on the costs of card acceptance (*Humphrey et al. 2003*; *Turján et al. 2010*). Concerning empirical studies, our research primarily draws from the results of questionnaire-based surveys. *Jonker* (*2011*) explored card acceptance and surcharging using survey data collected among 1,008 Dutch merchants. The results of the author's regression analysis revealed that while the merchant's revenue and the number of employees are significant explanatory variables, the cost of card payments also influences card acceptance. *Arango and Taylor* (*2008*) investigated card acceptance decisions in the Canadian market, primarily focusing on merchant perceptions, whereas *Polasik and Fiszeder* (*2014*) studied the payment method acceptance decisions of online shops. The lion's share of empirical studies, however, concentrates on consumers' card usage rather than the supply side (*Bolt 2008*, *2010*; *Borzekowski 2006*).

In our research we verify the applicability of international results in Hungary, primarily focusing on demonstrating the impacts of the size of commerce – annual revenue – and those of subjective factors. Compared to questionnaire-based surveys, owing to the size of the sample and the scope of this survey, this research enables us to assess card acceptance on several sub-samples.

3. Methodology

3.1. Data source: online cash register (OCR) database

The Ministry for National Economy mandated the use of cash registers connected directly online to the tax authority pursuant to Decree 2013/48 (XI. 15). The replacement of cash registers was implemented as part of a gradual process at the end of 2014; subject to certain conditions, taxpayers were permitted to use traditional cash registers until 1 January 2015. The scope of the online cash register system has been expanded significantly since the adoption of the Decree. Initially, the regulation primarily covered retail trade turnover; from 1 January 2017, however, its provisions became applicable to a substantial part of the services sector too (e.g. taxi services, hospitality/catering, automotive repair services).

The online cash registers provide the NTCA with itemised data on all receipts issued. For the purposes of our analysis, we used an anonymised database of receipt-level aggregate data. Pursuant to legislation currently in force, retail outlets are not required to issue itemised receipts for each product; they only need to separate products according to collective VAT rate categories. As a result, the itemised breakdown of the database cannot be used for a comprehensive analysis. Besides aggregate data – value, VAT content, payment method, store information – data on the number of items listed on the receipt are also available.

Store information is displayed anonymously through randomly generated identifiers; the only known information about the physical location is the county, while the activity is only marked by the primary, four-digit NACE'08[1] code. The merchants are not required to obtain their NACE code on the basis of their main activity, so differences may occur. Certain special scopes of activity can be identified reliably, for example fuel trade.

Owing to the annuality of the database, the group of merchants under review changed during the period; some stores switched ownership, while others operated on a temporary basis. On several occasions, the taxpayer's activity was modified. Another serious problem is that owing to the anonymization it is not possible to monitor the turnover of a particular store from month to month. Besides the possible data errors, this means it is not clear in each case in the analysed database whether changes occurred in the operation of the store, or only in the reported administrative details. As a result, the number of stores included in the analyses exceeds that of the online cash registers installed in Hungary. This makes it impossible to assess the database by methods of panel-econometrics.

This problem occurs on a monthly basis; within the month, however, both the actual number of stores and the links within a network can be identified with a high degree of certainty. We have corrected this anomaly by generating the data of all stores separately for each month. In this case, each store is included in the database 12 times on average. This approach guarantees that if the anomaly of identification from month to month depends on the store size, the ratios will not be distorted in the final database. Otherwise, for example, if it is possible to monitor major stores more easily, while the smaller ones are presented several times with different IDs, the raw database would include significantly fewer minor stores than in reality.

There are two methods for making regression estimates on the database created with a monthly breakdown. In one case we have estimated separate regression values for each month. Since 12 regressions will be created here, owing to the restricted space available we only included the coefficients of one representative month in the final database. For most of the assessed variables there are no

[1] The Hungarian NACE 2008 codes correspond to the European classifications of NACE rev. 2.

significant differences between the monthly models, we placed the detailed tables in the Annex. The second option is to estimate the entire database within the framework of one model. The individual sub-samples will only be different in level, considering the impacts of other explanatory variables, the marginal impacts will be the same. In modelling we primarily apply the first approach, however, we compare the results to the parameters of the equations estimated on the common sample. Naturally, in that case the impact of the given explanatory variables on card acceptance will be the average annual impact.

3.2. Estimation steps

We can split up the aims of our research into three logically separate parts. Our first question looks at the marginal impact of the individual explanatory variables on the probability of card acceptance. The second question is whether the decision model shows significant differences for stores of various sizes, while the third is whether it is also different if the decision is made at chain level.

In the first case, in the manner presented in the previous chapter, two types of models can be estimated depending on whether we include the monthly data jointly or in a separate regression. In our analysis we present a model in which only the annual revenue and its orthogonal polynomials are included, furthermore, a complex model with all the significant explanatory variables.

For the second question, initially we include the cross products of the major explanatory variables and those of the annual revenue. In the second step we broke up the sample into three size categories based on annual revenue (*Annex 1*). We determined the cutting points with a simple decision tree model, in an endogenous manner. The stores whose annual turnover is below HUF 15 million were placed in the smallest group. Typically, the stores are only capable of generating funds to cover the labour costs of one or two people. We consider stores with an annual revenue of between HUF 15 and 150 million as medium-sized stores. Based on the cross-sectional data, the marginal impact of the annual revenue on card acceptance is the highest in this category, with everything else unchanged. In stores larger than that, card acceptance is consistently high, and based on the descriptive data it does not depend meaningfully on the store size.

We distinguished three sub-categories for the assessment of chain-level decisions. We separated the individual stores. From the stores belonging to a chain – sharing the same numerical tax ID – we considered as subject to chain-level decision-making on card acceptance those stores where card acceptance or the lack of it affects over 95 per cent of all stores. For the remaining stores, individual decisions are presumably made on card acceptance, regardless whether or not they belong to the one chain. We included the three sub-categories as a dummy variable in the main regression as well; however, in the second step we assessed whether we get different results if we estimate regression separately according to the three sub-categories. In the

case of the sub-samples differentiated according to chain-level decision, the fact that selection is performed in an endogenous manner, depending on the dependent variable, could distort the results. Correcting this problem accurately is not an aim of this study, so the results should be treated with appropriate caution.

The estimated logit model shows whether the store with a given characteristic will become an acceptor or a non-acceptor in the period under assessment. The model is not applicable dynamically for the introduction of card acceptance. In the decision on card acceptance in time, there is presumably a significant level of inertia, i.e. the decision made in the previous period is an important explanatory variable for the next period. Our study does not analyse this temporal, stochastic process, rather, an accepting or non-accepting state generated by the process in a given moment. In the case of biases caused by the missing variable, such an interpretation of the results would be distorted and wrong. The results only show the statistically significant differences between acceptor and non-acceptor stores. This approach is primarily derived from the shortcomings of the database, but it also makes the results comparable to analyses based on other international surveys.

In our analysis we assessed the following regressions:

- A model only containing annual turnover
  - Consolidated, using annual data
  - In a monthly breakdown
- A model containing all the significant variables
  - Consolidated, using annual data
  - In a monthly breakdown
- Full model, containing the cross products taken with the annual revenue
  - Consolidated, using annual data
  - In a monthly breakdown
- A model broken down to sub-samples according to chain-level decision, in a monthly breakdown
  - Stores not belonging to a chain
  - Stores belonging to a chain
- Store-level decision on card acceptance
- Chain-level decision on card acceptance
- A model broken down to sub-samples according to annual revenue, in a monthly breakdown
  - Small-sized stores
  - Medium-sized stores
  - Large-sized stores

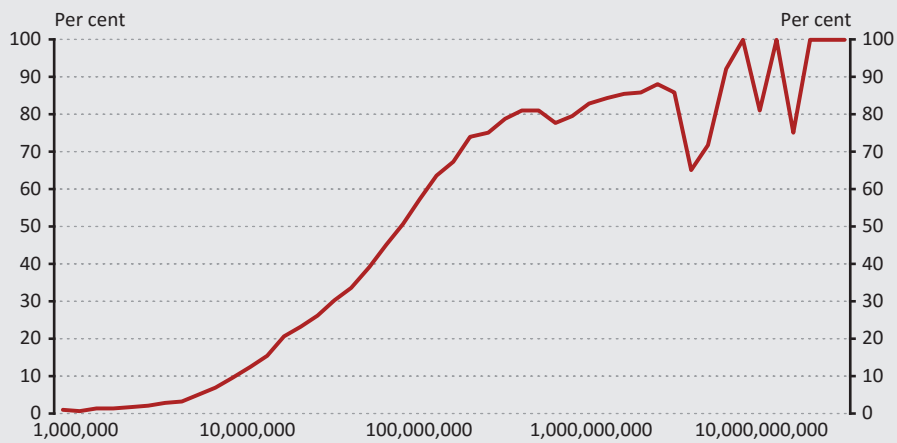
Owing to the complexity of the models and the high level of multicollinearity among the variables, the direct comparison is not unequivocal in the case of binary dependent variables. In our analysis we consider two models similar if their explanatory power and the classification generated by them are identical on the rest of the sub-samples as well.

3.3. Variables used

Dependent variable

In line with our research question, the primary dependent variable is card acceptance. A merchant or a store is considered a card acceptor when payment card transactions are linked to it in the database. Since payment information is often entered manually in the cash register, some transactions might be erroneous. For the purposes of our analyses, we selected 0.5 per cent as the lower margin of error.

Figure 1
Card use according to annual turnover



Note: Vertical axis: ratio of acceptor stores, horizontal axis: annual turnover in HUF shown on a logarithmic scale.

Company size

In our analysis, company size is the most important and most decisive explanatory variable. As we have no external information on the store, annual turnover is derived from the sum of the relevant receipts. Although this raw data series has good mathematical attributes – a lognormal-exponential distribution –, owing to the identification problems mentioned above it may cause bias. Since in some cases a single business may be included more than once (due to store information modifications), it would appear in the database as several, small-turnover stores. Therefore, we use annualised turnover calculated on the basis of actual turnover

and opening days. The review period – 2016 – includes the mandatory Sunday closure as well as the period following the revocation of the regulation (the provision on the repeal was announced on 15 April 2016).

There is a strong correlation between store size and card acceptance, but it is non-linear (see *Figure 1*); so complex functional forms are required to ensure good explanatory power. We include the orthogonal polynomials of the logarithm of store size in the models. In the case of the models segmented by store size, the sample selection itself increases the complexity of the functional form further.

Among the explanatory variables, card acceptance and the average costs of cash management may be raised. Fundamentally, card acceptance consists of fixed costs – installation and operation of the terminal – and variable costs, which primarily means the merchant service fee. According to an intuitive approach, if the annual turnover of the store is high enough, then card acceptance will create a lower unit cost than cash does. According to surveys of the Magyar Nemzeti Bank, since cash turnover is extremely intensive in Hungary, the cost advantage of cash remains even in the largest stores, therefore this cannot be a direct decision factor.

Value categories

Based on the cross-sectional analysis of the database we can conclude that the willingness to accept payment cards depends strongly on payment value. Presumably, therefore, in the case of stores with the same annual turnover, actual card use is likely to be higher in businesses where the majority of transactions fall into the appropriate value category as opposed to the stores whose turnover, for the most part, comprises mainly very small-value or very large-value transactions. *Table 1* shows the turnover value categories used in the study.

Table 1
Card usage by value category

Value category	Average card use in 2016
transactions below HUF 1,000	5.0%
transactions of HUF 1,000 – HUF 5,000	15.1%
transactions of HUF 5,000 – HUF 10,000	27.7%
transactions of HUF 10,000 – HUF 20,000	37.0%
transactions above HUF 20,000	29.6%

As regards turnover structure, we can examine absolute and relative turnover separately in each individual category. In terms of ratios, the benchmark category is always the highest value category. Due to the nature of the relationship and given the limited number of explanatory variables, the final models include the turnover's log and its square.

Temporal attributes of the stores

Not only the annualised turnover of the stores, but also the turnover's monthly and weekly distribution can be established based on the dates indicated on the receipts. Accordingly, in our analysis we also studied the effect of the weekly turnover structure on card acceptance. For most of the two years under review, the decree on Sunday store closures was in effect in the retail sector. Family-owned stores were the main exceptions. Consequently, Sunday opening hours can be used as a proxy for ownership. Since the correspondence is imperfect, this variable is included in conjunction with the NACE variable in the models. This way we can separate the effects of individual sectoral exceptions from the attributes of the owner.

Since store closures on Mondays and Tuesdays proved to have a significant explanatory power in our analysis, this serves as the control variable in the rest of the models. These attributes are linked to special stores – e.g. museum gift shops, sample stores – where the business is not considered to be an independent financial unit.

Network attributes

A large part of the retail sector operates in the form of a network; in other words, numerous outlets are operated by a single legal entity. According to our hypothesis, the fact that the store is part of a chain affects card acceptance decisions in two ways. In networks where each member of the network belongs to the same category – accepting or not accepting card payments – card acceptance is presumably based on a network-level decision; therefore, the decision situation itself may differ from that of individual stores. By contrast, in networks where, according to observations, card acceptance is based on the independent decision of the store, the decision situation is determined by the store's unique characteristics. So our models were also designed to examine the effect of decomposing the sample into three parts – independent store, independent decision, chain decision –; moreover, in the case of chain stores, we also included the chain's total turnover and the number of stores included in the chain. According to the cross-sectional analyses, the correlation is non-linear; therefore we also include the squared terms in the regressions.

Activity

The NTCA database includes the four-digit NACE identifier of the stores' primary activity. Due to the nature of the sample, nearly three-third of the stores belong to the narrowly interpreted retail sector. In several cases during the modelling, estimating the detailed breakdown is problematic and cannot even be performed completely – for example, where certain secondary activities only involve stores accepting or not accepting cards – or the large number of dummy variables poses obstacles to the estimation of the model. Because of this, we only use the first three digits of the identifier for the majority of our models. The only exceptions

are decision-tree and decision-forest models, where this phenomenon does not present a technical problem.

County code

To ensure the anonymity of the stores, the explanatory variables do not include the precise physical location, only the county identifier. Unfortunately, this significantly restricts the examination of stores that have a different customer base, as we could only distinguish between 21 different types. County code 21 indicates mobile shops with no fixed place. The models do not include customer base information, only the dummy variables of the county codes and the capital city. In the second step, we explain the coefficients of the dummy variables with the aggregate data of the given county.

Item number

The database includes the number of products purchased under each receipt. This allowed us to use the total item number of the store as another approach to the size variable and to introduce average and maximum item numbers. The average and the maximum item number presumably correlate strongly with the payment time and as such, they are used as the proxy variable of the latter. We used average payment value as the control variable in several cases; however, this variable correlates extremely closely with the decomposition of the turnover by value and with the proportions of the ranges.

The most important statistical features of the major explanatory variables are contained in *Annex 2*.

4. Results

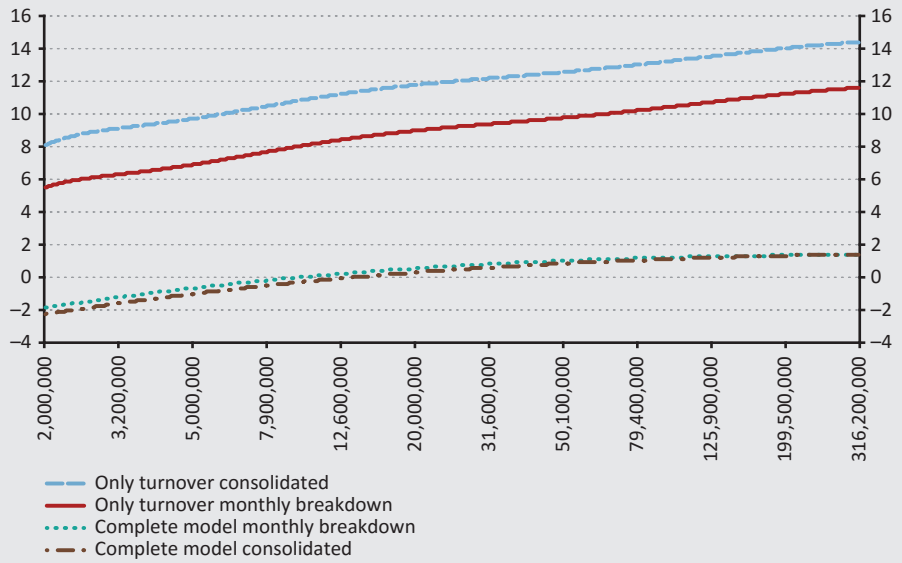
In the manner shown in the presentation of our aim, our first question is to what extent the annual turnover explains card acceptance in Hungary in itself. Based on international literature, the size of turnover of the store is the most important explanatory variable in decisions on card acceptance. After that, we present to what extent the turnover according to value category influences the impact of the entire turnover. In the second step, we analyse the impact of other factors – such as branch, geographical location – then we analyse the identity of the models estimated on samples cut up according to size and decision at chain level.

4.1. Effect of the size variables

It can be concluded from the results (*Annex 3*) that even if we only make estimates based on annual turnover, acceptor and non-acceptor stores can be set apart from each other to a medium extent. In other words, the annual turnover of the store is the most important aspect in the implementation of card acceptance. The high significance of high-level polynomials implies that fundamentally, the logistic function

form is not capable of properly explaining the processes. The main reason for this is that the impact of size is not linear (*Figure 2*). In stores with an annual turnover of 150 million, the marginal impact of size decreases significantly. This result returns the phenomenon observed in the cross-sectional analysis of the database.

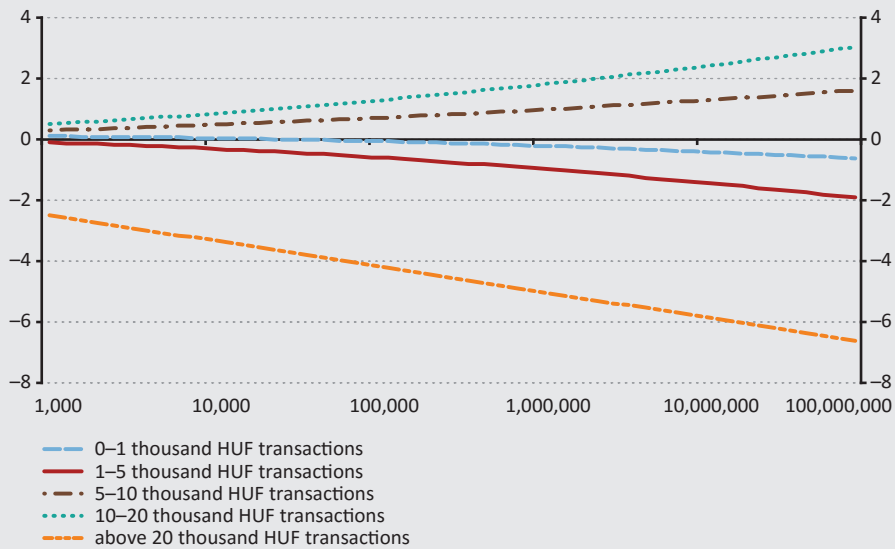
Figure 2
Impact of annual turnover in regression in the main models



Note: In the case of logistic regressions the impact of the coefficients can be directly interpreted in two ways, the individual impact on the scale of explanatory variables before the logistic transformation, and as an odds-rate multiplier on the scale of the dependent variable. To make the interpretation of polynomial forms of functions easier, in this article we present our results according to the first version, therefore they will be comparable in terms of magnitude according to the different variables. Vertical axis: the impact calculated on the scale of explanatory variables, horizontal axis: annual turnover presented on a logarithmic scale.

The turnover split up according to value categories does not significantly change the impact of annual turnover, the explanatory power of the model does not improve substantially (*Annex 4*). In addition, the various categories affected card acceptance to different degrees. The stores where cards are accepted are more likely to produce transactions that are often paid for by card. The impact of transactions between HUF 10 and 20 thousand is the strongest, while transactions paid for by card in a relatively small ratio even lowered the chance of card acceptance to a small degree (*Figure 3*). However, the entire impact is lower by an order of magnitude than the impact of the annual turnover. Based on these, we can say that although a split according to value category is significant from a statistical aspect, their impact is not substantial; annual turnover in itself provides a good explanation for card acceptance in Hungary.

Figure 3
Impact of turnover according to value category in the main model



Note: Vertical axis: the impact calculated on the scale of explanatory variables, horizontal axis: annual turnover in HUF of categories of a given value on the logarithmic scale

4.2. Impact of other factors

We have added several other explanatory variables to logistic regression, however, the explanatory power of the model only changes to a slight extent as a result of these. Owing to the high number of sample elements, we can also identify minor impacts in our analysis, and although these are statistically significant, they do not substantially influence the decision on card acceptance. Three of the dummy variables should be highlighted, which have a relatively higher impact on the dependent variable. Staying open on Sundays significantly lowers the probability of card acceptance, while giving detailed invoices increases it significantly. The rest of the variables have a low impact, similarly to value categories, and their marginal value is what we expected. Both the size of the chain and the number of stores increase card acceptance, albeit to a decreasing extent. By contrast, the dummy variable of stores with chain-level decisions shows the lowest value. This would imply that in Hungary, controlled for every other impact – primarily filtering out the impact of size-type variables – stores with chain-level decisions are less likely to become acceptors than independent stores. In the database, the level of card acceptance is high in stores with chain-level decisions, however, in their case the impact of size is more powerful. The results can be interpreted to imply that chains deciding to reject card acceptance are less likely, overall, to accept cards compared

to their size. All told we can conclude that the impact of other factors is small, and not comparable to the explanatory power of the annual turnover.

We only had the county codes of stores available for our analysis, so owing to the small number of observations we did not directly include information related to counties in the model. However, in a second step we assessed the coefficient of dummy variables belonging to the county, to determine to what extent they can be explained by the socio-demographic statistics available at county level. Including the capital city, there are 20 county codes in total; therefore, in view of the small sample size we did not estimate a regression and only examined the linear correlation.

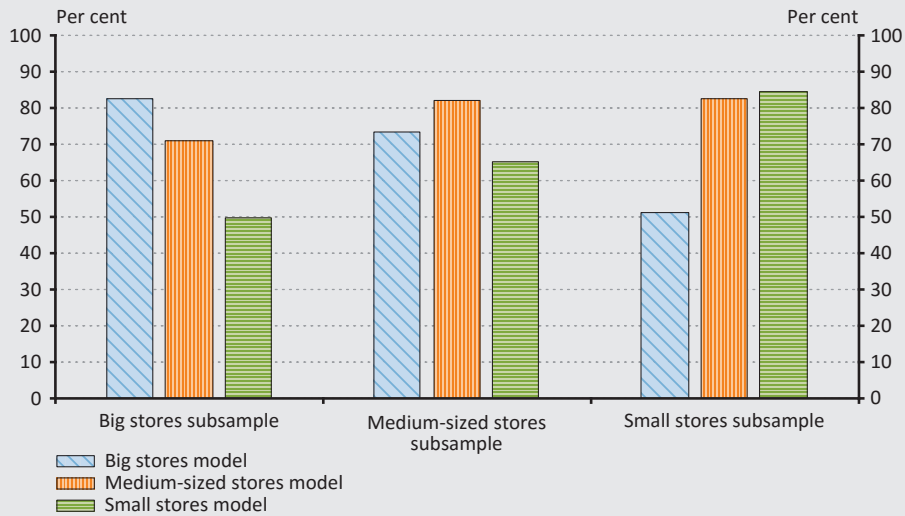
Among the variables under review, the percentage of the working-age population, the number of municipalities and the number of residents per shopping centre indicate a medium-strong correlation. Contrary to expectations, development and income variables did not prove to be significant at any level. The correlation does not improve even after the omission of the capital city's outstanding, outlier data point. Based on these, we can conclude that according to the available data no relationship can be shown to exist between the county-level composition of the community of buyers on the one hand, and card acceptance on the other. The coefficients do not change meaningfully even if we perform the estimate on the sub-sample of stores with independent decisions. However, considering the major socio-demographic variables, a significant variation can be observed even within one county, therefore the lack of a demonstrable relationship can also be derived from the level of aggregation. If there is any correlation at all, only a deeper – presumably municipality-level – segmentation would be able to identify it.

Since the high degree of multicollinearity between the variables renders the parameter estimates uncertain, we examined the significance and sign of the variable groups in various combinations. The main problem is caused by the fact that although most construed variables exhibit a strong correlation with store size, in some cases this correlation exists by definition – such as turnover broken down by value categories –, while in others it is empirical. To eliminate this discrepancy, we also ran the regressions without the size variables and studied the explanatory power of the rest of the variables. The results confirm that the proportion of the item numbers and value categories strongly correlates with size and takes over the role of size in the restricted model. The explanatory power of the model declines significantly without the direct use of the size variables. This suggests that the remaining variables are unable to take over a significant part of the explanatory power directly.

4.3. Impact of breakdown to sub-samples

We also included the cross products of other factors and the annual turnover in the regression, which became significant without exception. Based on these, the marginal impact is significantly different for stores of various sizes. The dummies generated according to chain-level decision are also highly significant in the model. Therefore, in order to carry out the assessment of our research question we cut up the sample in the manner described in the previous chapter into small, medium and large stores, and re-estimated the regressions (*Figure 4* and *Annex 5*).

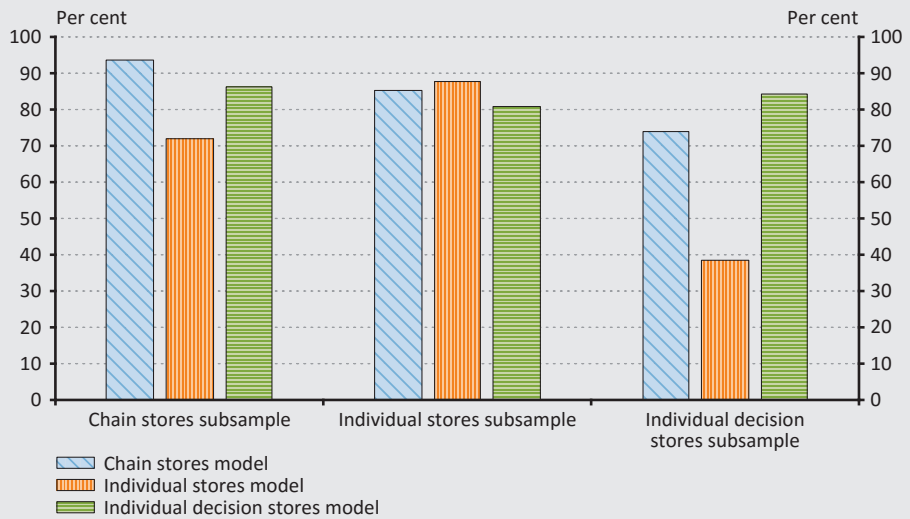
Figure 4
Classification characteristics of regressions estimated on sub-samples according to size (AUC)



The three estimated regressions perform to a medium extent on their own sub-sample, but the explanatory power deteriorates significantly, primarily for large-sized stores. In other words, the regression estimated on small and medium-sized stores is not applicable to large stores. The assessment of the parameters implies that it is mainly the impact according to the value category that differs to a significant extent depending on size. While in small- and medium-sized stores the turnover broken down according to value category only exerts a small impact, as described in the previous chapter, with large stores it improves the accuracy of the model significantly. In summary, it can be concluded that in a breakdown according to size, stores belonging to the largest category should clearly be treated separately. In stores with a large turnover, card acceptance can be explained well by the observed factors.

We can also cut up the sample and the estimated models according to type of chain decision (*Figure 5 and Annex 5*). According to this kind of grouping, substantially higher differences can be observed in the explanatory power of the models. It can clearly be determined that different aspects should be applied for stores not belonging to a chain, to make a distinction between acceptor and non-acceptor stores, than for stores belonging to a chain. Based on the models, it can be concluded that the size of the chain explains card acceptance in the relevant stores to a significant extent, and we cannot treat them as individual stores.

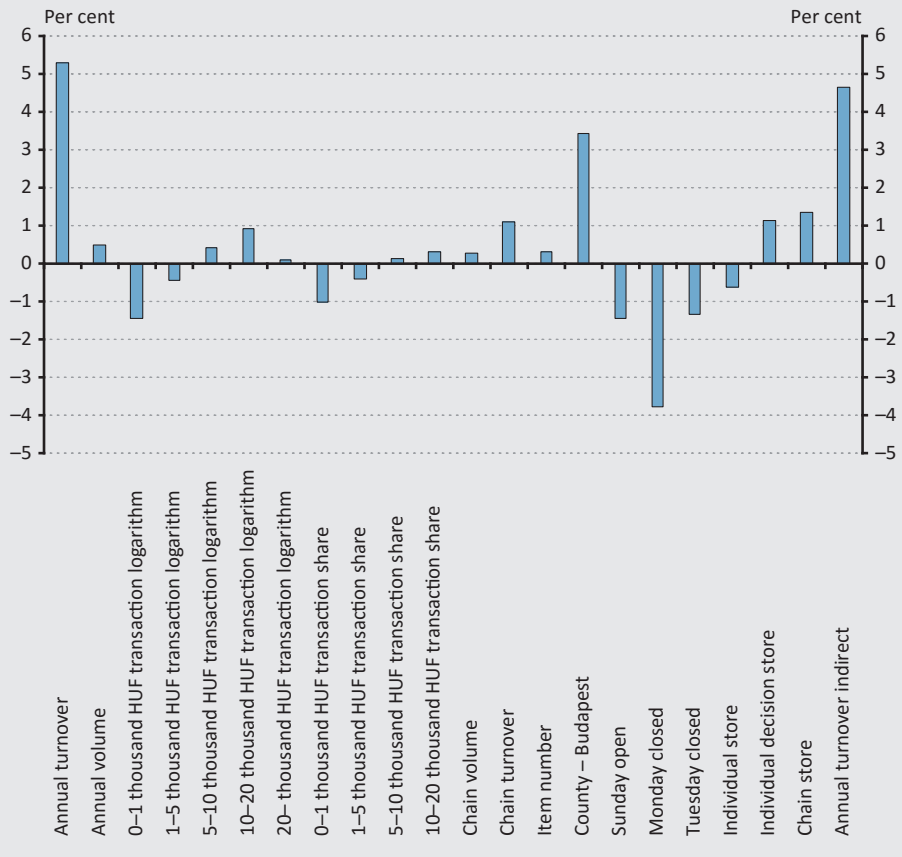
Figure 5
Characteristics of matching regressions estimated on sub-samples according to chain-level decision



4.4. Simulating the impacts of explanatory variables

The scale of the parameters of the logistic regression cannot be interpreted directly. Therefore, simulation was used to analyse the effect of the different variables. We prepared new estimates based on the model of the previous section, to run the simulation in such a way that we increased the value of each variable one by one by a total of 10 per cent, with all other variables remaining unchanged. In the case of the dummy variables we replaced the variables with the higher value, and the county variable was Budapest for all stores. The results of each simulation are shown by *Figure 6*. Turnover had the greatest impact both directly and indirectly through the cross-products. The coefficients of network turnover were comparable in magnitude. Of the dummy variables, Sunday opening and Monday closure significantly reduced the probability of card acceptance, while among the county variables, the effect of Budapest was outstanding.

Figure 6
Impact of main explanatory variables in the simulation



5. Conclusion

In our study we examined payment card acceptance in the domestic retail sector based on a receipt-level, detailed dataset derived from online cash registers. The main objective of our research was to identify the primary explanatory variables and to test conventional card acceptance hypotheses.

For the purposes of our analysis, we relied on anonymised online cash register data provided by the National Tax and Customs Administration (NTCA) for the year 2016. Covering an extremely broad section of the Hungarian retail sector, with nearly 3.8 billion data points, the database provides a basis for complex and robust analyses. We tested store-level monthly aggregate data with county and network attributes.

According to our analysis, *in line with international experiences, payment card acceptance can be mainly attributed to store size, which was approximated in our case with annual revenue.* Revenue affects the card acceptance of mid-sized stores the most; the marginal effect is far lower in the case of small and large stores. It can be concluded from the results that the *logistic function form does not necessarily characterise the relationship between size and acceptance properly, we need a more complex, polynomial form of function to describe the relationship appropriately.*

In addition to its value, even the *structure of the revenue influences* card acceptance, albeit to a lesser degree. A store is more likely to accept payment cards if the bulk of its turnover is composed of transactions that have a higher expected card usage rate. *The impact of value structure is very significant in the group of medium-sized and large stores*, the extent of the impact is outstanding in the largest store category.

The opening hours of the business and, indirectly, its ownership structure, exert a similarly strong influence in card acceptance decisions; in the case of owner-operated stores, card acceptance is significantly lower. *We found that the income of the customer base does not correlate significantly with card acceptance;* however, for a more in-depth analysis of this issue the dataset should be broken down further than the county level.

The decomposition of the retail sector by network type and size does not improve the predictive power of the models significantly, but it has a moderate effect on all other significant variables, on several sub-samples. Based on these, we can state that *it is stores not belonging to a chain and stores in the highest size category that differ significantly in terms of card acceptance, and these should be assessed separately in any case.*

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Annex

Annex 1: Average element numbers of the sub-samples

Sub-samples according to size		Sub-samples according to type	
Small-sized stores	73,247	Stores with chain-level decision	61,996
Medium-sized stores	91,676	Individual stores	81,411
Large-sized stores	21,153	Stores with individual decision	42,670
Total	186,076	Total	186,076

Annex 2: Major characteristics of the database variables

	Average	Standard error	Minimum	Maximum
Annual revenue orthogonal polynomial of the first kind	–5.1E–03	6.3E–03	–1.6E–02	2.9E–02
logarithm of the 0 to 1 thHUF category	6.3E+00	3.0E+00	–2.7E–03	1.6E+01
logarithm of the 1 to 5 thHUF category	6.4E+00	2.4E+00	–2.7E–03	1.6E+01
logarithm of the 5 to 10 thHUF category	3.9E+00	2.6E+00	–2.7E–03	1.4E+01
logarithm of the 10 to 20 thHUF category	2.7E+00	2.6E+00	–2.7E–03	1.3E+01
logarithm of the 20– thHUF category	2.0E+00	2.4E+00	–2.7E–03	1.3E+01
Average item number	1.9E+00	1.5E+00	0.0E+00	3.5E+02
Average payment value	6.7E+03	5.8E+04	1.0E+00	4.9E+07
ratio of the 0 to 1 thHUF category	4.3E–01	3.2E–01	0.0E+00	1.0E+00
ratio of the 1 to 5 thHUF category	3.6E–01	2.2E–01	0.0E+00	1.0E+00
ratio of the 1 to 5 thHUF category	9.0E–02	1.2E–01	0.0E+00	1.0E+00
ratio of the 10 to 20 thHUF category	5.6E–02	1.1E–01	0.0E+00	1.0E+00
Total revenue of the chain	1.8E+01	2.4E+00	1.5E+01	2.8E+01
Number of stores in the chain	5.8E+01	3.4E+02	1.0E+00	3.0E+03
Closed on Monday	1.8E–01	3.9E–01	0.0E+00	1.0E+00
Closed on Tuesday	1.4E–01	3.5E–01	0.0E+00	1.0E+00
Open on Sunday	6.6E–01	4.7E–01	0.0E+00	1.0E+00
Cross product closed on Monday	3.1E+00	6.5E+00	0.0E+00	2.4E+01
Cross product closed on Tuesday	2.4E+00	6.0E+00	0.0E+00	2.4E+01
Cross product closed on Sunday	1.1E+01	8.1E+00	0.0E+00	2.5E+01
Cross product number of stores in the chain	9.5E+02	5.4E+03	1.5E+01	5.8E+04
Cross product total revenue of the chain	3.1E+02	6.5E+01	2.1E+02	6.7E+02

Annex 3: Coefficients of the main models

	Only the size, on a consolidated sample	Only the size, monthly breakdown	Full model on a consolidated sample	Entire model monthly breakdown	Cross products on the merged sample	Cross products monthly breakdown
Constant	–13.068 (–8.174)	–10.474 (–1.923)	–12.492 (–0.050)	–10.801 (–0.012)	–27.552 (–0.111)	–26.248 (–0.030)
Annual revenue orthogonal polynomial of the first kind	1,569.077 (9.016)	1,256.704 (2.115)	137.895 (43.194)	109.014 (9.716)	–382.139 (–10.875)	–287.557 (–2.144)
Annual revenue orthogonal polynomial of the second kind	–1,573.727 (–7.816)	–1,226.946 (–1.789)	–63.635 (–38.029)	–71.990 (–11.916)	–160.482 (–64.993)	–158.770 (–17.560)
Annual revenue orthogonal polynomial of the third kind	1,463.783 (8.069)	1,138.491 (1.836)	22.648 (15.388)	20.016 (3.948)	10.659 (5.786)	7.012 (1.084)
logarithm of the 0 to 1 thHUF category			0.039 (6.477)	0.037 (1.706)	0.016 (2.543)	0.015 (0.685)
logarithm of the 1 to 5 thHUF category			0.103 (9.602)	0.121 (3.114)	0.130 (11.961)	0.132 (3.365)
logarithm of the 5 to 10 thHUF category			0.124 (14.477)	0.085 (2.768)	0.110 (12.795)	0.073 (2.366)
logarithm of the 10 to 20 thHUF category			0.045 (6.930)	0.033 (1.430)	0.038 (5.886)	0.021 (0.878)
logarithm of the 20- thHUF category			0.092 (17.804)	0.105 (5.641)	0.137 (26.033)	0.147 (7.699)
square of the logarithm 0 to 1 thHUF category			0.020 (24.818)	0.025 (8.491)	0.024 (28.800)	0.028 (9.215)
square of the logarithm 1 to 5 thHUF category			–0.023 (–19.448)	–0.020 (–4.633)	–0.027 (–22.999)	–0.023 (–5.302)
square of the logarithm 5 to 10 thHUF category			–0.027 (–22.693)	–0.031 (–7.283)	–0.026 (–21.481)	–0.031 (–7.185)
square of the logarithm 10 to 20 thHUF category			0.042 (34.785)	0.057 (12.929)	0.045 (36.764)	0.062 (13.861)
square of the logarithm of the 20- thHUF category			–0.041 (–35.834)	–0.053 (–12.290)	–0.052 (–43.241)	–0.063 (–13.970)
Average item number			–0.025 (–10.502)	–0.037 (–4.341)	–0.009 (–3.356)	–0.023 (–2.412)
Average payment value			0.000 (–20.028)	0.000 (–4.198)	0.000 (–19.345)	0.000 (–4.161)
ratio of the 0 to 1 thHUF category			–0.640 (–6.450)	–1.544 (–4.366)	–0.486 (–4.869)	–1.317 (–3.702)
ratio of the 1 to 5 thHUF category			–1.123 (–10.618)	–1.913 (–5.042)	–1.278 (–12.034)	–1.964 (–5.158)
ratio of the 5 to 10 thHUF category			2.680 (20.558)	3.187 (6.824)	2.862 (21.806)	3.411 (7.248)
ratio of the 10 to 20 thHUF category			1.880 (17.003)	1.060 (2.740)	1.631 (14.732)	0.793 (2.044)

	Only the size, on a consolidated sample	Only the size, monthly breakdown	Full model on a consolidated sample	Entire model monthly breakdown	Cross products on the merged sample	Cross products monthly breakdown
square of the 0 to 1 thHUF category ratio			–3.682 (–41.924)	–3.554 (–11.425)	–4.036 (–45.505)	–3.970 (–12.624)
square of the 1 to 5 thHUF category ratio			0.701 (7.568)	0.875 (2.659)	0.896 (9.654)	0.997 (3.027)
square of the 5 to 10 thHUF category ratio			–6.377 (–30.918)	–7.778 (–10.391)	–6.776 (–32.481)	–8.207 (–10.837)
square of the 10 to 20 thHUF category ratio			–3.128 (–24.361)	–2.716 (–6.180)	–2.959 (–23.013)	–2.526 (–5.731)
Total revenue of the chain			–0.301 (–9.965)	–0.481 (–4.184)	0.287 (0.990)	1.014 (0.916)
Square of the entire revenue of the chain			0.015 (19.271)	0.020 (6.844)	–0.084 (–10.660)	–0.098 (–3.244)
Number of stores in the chain			–0.007 (–54.065)	–0.010 (–17.006)	0.091 (68.225)	0.097 (14.733)
Square of the number of stores in the chain			0.000 (43.612)	0.000 (12.189)	0.000 (–45.599)	0.000 (–3.180)
Closed on Monday			–0.661 (–58.244)	–0.637 (–15.986)	0.200 (1.058)	–0.529 (–0.798)
Closed on Tuesday			–0.590 (–37.402)	–0.735 (–12.278)	0.285 (1.115)	–1.490 (–1.491)
Open on Sunday			–0.134 (–22.699)	–0.063 (–2.961)	–0.822 (–9.821)	–0.956 (–3.251)
County: Mobile shops			–0.827 (–32.574)	–0.841 (–9.056)	–0.807 (–31.544)	–0.822 (–8.799)
County: Bács-Kiskun			0.428 (30.770)	0.379 (7.743)	0.445 (31.897)	0.400 (8.163)
County: Baranya			0.162 (9.087)	0.099 (1.588)	0.169 (9.463)	0.106 (1.691)
County: Békés			–0.466 (–27.580)	–0.534 (–8.974)	–0.465 (–27.464)	–0.527 (–8.816)
County: Borsod-Abaúj-Zemplén			–0.390 (–20.742)	–0.457 (–6.868)	–0.391 (–20.686)	–0.451 (–6.744)
County: Budapest			–0.134 (–8.023)	–0.189 (–3.216)	–0.138 (–8.240)	–0.197 (–3.330)
County: Csongrád			0.145 (8.395)	0.105 (1.740)	0.144 (8.307)	0.114 (1.879)
County: Fejér			0.255 (14.371)	0.199 (3.193)	0.257 (14.462)	0.204 (3.272)
County: Győr-Moson-Sopron			–0.372 (–22.301)	–0.441 (–7.532)	–0.375 (–22.405)	–0.437 (–7.429)
County: Hajdú-Bihar			–0.007 (–0.405)	–0.050 (–0.857)	0.004 (0.223)	–0.035 (–0.590)

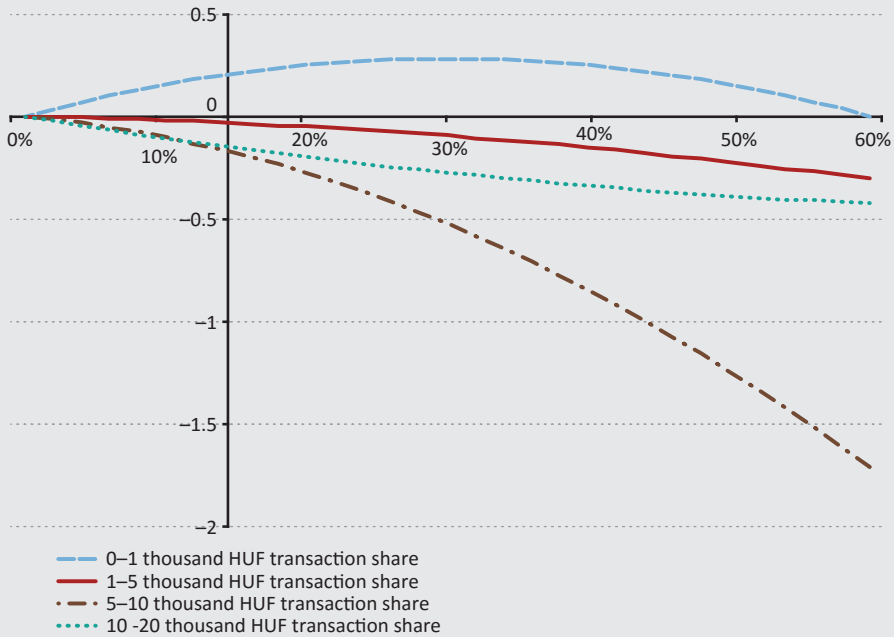
	Only the size, on a consolidated sample	Only the size, monthly breakdown	Full model on a consolidated sample	Entire model monthly breakdown	Cross products on the merged sample	Cross products monthly breakdown
County: Heves			–0.007 (–0.400)	–0.097 (–1.478)	–0.010 (–0.519)	–0.095 (–1.441)
County: Jász-Nagykun-Szolnok			0.394 (21.123)	0.327 (4.975)	0.398 (21.285)	0.337 (5.132)
County: Komárom-Esztergom			–0.330 (–13.709)	–0.383 (–4.531)	–0.339 (–14.005)	–0.391 (–4.588)
County: Nógrád			0.083 (5.569)	0.020 (0.383)	0.084 (5.621)	0.028 (0.529)
County: Pest			–0.275 (–14.691)	–0.286 (–4.232)	–0.277 (–14.725)	–0.286 (–4.217)
County: Somogy			–0.697 (–39.108)	–0.799 (–12.647)	–0.703 (–39.251)	–0.803 (–12.655)
County: Szabolcs-Szatmár-Bereg			–0.181 (–9.912)	–0.238 (–3.688)	–0.183 (–9.963)	–0.237 (–3.657)
County: Tolna			–0.126 (–6.199)	–0.208 (–2.911)	–0.132 (–6.471)	–0.210 (–2.933)
County: Vas			–0.529 (–26.831)	–0.621 (–8.880)	–0.544 (–27.391)	–0.630 (–8.953)
County: Veszprém			0.151 (8.651)	0.124 (2.002)	0.156 (8.934)	0.132 (2.123)
County: Zala						
Dummy variable 1st month of 2016	–0.254 (–24.314)		–0.112 (–9.363)		–0.111 (–9.245)	
Dummy variable 2nd month of 2016	–0.066 (–6.449)		0.027 (2.296)		0.030 (2.551)	
Dummy variable 3rd month of 2016	–0.048 (–4.661)		0.050 (4.326)		0.054 (4.644)	
Dummy variable 4th month of 2016						
Dummy variable 5th month of 2016	–0.237 (–22.711)		–0.101 (–8.509)		–0.100 (–8.369)	
Dummy variable 6th month of 2016	–0.207 (–20.017)		–0.115 (–9.808)		–0.115 (–9.759)	
Dummy variable 7th month of 2016	–0.201 (–19.469)		–0.073 (–6.239)		–0.069 (–5.916)	
Dummy variable 8th month of 2016	–0.185 (–18.030)		–0.076 (–6.525)		–0.072 (–6.153)	
Dummy variable 9th month of 2016	–0.175 (–17.067)		–0.059 (–5.096)		–0.054 (–4.680)	
Dummy variable 10th month of 2016	–0.129 (–12.602)		–0.024 (–2.038)		–0.019 (–1.664)	

	Only the size, on a consolidated sample	Only the size, monthly breakdown	Full model on a consolidated sample	Entire model monthly breakdown	Cross products on the merged sample	Cross products monthly breakdown
Dummy variable 11th month of 2016	–0.114 (–11.147)		–0.029 (–2.543)		–0.025 (–2.147)	
Dummy variable 12th month of 2016	–0.114 (–11.176)		0.028 (2.461)		0.035 (3.048)	
Dummy variable store with chain decision						
Dummy variable individual store			0.390 (52.267)	0.434 (16.335)	0.449 (52.668)	0.470 (15.379)
Dummy variable store with individual decision			1.137 (155.031)	1.217 (45.851)	1.139 (152.954)	1.204 (44.595)
Cross product closed on Monday					–0.050 (–4.543)	–0.006 (–0.168)
Cross product closed on Tuesday					–0.050 (–3.410)	0.043 (0.752)
Cross product closed on Sunday					0.038 (8.007)	0.050 (2.991)
Cross product number of stores in the chain					–0.005 (–71.994)	–0.006 (–14.647)
Cross product total revenue of the chain					0.039 (2.470)	–0.005 (–0.083)
Annual revenue orthogonal polynomial of the fourth kind	–1,211.598 (–7.313)	–939.773 (–1.667)				
Annual revenue orthogonal polynomial of the fifth kind	970.584 (8.547)	767.118 (1.971)				
Annual revenue orthogonal polynomial of the sixth kind	–648.841 (–7.059)	–510.047 (–1.633)				
Annual revenue orthogonal polynomial of the seventh kind	415.525 (9.190)	336.030 (2.162)				
Annual revenue orthogonal polynomial of the eighth kind	–214.536 (–6.480)	–170.405 (–1.518)				
Annual revenue orthogonal polynomial of the ninth kind	98.416 (11.105)	83.588 (2.734)				
Annual revenue orthogonal polynomial of the tenth kind	–26.204 (–4.091)	–19.092 (–0.881)				

Note: In the case of models with a monthly breakdown, we separately estimated the value of the regression parameters for each month, however, they only show a slight variation. Owing to the limited space available, the table only includes the values of one representative month (March 2016), which characterise the results of the given model group adequately.

Note: The z statistics of the given variables are shown in brackets.

Annex 4: The impacts of value category ratios in the model



Note: Vertical axis: the impact calculated on the scale of explanatory variables, horizontal axis: ratio of the given category within turnover.

Annex 5: Coefficients of the models estimated on the sub-samples

	Stores with chain-level decision	Individual stores	Stores with individual decision	Small-sized stores	Medium-sized stores	Large-sized stores
Constant	–20.428 (–9.183)	3,053.212 (1.007)	57.684 (13.695)	–4.679 (–0.006)	–27.998 (–6.462)	57.684 (13.695)
Annual revenue orthogonal polynomial of the first kind	28.913 (1.292)	–5,427.169 (–1.130)	146.156 (5.582)	509.814 (2.562)	979.621 (3.821)	146.156 (5.582)
Annual revenue orthogonal polynomial of the second kind	–81.554 (–7.297)	–7,360.084 (–1.372)	–96.260 (–6.655)	57.609 (1.067)	–582.733 (–3.770)	–96.260 (–6.655)
Annual revenue orthogonal polynomial of the third kind	22.229 (2.121)	31.719 (4.037)	–21.697 (–1.843)	194.475 (2.166)	277.567 (3.853)	–21.697 (–1.843)
logarithm of the 0 to 1 thHUF category	–0.108 (–2.388)	0.087 (2.944)	0.024 (0.404)	0.139 (4.807)	–0.189 (–2.560)	0.024 (0.404)
logarithm of the 1 to 5 thHUF category	0.279 (3.363)	0.089 (1.717)	–0.033 (–0.320)	0.102 (1.984)	0.075 (0.594)	–0.033 (–0.320)
logarithm of the 5 to 10 thHUF category	0.046 (0.677)	0.131 (3.152)	–0.139 (–1.927)	0.049 (1.273)	0.344 (2.706)	–0.139 (–1.927)

	Stores with chain-level decision	**Individual stores**	**Stores with individual decision**	**Small-sized stores**	**Medium-sized stores**	**Large-sized stores**
logarithm of the 10 to 20 thHUF category	–0.054 (–1.030)	0.061 (1.921)	0.082 (1.464)	0.038 (1.213)	–0.324 (–3.413)	0.082 (1.464)
logarithm of the 20- thHUF category	0.151 (3.956)	0.121 (4.637)	0.144 (3.054)	0.156 (6.107)	0.162 (2.741)	0.144 (3.054)
square of the logarithm 0 to 1 thHUF category	0.079 (13.024)	0.006 (1.251)	0.008 (1.061)	0.009 (2.005)	0.068 (6.770)	0.008 (1.061)
square of the logarithm 1 to 5 thHUF category	–0.064 (–7.373)	–0.008 (–1.365)	0.008 (0.731)	–0.015 (–2.655)	–0.035 (–2.634)	0.008 (0.731)
square of the logarithm 5 to 10 thHUF category	–0.048 (–5.368)	–0.032 (–5.265)	0.001 (0.065)	–0.029 (–5.207)	–0.051 (–3.522)	0.001 (0.065)
square of the logarithm 10 to 20 thHUF category	0.092 (10.018)	0.054 (8.656)	0.026 (2.394)	0.055 (8.935)	0.085 (6.737)	0.026 (2.394)
square of the logarithm of the 20 thHUF category	–0.065 (–7.595)	–0.058 (–9.370)	–0.052 (–4.435)	–0.064 (–9.987)	–0.047 (–4.774)	–0.052 (–4.435)
Average item number	–0.013 (–0.825)	–0.033 (–2.366)	–0.023 (–1.012)	–0.070 (–5.476)	0.106 (4.944)	–0.023 (–1.012)
Average payment value	0.000 (–2.677)	0.000 (–2.184)	0.000 (–1.011)	0.000 (–7.004)	0.000 (–1.184)	0.000 (–1.011)
ratio of the 0 to 1 thHUF category	–2.008 (–2.555)	–1.036 (–2.220)	0.463 (0.497)	–2.572 (–5.722)	1.290 (1.060)	0.463 (0.497)
ratio of the 1 to 5 thHUF category	–3.400 (–4.110)	–1.808 (–3.631)	–0.981 (–0.981)	–2.164 (–4.403)	–2.756 (–2.188)	–0.981 (–0.981)
ratio of the 5 to 10 thHUF category	4.393 (4.140)	3.128 (5.004)	3.105 (2.741)	2.482 (4.235)	1.841 (1.028)	3.105 (2.741)
ratio of the 10 to 20 thHUF category	1.933 (2.149)	0.103 (0.211)	2.502 (2.381)	0.312 (0.637)	5.049 (3.126)	2.502 (2.381)
square of the 0 to 1 thHUF category ratio	–5.652 (–8.423)	–3.665 (–8.657)	–3.602 (–4.540)	–2.857 (–7.256)	–5.903 (–5.353)	–3.602 (–4.540)
square of the 1 to 5 thHUF category ratio	3.370 (4.740)	0.317 (0.723)	0.820 (0.954)	0.414 (1.013)	5.203 (4.558)	0.820 (0.954)
square of the 5 to 10 thHUF category ratio	–9.655 (–5.470)	–8.170 (–8.180)	–6.807 (–3.910)	–7.127 (–7.471)	–1.559 (–0.587)	–6.807 (–3.910)
square of the 10 to 20 thHUF category ratio	–4.154 (–4.003)	–1.730 (–3.146)	–3.640 (–3.030)	–2.177 (–3.913)	–5.645 (–2.469)	–3.640 (–3.030)
Total revenue of the chain	1.135 (5.017)	–375.069 (–1.330)	–5.483 (–12.420)	–0.798 (–3.966)	1.601 (4.326)	–5.483 (–12.420)
Square of the entire revenue of the chain	–0.006 (–1.105)	11.003 (1.360)	0.128 (11.098)	0.028 (5.306)	–0.035 (–3.951)	0.128 (11.098)
Number of stores in the chain	–0.023 (–20.990)	0.000 (0.000)	0.004 (1.291)	–0.003 (–4.493)	0.031 (12.147)	0.004 (1.291)

	Stores with chain-level decision	Individual stores	Stores with individual decision	Small-sized stores	Medium-sized stores	Large-sized stores
Square of the number of stores in the chain	0.000 (19.004)	0.000 (0.000)	0.000 (–1.064)	0.000 (3.750)	0.000 (–18.701)	0.000 (–1.064)
Closed on Monday	–0.642 (–7.025)	–0.570 (–11.195)	–0.728 (–7.562)	–0.675 (–13.897)	–0.490 (–3.012)	–0.728 (–7.562)
Closed on Tuesday	–0.792 (–5.903)	–0.592 (–7.811)	–1.067 (–7.190)	–0.779 (–10.764)	–0.728 (–3.279)	–1.067 (–7.190)
Open on Sunday	0.126 (2.759)	–0.115 (–3.967)	0.025 (0.493)	–0.023 (–0.882)	–0.078 (–1.287)	0.025 (0.493)
County: Mobile shops	–0.677 (–3.299)	–0.838 (–6.668)	–0.920 (–4.499)	–0.708 (–6.537)	–1.039 (–3.925)	–0.920 (–4.499)
County: Bács-Kiskun	0.608 (5.656)	0.321 (4.920)	0.229 (1.955)	0.447 (7.562)	0.054 (0.326)	0.229 (1.955)
County: Baranya	0.364 (2.693)	–0.075 (–0.874)	0.200 (1.369)	0.198 (2.650)	–0.237 (–1.116)	0.200 (1.369)
County: Békés	–0.328 (–2.559)	–0.622 (–7.639)	–0.473 (–3.487)	–0.445 (–6.235)	–0.748 (–4.074)	–0.473 (–3.487)
County: Borsod-Abaúj-Zemplén	–0.137 (–0.971)	–0.578 (–6.187)	–0.410 (–2.796)	–0.351 (–4.420)	–0.378 (–1.818)	–0.410 (–2.796)
County: Budapest	–0.293 (–2.249)	–0.131 (–1.646)	–0.359 (–2.686)	–0.158 (–2.228)	–0.643 (–3.372)	–0.359 (–2.686)
County: Csongrád	0.307 (2.338)	0.022 (0.263)	0.157 (1.135)	0.225 (3.104)	–0.365 (–1.878)	0.157 (1.135)
County: Fejér	0.496 (3.670)	0.064 (0.762)	0.179 (1.182)	0.291 (3.914)	–0.184 (–0.905)	0.179 (1.182)
County: Győr-Moson-Sopron	–0.173 (–1.356)	–0.532 (–6.745)	–0.540 (–3.950)	–0.351 (–4.971)	–0.883 (–4.901)	–0.540 (–3.950)
County: Hajdú-Bihar	0.133 (1.060)	–0.108 (–1.342)	0.030 (0.222)	–0.014 (–0.200)	–0.231 (–1.200)	0.030 (0.222)
County: Heves	0.095 (0.636)	–0.148 (–1.661)	–0.168 (–1.137)	0.054 (0.678)	–0.211 (–1.008)	–0.168 (–1.137)
County: Jász-Nagykun-Szolnok	0.675 (4.815)	0.180 (2.028)	0.289 (1.864)	0.501 (6.284)	0.308 (1.370)	0.289 (1.864)
County: Komárom-Esztergom	0.062 (0.373)	–0.566 (–4.562)	–0.669 (–3.595)	–0.316 (–3.094)	–0.394 (–1.553)	–0.669 (–3.595)
County: Nógrád	0.267 (2.339)	–0.109 (–1.573)	0.033 (0.265)	0.094 (1.487)	–0.379 (–2.211)	0.033 (0.265)
County: Pest	–0.320 (–2.239)	–0.340 (–3.693)	–0.249 (–1.562)	–0.288 (–3.564)	–0.540 (–2.555)	–0.249 (–1.562)
County: Somogy	–0.818 (–6.036)	–0.772 (–8.841)	–0.839 (–5.983)	–0.761 (–10.018)	–1.007 (–5.208)	–0.839 (–5.983)

	Stores with chain-level decision	Individual stores	Stores with individual decision	Small-sized stores	Medium-sized stores	Large-sized stores
County: Szabolcs-Szatmár-Bereg	0.008 (0.054)	–0.380 (–4.247)	–0.104 (–0.725)	–0.147 (–1.912)	–0.520 (–2.524)	–0.104 (–0.725)
County: Tolna	0.053 (0.345)	–0.341 (–3.378)	–0.137 (–0.884)	–0.084 (–0.991)	–0.416 (–1.785)	–0.137 (–0.884)
County: Vas	–0.382 (–2.674)	–0.660 (–6.643)	–0.671 (–4.377)	–0.550 (–6.580)	–0.754 (–3.653)	–0.671 (–4.377)
County: Veszprém	0.475 (3.540)	0.024 (0.293)	0.061 (0.428)	0.233 (3.161)	–0.142 (–0.691)	0.061 (0.428)
County: Zala						

Note: The z statistics of the given variables are shown in brackets.

Behavioural Factors in the Hungarian Retail Government Bond Market*

Gábor Kutasi – László György – Krisztina Szabó

It has long been known that the decision-making of money market participants deviates from the pattern outlined by textbook models. This study attempts to explore the real processes taking the approach of behavioural finance, and analyses the hypothetical investment decisions of Hungarian retail government bond investors based on the literature of behavioural finance theses. The analysis relies on the results of a representative opinion poll using behavioural finance theory on the government bond market as a basis. The survey covers the political, emotional and literacy factors underlying the decisions. It examines the herding effect, the influence of demographic factors, and as a new approach, it outlines the profile of Hungarian retail investors. One other novel result of the survey is that it confirms a number of commonly known assumptions about the behaviour of retail investors through collecting data, while reviewing and synthesising behavioural finance literature specifically relevant to the government bond market.

Journal of Economic Literature (JEL) codes: D91, G11, G41

Keywords: behavioural finance, government bond, retail investor, non-rational decision-making

1. Introduction

Empirically, it was established a long time ago that decisions made in money markets do not follow the patterns outlined by textbook models. The study reveals the behaviour and way of thinking of Hungarian households in the domestic government bond market. According to our initial assumption, the decisions made by households are not solely based on a desire to maximise returns. One novel

* The views expressed in this paper are those of the author(s) and do not necessarily reflect the offical view of the Magyar Nemzeti Bank.

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outcome of the study is that it analyses the hypothetical decision-making behaviour of Hungarian retail government bond investors through an opinion poll based on a review of behavioural finance literature relevant to the government bond market.

The survey covers the political, emotional and literacy factors underlying the decisions. Moreover, the herding effect and the influence of demographic factors are also investigated. The relevant literature served as a basis for identifying factors influencing the demand side of the retail government bond market. The study captures how Hungarian retail investors adjust their government bond portfolios in response to international effects, and presumably, the steps of market-shaping investors. It draws conclusions about the extent of non-rational decision-making and excessive risk-taking or risk aversion.

One new result is the profile of Hungarian retail investors outlined by the study. Another novel outcome is that it confirms a number of commonly known assumptions about the behaviour of retail investors through collecting data, while synthesising an overview of the behavioural finance literature that is specifically relevant to the government bond market.

The results are particularly relevant in an economic policy and government-debt strategy environment that favours domestic retail investors purchasing a substantial part of government bonds as opposed to non-resident investors.

2. Methodology

The results of behavioural finance so far have demonstrated that the individual and societal characteristics of household investors (e.g. gender, financial standing, age, marital status, etc.) influence savings habits and the composition of the investment portfolio. Accordingly, the interest rate level is not the only factor determining the success and cost of bond management in the government bond market. The survey was guided by the following question: What characteristics shape demand for government bonds among Hungarian households?

The survey adopted the following method:

We collected the determinants of investments and compiled our own questions for the poll on this basis. We conducted two questionnaire-based surveys on a representative sample of Hungarian households with regard to savings habits and risk acceptance. The survey was conducted and the resulting database was compiled by the staff of the Századvég Foundation. As the number of questions exceeded the possibilities of phone polling, the questionnaire-based survey had to be conducted in more than one round.

The first survey method was as follows: on 18–24 October 2016, we conducted an opinion poll among the adult Hungarian population, during which we polled 2,002 randomly selected adults using the CATI method (Computer Assisted Telephone Interviewing). For sampling reasons the data divulged in the analysis may deviate by no more than ±2.2 percentage points from the data that would have been obtained by interviewing the entire adult population of the country.

The second survey method was as follows: on 22–29 October 2016, we conducted an opinion poll among the adult Hungarian population, during which we polled 2,005 randomly selected adults using the CATI method. For sampling reasons the data divulged in the analysis may deviate by no more than ±2.2 percentage points from the data that would have obtained by interviewing the entire adult population of the country.

In compiling the household questionnaires, we considered the ideas raised in the studies referred to in the theoretical chapter and in the *Legg Mason* (*2015*) presentation. During the survey, we recorded the profiles of the respondents in terms of age, gender, education, residence, self-described social status, political leaning, labour market activity, and number of members in the household.

3. Behavioural finance in the government bond market

3.1. Political instability

Political risk, owing to the effect of political stability and uncertainty and political realignment at the level of information, may influence the rationality of investors' decisions. In their study, *Pantzalis et al.* (*2000*) examined the behaviour of stock market indices across 33 countries around political election dates between 1974 and 1995. They found positive, abnormal returns during the two-week period prior to the election. Their findings are consistent with those of *Brown et al.* (*1988*), and *Harrington* (*1993*), namely, that elections susceptible to certain political directions are accompanied by greater uncertainty and they are more likely to be manipulated. According to the model, the uncertainties surrounding political elections tend to raise the return on securities.

Moser (*2007*) attempts to explore the extent to which investors' decisions are affected by the departure – resignation or dismissal – of a country's minister of finance. Examining twelve Latin-American countries, the author found that such political news instantaneously increased bond spreads on the day of the announcement. The subsequent decline in the spread offset the previous hike to some extent, but the weeks following the announcement were characterised by political instability, and the spread flattened out on a higher level than the initial value. *Huang et al.* (*2015*) studied the effect of international political risks on government bond yields. The authors investigated 109 international political

crises on a sample of 34 debtor countries, and found a significant link between international political risks and government bond yields.

3.2. The emotional factor

An utter disregard for investor sentiment is typical of classical finance theories. The following studies, however, provide evidence that emotions undoubtedly exert a strong impact on investors' decisions, although the influence of investor sentiment is extremely hard to quantify. *Martell* (*2008*) investigated the determinants of the spread between the yields on certain sovereign bonds and US government bonds, and found that even after adjusting for fundamentals motivated by structural credit risk models, there were still significant unexplained components of the yield spread, some of which may be attributed to emotional factors.

Baker and Wurgler (*2006*) studied how investor sentiment affects stock market securities, and demonstrated – albeit to a different degree in individual cases – that certain emotions (fear, euphoria) have an explanatory power in investors' decisions, although the intensity of their effects may vary. (Several earlier studies had arrived at a similar conclusion: *Kothari – Shanken 1997*; *Neal – Wheatley 1998*; *Shiller 2000*). The analysis by *Laborda and Olmo* (*2014*), which was specifically intended to study the relationship between the risk premium on US sovereign bonds and a set of market sentiment variables, is also based on the above study. The authors' findings revealed that the market sentiment factor had predictive power beyond that contained in the yield curve and benchmark macroeconomic factors. However, its predictive power varies over time, exhibiting more relevance during recession periods.

3.3. Demographic factors

The study by *Sevic and Brawn* (*2015*) attempts to gauge the effect of demographic specificities on government bond yields. The authors compared the inflation-adjusted yield on 10-year government bonds of seven developed countries to a benchmark, to determine the extent to which the low level of the real bond yield can be explained by demographic and non-demographic variables. *Modigliani and Brumberg* (*1954*) were pioneers in examining the relationship between the financial market and demographic variables, which can be traced back to the life-cycle hypothesis. The younger generation tends to invest a substantial part of its income in real estate, whereas the older generation is characterised by a propensity to save.

Bakshi and Chen (*1994*) found that aggregate consumption and demographic fluctuations can, to a certain degree, predict the risk premium. Owing to the ageing society phenomenon, capital typically flows into the securities market rather than the real estate market. *Davis and Li* (*2003*) explored the relationship between demographics and financial asset prices in a number of OECD countries. Those aged 40–64 are more likely to hold their savings in real assets and live on the yields, whereas the 65+ generation is strongly linked to bonds and bond yields; the latter

may be partly attributed to the retirement age and pensions derived from private pension funds, as pension funds can mainly invest in bonds.

Arnott and Chaves (*2012*) pointed out that the expected return for securities rises for the 40–64 year-old age group, which can partly be explained by age characteristics, since a middle-aged person is typically less likely to avoid uncertainty than an older investor. Accordingly, another conclusion of the study is that the expected return falls for those over 65. *Barber and Odean* (*2001*) revealed a relationship between the investor's gender and trading activity. Through psychological testing they demonstrated that men's financial decisions are more likely to be extreme or risky than those of women.

3.4. Geographical and cultural factors

Coval and Moskowitz (*1999*), *Kang* (*1997*), as well as *Karlsson and Norden* (*2007*) demonstrated that portfolio allocation is strongly influenced by geographical bias. *Amadi* (*2004*) concluded that institutional investors' demand for foreign stocks and hence, the diversification of the institutional portfolio, are strongly influenced by certain factors, such as a common language, trade and possibly immigration traditions. According to *Kang et al.* (*2010*), the under- or over-valuation of foreign stocks can be explained, on the one hand, by the different evaluation of domestic and foreign investors and, on the other hand, by the home bias exhibited by investors. *Ferreira and Matos* (*2008*) found that non-US-based foreign investors often overvalue the stock of US firms. Examining the decisions and behaviour of Finnish investors, *Grinblatt and Keloharju* (*2001*) concluded that Finnish investors are more likely to invest in firms that have Finnish management.

According to the investigation of *Karlsson and Norden* (*2007*) in Sweden, there is also a relationship between investors' gender and the degree of their home bias. In their empirical analysis, Swedish men proved to be far more biased towards the bonds of their own country than women. *Guiso et al.* (*2004*) concluded that perceptions rooted in culture are important determinants of the trust citizens have for the citizens of other countries, which explains investors' behaviour and decisions in the equity market. *Beugelsdijk and Frijns* (*2010*) argued that a society's culture and cultural differences play an important role in the diversification of portfolio allocation. *Power et al.* (*2009*) stressed the importance of a nation's culture as they compared collectivist, emerging Asian economies with individualistic, industrialised Western nations.

The research conducted by *Anderson et al.* (*2011*) covered 60 countries to study the diversification of the institutional portfolio and the effect of cultural factors. Introducing country-specific variables on cross-cultural behaviours, the authors found that behavioural differences between cultures account for the diversification of foreign capital and home bias. It is especially in risk-averse countries that investment funds are more likely to exhibit home bias and hold less diversified

investments. Culturally distant countries typically invest less abroad; indeed, they are prone to disregard culturally distant target markets.[1]

4. Behaviour of retail investors in the Hungarian government bond market

4.1. Degree of non-rational decision-making

For this study, the household surveys were designed to *capture the presence of investor decisions that are non-rational in the economic sense among Hungarian households, and to assess the magnitude of this phenomenon. Lack of information* is one of the criteria of non-rational decision-making. In this regard we asked respondents whether the government guarantees the yields on and the redemption of government bonds. Only 55 per cent of the respondents thought/knew that government bonds are backed by the state's payment guarantee. Although information improved with age, only about 60 per cent of the 40+ age-group was aware of this fact. Education is a stronger determinant of information: 71 per cent of those with higher education knew about the state guarantee. Similarly, higher income – which may be strongly related to education and the ability to save – also brought greater knowledge about investment issues. Compared to the responses given to other questions designed to gauge the level of information, there is a strong relationship between the perception of the riskiness of various investment instruments and the (lack of) knowledge about the state guarantee. More than two thirds of the respondents who considered government bonds the riskiest investment instrument in response to a different question did not know about the state guarantee. 90 per cent of the respondents who considered government bonds the least risky investment option were aware of the state guarantee. Irrational investment decisions stemming from inadequate information can be clearly captured in the responses. Less than 20 per cent of those perceiving government bonds too risky to invest in had heard about the state guarantee.

We detected a degree of interpretational uncertainty in the understanding of investment instruments as well, which may contribute to reducing financial rationality. We asked the respondents to select the least risky instrument from the following list: share, government bond, corporate bond, gold, real estate. Most respondents perceived real estate to be the least risky instrument. Gold was second, and government bonds only came third on the list. In addition, a significant number of the respondents presumably interpreted the safe investment option of gold as

[1] The study takes the primary dimensions of cultural attributes identified by *Geert Hofstede* (*2001*) as a basis. According to Hofstede, countries' cultural attributes can be measured in five primary dimensions: power distance, individualism versus collectivism, masculinity versus femininity, uncertainty avoidance, long-term versus short-term orientation. According to Hofstede's dimensions, Hungary is a strongly masculine, extremely uncertainty avoiding, strongly individualistic country with a medium-term orientation (pessimistic) that finds it medium-hard to tolerate the centralisation of power (http://geert-hofstede.com/hungary.html). On the whole, it can be called medium-distant in a cultural sense.

an easily mobilised monetary asset that can be physically held by them and used any time as a payment alternative. They disregarded the fact that the price of gold fundamentally hinges on the price quoted on international commodity exchanges and that gold, as an essentially speculative financial instrument, has a continuously fluctuating price. So a certain degree of cognitive dissonance is also evident in this regard. It is not surprising, then, that education has an explanatory power in this case as well. Twice as many respondents with higher education (32%) perceived government bonds to be the least risky investment instrument than those with primary education (14%). Income, in this case, also points in the same direction as risk perception. Obviously, this is because those with higher income encounter saving options more often and tend to belong to the more educated segment.

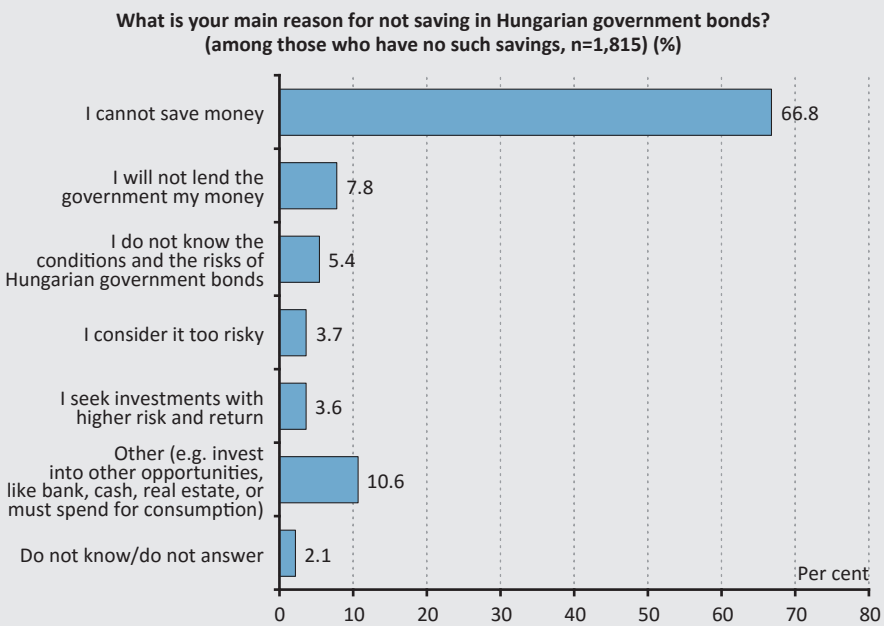
Only 37.3 per cent of the respondents held investments. More than one third of them – 13.1 per cent of the respondents – declared that they do not monitor the status of their investments. Although there are investment schemes that do not require any monitoring on the part of the investor before maturity, this case is more about respondents' lack of motivation to understand the value, composition and maturity of their invested assets, which not only reveals a lack of financial awareness, but also reflects inadequate information, i.e. a non-rational decision-making situation.

The survey revealed that 89 per cent of the respondents had no savings in Hungarian sovereign bonds at the time of the interview. 62.2 per cent of the respondents had no savings at all. We asked them the reason why. The distribution of the responses is summarised in *Figure 1.* It indicates that 5.4 per cent of the respondents do not know the conditions and the risks – i.e. their information is not perfect –, while 7.8 per cent explained their decision specifically with a political motivation. Political opinion strikingly influenced responses: 25 per cent of those describing themselves as left-wing voters declared their reluctance to "loan their money to this government", whereas this rate is around 5 per cent among respondents with a central or right-wing orientation. With respect to age distribution, the rejection on political grounds was the highest among the youngest cohort (12.5%), whereas the saving rate was relatively low in this age group. Rejection on political grounds is easily the highest among those with higher education (11.3%), although 9.9 per cent of the respondents with secondary education would also be reluctant to loan money to the government. The rate of political rejection is 10.6 per cent among respondents in the highest income bracket.

Differences in responses by education are aptly reflected in responses by income clusters. Only half of the highest-income group cited their inability to save; 8 per cent mentioned that they did not know the conditions, 10.6 per cent rejected such investments on political grounds; all in all, 24.6 per cent seek investment opportunities in markets other than the government bond market.

Intention to purchase is perceivably influenced by information. The result of the questions intended to gauge respondents' knowledge – that were included in the same survey as the questions regarding their intention to purchase – is the following: 35 per cent of those – wrongly – believing that government papers are not subject to any tax allowances would not buy sovereign bonds, while this rate is 25 per cent among the respondents that are aware of the tax allowance. 33.5 per cent of those who – wrongly – believe that the return on bank deposits exceeds the yield on government bonds would not invest in Hungarian sovereign bonds, while this statement is true for 41.7 per cent of those who perceived – also wrongly – the returns to be identical. The rate of rejection is only 26.3 per cent among respondents who were aware of the fact government bonds have a higher yield. Similarly, more respondents (38.4%) reject this investment option among those who – wrongly – believe that investing in government papers entails a fee compared to those who understand that it is free of charge (24.5%).

Figure 1
Reasons for not holding government bonds



4.2. How does the Hungarian population behave in investment matters?

In the survey we also examined how respondents behaved in specific investment situations. According to the responses, 46.7 per cent of households would automatically invest their savings in bank deposits or government bonds, i.e. the two least risky, yet liquid investment options. This question aptly illustrates the difference between the genders: 52 per cent of women but only 42 per cent of men described

themselves with this attitude. The behaviour of age groups in this regard is extremely diverse: only 35–38 per cent of the three age groups between 18 and 49 said that they would automatically invest their savings in bank deposits and government bonds, whereas 44 per cent of those aged 50–59 and 64 per cent of the 60+ age group would do the same. In other words, in the latter age groups, government bonds primarily compete with bank deposits, while for younger generations government papers should offer an attractive alternative to high-return but riskier investments. As regards education, there is a deep gulf between elementary education (eight grades) and the rest of the categories. 62 per cent of the former and 44 per cent of the latter invest their savings automatically in the two risk-free instruments. One important observation is that among the respondents with independent income, only 37.4 per cent of active workers would prefer to invest in bank deposits or government bonds, whereas this figure is 64.3 per cent among pensioners. From the perspective of income, the dispersion is not this significant.

The next two questions revealed that a fairly large portion of the population does not make reckless investment decisions. Only 8.3 per cent would be willing to gamble on "a sure bet". A significant minority, 19 per cent, leaves investment decisions to someone else, although a higher education level scaled back this attitude significantly. As regards "sure bets", the percentage of those preferring to leave the decision to others is as high as 19.5 per cent, while this attitude drops – in large increments with each education category – to 2.8 per cent among respondents with a college degree. Albeit with a smaller deviation, there is a clear relationship between leaving investment decisions to others and education level. There is a 6.5 percentage point difference between respondents with primary education (21.8%) and respondents with a college/university degree (15.3%). This percentage declines evenly with the increase in education level. At the same time, the overlap between the two forms of giving up decision-making is extremely small. Less than one tenth accepts "sure bets" at face value from among those who leave the decision to someone else, and even among those who declared they invest their money in "sure bets" without thinking, only 22 per cent would generally leave investment decisions to someone else (though the unconditional acceptance of someone else's suggestions practically means that the decision is made by someone else).

Household respondents were put into different decision-making situations to simulate the response of their demand for government bonds to various shocks. Respondents' horizon and propensity to save were not only measured by the extent to which they can/cannot save a portion of their current income and invest it in government papers, but they were also prompted to decide over what horizon would they be willing to save if they were given 1 million forints now. One quarter of the respondents could or would not set aside any savings, and nearly one third would not be able to wait even for a six-week retail Treasury bond to mature. Slightly more than 58 per cent of the respondents could invest an unexpected

Figure 2
Decisions regarding the saving horizon

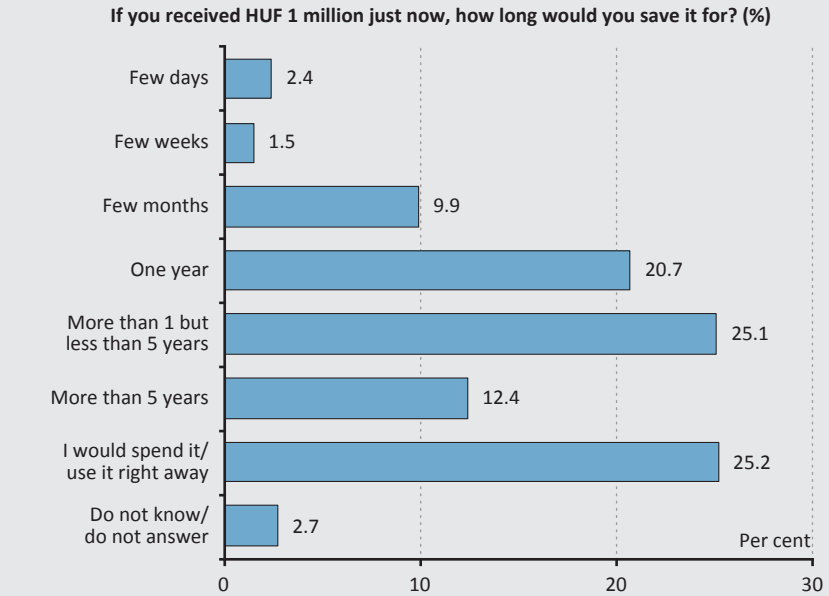
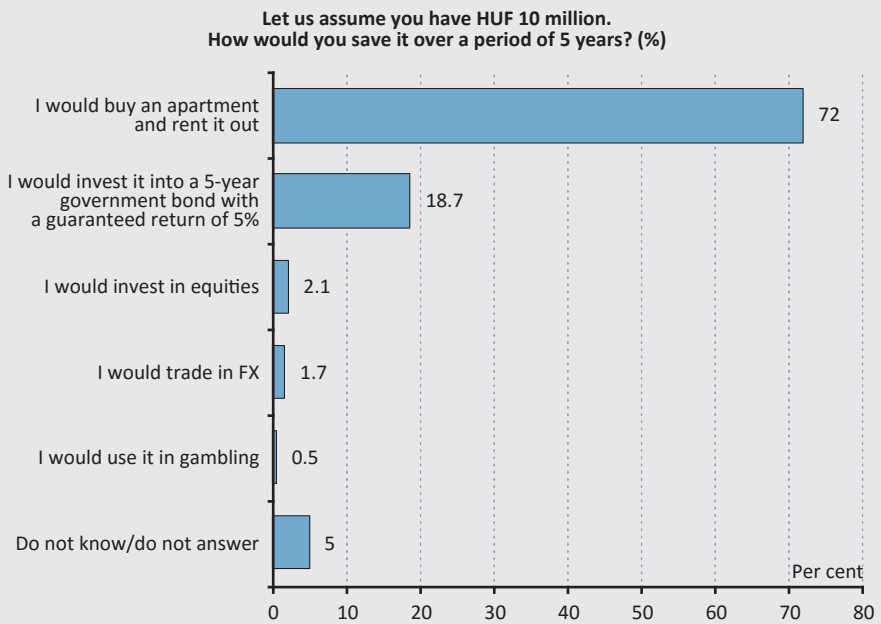


Figure 3
Households' preferences regarding savings instruments



amount over and above their current income in a 1-year government security, from which only 12.4 per cent could get by without this amount in the long term (over 5 years). Deviations from this are fundamentally determined by income status and the related earning status. Those with higher income were more likely to be able to save the extra income over a longer horizon *(Figure 2).*

However, responses about a significant sum for investment, irrespective of the investment horizon, revealed that the vast majority (72%) of the population would prefer to invest larger sums in real estate, which would not really require the same financial literacy and investment savviness as demanded by bond, equity and foreign exchange markets *(Figure 3).* Obviously, this may have been influenced by the surge observed in Hungarian real estate prices in 2016 and the parallel drop in bond yields.[2] That said, government bonds are still in second place with 18.7 per cent. Votes for the rest of the investment options were practically negligible. Once again, this reflects households' risk-averse and responsible saving behaviour.

We measured risk acceptance by asking household respondents about the level of risk they would be willing to take to abandon government bonds and their relatively safe return in the hope of higher yields. We asked whether they would be willing to sell a government bond worth HUF 1 million if they received a business offer which is just as likely to achieve a high return as generate a corresponding amount of loss. We asked this question for +/–33 per cent and +/–10 per cent profit/loss outcomes. Retail investors would be more open to accept a 10 per cent profit/loss, but even in this case, less than one third of the respondents would be willing to sell their government bond. Increased risk (and profit/loss outcomes) deters investors and encourages fewer respondents to take the risk. We found that the vast majority of households would be reluctant to give up safe returns in exchange for high promised yields entailing high risks. However, risk acceptance is higher among respondents with a higher income – those more likely to invest in government bonds –; they are more willing to combine their higher saving ability with a higher-risk portfolio. Whereas only 14–17 per cent of households with a per capita income of HUF 50,000 and HUF 100,000 would be willing to accept the +/–33 per cent outcome, and 23–28% the +/–10 per cent outcome, 22 per cent and 32 per cent of respondent households with a per capita income above HUF 100,000 would be willing to sell the safe government paper and take the risk. Willingness to take risks declines with age in the case of both potential return outcomes. A distinction by gender confirms that men are more likely to be risk seekers, while women prefer safer investment portfolios.

[2] See the MNB's House Price Index at http://www.mnb.hu/en/statistics/statistical-data-and-information/statistical-time-series/vi-prices/mnb-house-price-index and MNB – Average Government Securities Yields at Auctions http://www.mnb.hu/en/statistics/statistical-data-and-information/statistical-time-series/xiii-securities-and-capital-market-data

There is no complete overlap between the risk takers of the two profit levels; in other words, those who are willing to risk a smaller loss in the hope of a smaller profit would not necessarily take a greater risk for a higher return, and vice versa: those willing to take a greater risk for a higher return do not necessarily choose the riskier option in the smaller risk, smaller profit scenario. Only 41 per cent of those willing to take the 10 per cent profit/loss outcome were willing to take the 33 per cent profit/loss outcome. Moreover, only 58 per cent of those who would restructure their safe investments for a 33 per cent profit/loss outcome would do the same for a smaller profit/loss outcome. In a theoretical model that assumes a complete market and rational decision-makers, the decision-maker is risk neutral.[3] The expected value of the specific decision-making situations of the opinion poll – i.e. the respondent is as likely to win or lose – in all probability is zero. A rational, risk neutral participant should respond identically to the two different alternative investment opportunities (10 per cent and 33 per cent profit/loss outcomes) that still have the same expected value. This was not the case in this survey. In addition, the inconsistency of the response with the model is confirmed by the fact that one quarter to one fifth of the respondents would be willing to abandon an investment with a safe 5 per cent return for an investment with an expected value of zero.

4.3. Imperfect information, herding effect

The survey revealed that some of the population do not necessarily seek perfect information and rely on the opinions of others in investment decisions. 17.8 per cent of the respondents act intuitively, while 14.9 per cent follow the advice of close acquaintances, which could be viewed as a manifestation of the herding effect. Although financial advisors and banks are presumably well-informed in investment issues, consultation with such participants (9.5% and 1.7%) can be regarded as a manifestation of the follower attitude. The only difference is that the participant followed relies on perfect – or at least, broad-based – information *(Figure 4).*

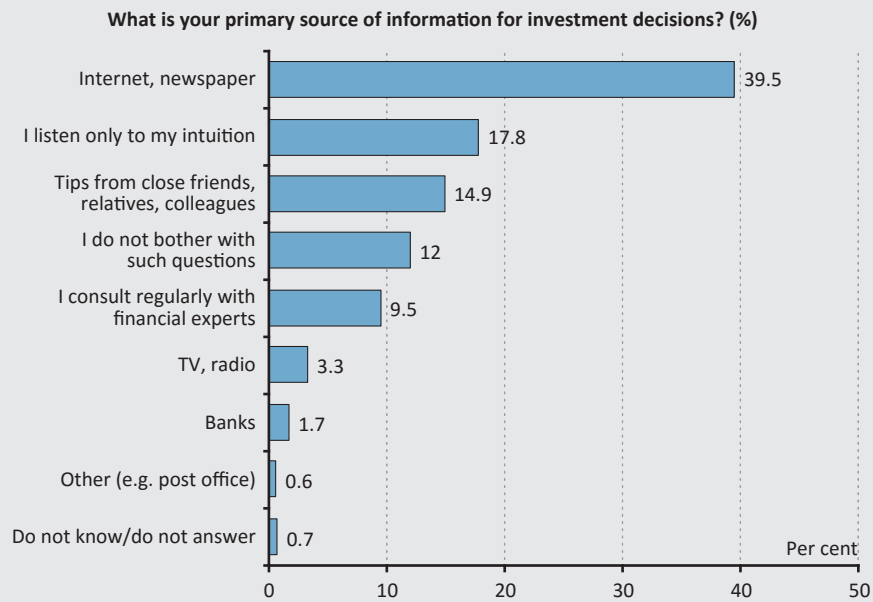
With respect to age distribution, the two extremes – ages 18–29 and the 50+ age group – are more likely to act on intuition (17% and 21%, respectively), whereas the corresponding rates are 10–15 per cent in the age groups between 30 and 49 that exhibit a greater capacity to save. Interestingly, the rate of those obtaining information online is the highest in the latter age group (51 per cent and 42 per cent among respondents in their thirties and forties, respectively), even higher than with those aged 18–29, the Y generation (40%). The advice of close friends and acquaintances counts the most among the youngest respondents; one quarter of them primarily relies on such acquaintances for information. This rate is around 12–14 per cent in the older age groups. With respect to per capita income, the rate of those more likely to consult with financial advisors or banks or obtain

[3] For more detail about risk neutrality, see: *Markowitz* (*1959*), *Merton* (*1972*), *Medvegyev* (*2009*), *Medvegyev* (*2010*).

information online increases with income. In other words, an increase in the saving rate improves the population's knowledge and scales back the herding effect.

It is a well-known phenomenon in group sociology that the decisions of individuals can be shaped by the ringleaders of their close acquaintances or a group. Respondents were asked whether the opinion of a close acquaintance was likely to change their investment preference. Nearly 17 per cent of the respondents answered probably or definitely; in their case the follower attitude is fairly apparent. In addition, more than a quarter of the respondents could not declare with certainty that they would not change their decisions in such situations. Consequently, it appears that a fairly large portion of households would potentially act on informal investment information if it is received from a close acquaintance; in other words, investment decisions are strongly influenced by group dynamics. In relation to this question, we cannot particularly identify based on specific group attributes who are more likely to listen to the opinions of others.

Figure 4
Primary source of information in households' investment decisions

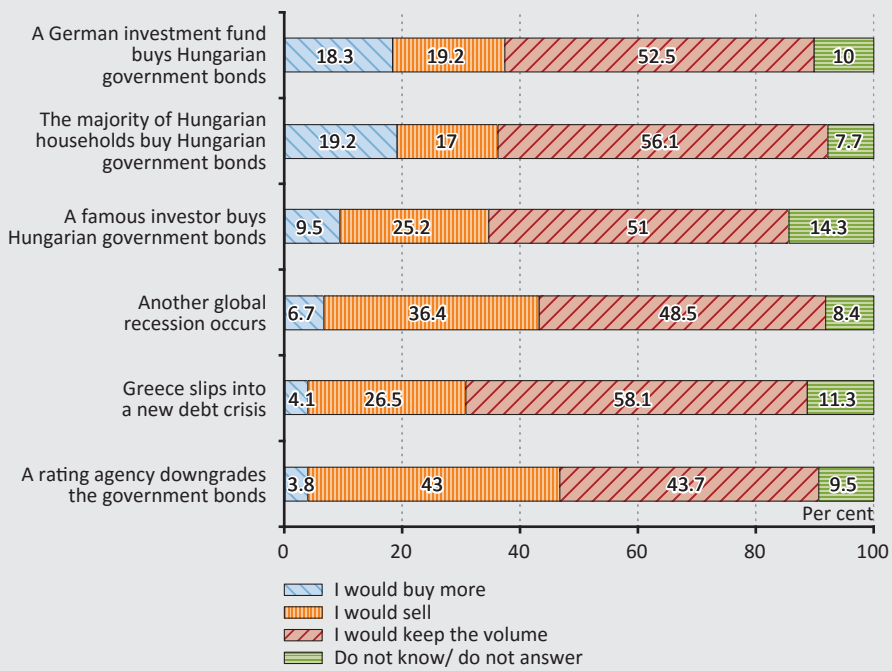


We formulated six questions to explore investors' response to an international market event or the action of an investment opinion leader *(Figure 5).* A potential downgrade of government debt would have a reasonably clear-cut result as it is directly related to the investment. In this scenario, a roughly identical percentage of retail investors (43.7% and 43%) would choose to hold or sell their government

papers. As regards international effects, households perceive more severe risks from a negative global economic shock than from a regional Greek insolvency. In the event of another Greek crisis, almost 60 per cent of the respondents would not adjust their Hungarian government bond position, whereas less than half of the respondents would stick with this decision in the case of a global downturn. Interestingly, some investors would be willing to increase their Hungarian government bond holdings in the case of both shocks, even in the event of a downgrade. We must assume that they either expect a hike in yields or view government bonds as a safe-haven asset. It is typically the younger, high-income category age group with (except for the Greek crisis) secondary or tertiary education that tend to overweight the decision to purchase. These are typical attributes of more informed investors.

To measure the herding effect, we asked respondents what they would do if a prominent investor, or the majority of market participants, or a "German" institutional investor – a paragon of reliability and prudence – started buying the government bonds. Although any one of these events is capable of mobilising the government bond market, apparently more than half of the population would not alter their government bond position at all. In response to purchases by the German participant and by Hungarian households, nearly one fifth of the respondents would

Figure 5
What would you do with your holdings of government bonds if ...?



follow suit, but only 10 per cent would do the same if the purchases were made by a prominent investor. Parallel to this, one quarter/fifth of the respondents would do just the opposite: they would sell government papers in all three cases. It is hard to tell from the survey whether this reflects a rational, carefully assessed expectation about a downward shift in the yield curve or some other consideration. It is safe to say, however, that respondents with higher income and at least secondary, but in several cases (prominent investor, German institutional investor), tertiary education are far more likely than the average to follow the example of (an) opinion leader market participant(s). Interestingly, a higher percentage (15–30%) of the respondents who consider themselves to be investors with an above-average performance follow the example of the above market participants.

Decisions do not overlap completely in the reactions to the three opinion leaders either. Only 26 per cent of those copying the decision of the German institutional investor copy the decision of the prominent investor as well, while 45.5 per cent also follow Hungarian households. 39 per cent of the respondents copying the decision of the prominent investor would also copy the action of Hungarian households, and 50 per cent of them would be motivated by the German investment fund too. 43 per cent of those copying Hungarian households would take the lead of the German investor, but only 20 per cent of them would be mobilised by the prominent investor's action. The overlap is far more significant in the case of those who would not alter their government bond position – the overlap here amounts to 70–75 per cent in all three cases. Respondents with an opposite attitude – willing to sell their papers contrary to the decision of opinion leaders – overlap at a rate of 50–65 per cent in each case. (Except for those responding to the prominent investor's intention to purchase by selling their papers, because they overlap at a rate of only 42 per cent with those selling their papers in response to Hungarian households' intention to purchase).

4.4. The dimension of national sentiment

Literature suggests that home bias or national sentiment also play an important role in the government bond market. During the survey we asked whether the respondents agreed that it is the patriotic duty of a Hungarian person to buy Hungarian government bonds. It appears that more than one quarter of household respondents agree with this opinion; accordingly, this sentiment is also a factor to be considered on the government bond market, yet another example that the factors explaining the behaviour of certain groups of retail investors go beyond return-maximising economic rationality. This opinion is extremely common (38%) among respondents in the 60+ age group (including pensioners). An above-average percentage of respondents with a lower education level gave a similar answer (31 per cent of those with primary education and 29 per cent of those with trade school/vocational school degrees). With respect to income status, respondents from households with a per capita income of HUF 50–75 thousand represent this attitude at the highest rate (34%). It should be noted that these groups generally represent peripheral groups of the

government bond market and of household savings in general, with little or no savings at all. They are less pressured by having to meet their own expectations in practice and purchase Hungarian government papers out of patriotism.

As regards political preference, although seemingly a conspicuously high percentage of the respondents describing themselves as right-wing voters support this attitude, in reality this may rather reflect the prevailing pro-government/opposition status and relationship in October 2016. Indeed, of the opposition parties, 49.4 per cent of the supporters of the Hungarian Socialist Party (MSZP) agree with this patriotic duty – significantly exceeding even the 43.4 per cent rate measured among pro-government Fidesz–KDNP supporters –, whereas only 16.7 per cent of Jobbik supporters agreed with this statement, falling short of the rate observed among several smaller left-wing parties. We wish to emphasise, therefore, that political preferences can be measured even with this question of the survey, depending on the momentary political situation.

Interestingly, the percentage of those supporting the patriotic attitude is above-average (30%) even among those who respond to negative events (downgrade, global crisis, Greek crisis) by holding or buying government bonds *(Figure 5).* Moreover, more than 42 per cent of those with a preference for government bonds as opposed to other investment alternatives *(Figure 3)* also agreed with this attitude.

5. Conclusions

The practical result of the study is an opinion poll on Hungarian retail demand for government bonds assessed in the light of relevant theories. The profile of Hungarian households outlined in the study is a completely new result. First and foremost, this survey confirmed the most general social and economic characteristic; namely, that roughly two thirds of Hungarian society have no savings. A significant number of households have no savings at all; consequently, they are not involved or interested in investment issues. Households able to save typically have a short investment horizon. 58 per cent of these households would not even consider buying instruments with a maturity of over 1 year for saving purposes. Good news for government bond dealers, however, is that nearly 60 per cent of the households currently unable to save would invest in government bonds in the event of a future improvement in their income situation that allows them to save a portion of their income. On the other hand, wealthier Hungarian households prefer real estate to government bonds.

In the survey underlying the study, only 37.3 per cent of the respondents held investments. More than one third of these respondents (13.1%), however, do not monitor the status of their investments, which cannot necessarily be considered rational behaviour on their part. 89 per cent of the respondents did not have government bond holdings, mostly because of their inability to save of course.

Some of the respondents able to save, however, chose not to invest in government bonds due to a lack of information. Consequently, the complete market hypothesis does not fully hold true.

It was confirmed from several angles that *households have limited information.* Only 55 per cent of the respondents thought/knew that government bonds are backed by the state's payment guarantee. Although information improved with age, only about 60 per cent of the 40+ age-group were aware of the existence of the state guarantee. Education is a stronger determinant of information: 71 per cent of those with higher education knew about the state guarantee. Similarly, higher income – which may be positively related to education and the ability to save – also brought greater knowledge about investment issues. Likewise, respondents were not fully informed about tax allowances and yields.

At the same time, the lack of information should not be always viewed as evidence of an incomplete market and a non-rational decision-making situation. The survey revealed that some of the population do not necessarily seek perfect information, and rely on the opinions of others in investment decisions. The advice of close friends and acquaintances is predominant among the youngest respondents; 25 per cent of them primarily rely on such acquaintances for information. With respect to per capita income, the rate of those more likely to consult with financial advisors or banks or obtain information online increases with income. In other words, an increase in the ability to save improves the population's knowledge and scales back the herding effect. The identified opinion-follower groups, in turn, can be a new target for the sale of government bonds, through which opinion followers could be included more efficiently in the retail demand for government bonds.

Based on various questions probing respondents' attitudes and preferences, 90 per cent of Hungarian households *seek safety* in investments and would not make irresponsible decisions if given an opportunity to save. We measured risk acceptance by asking household respondents about the level of risk they would be willing to take to abandon government bonds and their relatively safe return in the hope of higher yields. We found that the vast majority of households would be reluctant to give up safe returns in exchange for high promised yields entailing high risks. This also *benefits the sale of government bonds* in view of the strong loyalty of demand towards low-return but safe financial products. Interestingly, *risk acceptance is higher among respondents with higher income – those investing the most in government bonds* –; they are more willing to combine their higher ability to save with a higher-risk portfolio.

In a small and open economy such as Hungary and in the riskier investment environment of the forint market, it was worth examining households' response to international market effects. We formulated six questions to simulate Hungarian

retail investors' response to important international market events or to the action of an investment opinion leader. In the event of a downgrade of Hungarian sovereign bonds, a roughly identical percentage of retail investors would choose to hold or sell their government papers. As regards international effects, households associate more severe risks with a negative global economic shock than with a regional Greek insolvency. In the event of another Greek crisis, almost 60 per cent of the respondents would not adjust their Hungarian government bond position, whereas less than half of the respondents would stick with this decision in the case of a global downturn. In order to measure the herding effect, we asked respondents what they would do if a prominent investor, or the majority of market participants, or a "German" institutional investor – a paragon of reliability and prudence – would start buying the government bonds. Although any one of these events is capable of mobilising the government bond market, apparently more than half of the population would not alter their government bond position at all. In response to purchases by the German participant and by Hungarian households, nearly one fifth of the respondents would follow suit, but only 10 per cent would do the same if the purchases were made by a prominent investor. We may conclude, therefore, that *the domestic retail segment of the Hungarian government bond market is a stabilising factor for Hungarian government debt management. Accordingly, a greater share of Hungarian retail investors increases the shock resilience of the Hungarian government bond market and mitigates its exposure to financial speculation.*

The survey revealed that political considerations and political sentiment are also present in the Hungarian government bond market. Some respondent groups specifically cited political/sentimental reasons – instead of economic considerations – for not buying Hungarian government papers. For the most part, those rejecting government bonds on political grounds are anti-government voters. However, the opposite attitude – home bias – could also be observed in the securities market. Based on our results, *national sentiment, home bias and patriotism also play an important role in the government bond market.* More than one quarter of household respondents agree with the opinion that a Hungarian person has a patriotic duty to buy Hungarian government bonds, yet another example that the factors explaining the behaviour of certain groups of retail investors go beyond return-maximising economic rationality.

An ancillary result of the survey that may be the subject of further research is the following: It can be assumed that households do not have a textbook interpretation of risks. They consider real estate and gold to be less risky investment options than government bonds. *There is a strong relationship between the perception of riskiness for various investment instruments and awareness of the state guarantee.* More than two thirds of the respondents who considered government bonds the riskiest investment instrument did not know about the state guarantee.

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Annex

Questions asked in the opinion poll

1. In your opinion, which of the following is the least risky investment?

   1) Share
   2) Government bond
   3) Corporate bond
   4) Gold
   5) Real estate

2. In your opinion, which of the following is the riskiest investment?

   1) Share
   2) Government bond
   3) Corporate bond
   4) Gold
   5) Real estate

3. In your opinion, does the state guarantee the repayment of the principal in government bonds?

   1) Yes
   2) No
   3) Do not know/no response

4. In your opinion, is there a tax or contribution allowance on government bond yields?

   1) Yes
   2) No
   3) Do not know/no response

5. In your opinion, do bank deposits or government bonds have higher returns?

   1) Bank deposits
   2) Government bonds
   3) Do not know/no response

6. In your opinion, how much does it cost to subscribe government bonds?

   1) Free of charge
   2) 0.5% of the transaction value
   3) 1% of the transaction value
   4) Do not know/no response

7. Do you have any savings in a Hungarian government paper? (pick the most appropriate answer)

   1) I do not have any savings.
   2) No, because I seek high-risk/high-return investments.
   3) No, because I am not familiar with the conditions and risks of Hungarian government bonds.
   4) No, because I consider it too risky.
   5) No, because I refuse to loan any money to this government.
   6) Yes, because it is a safe and risk-free investment option.
   7) Yes, because I am not very familiar with any other investment options.
   8) Do not know/no response

8. Do you have any savings in Hungarian government bonds?

   1) Yes
   2) No
   3) No response

9. Is the following statement true for your saving decisions?

If I have a chance to save, I automatically invest in bank deposits or government bonds. I do not monitor yields and conditions.

1) Yes
2) No
3) Do not know/no response

10. Is the following statement true for your saving decisions?

If I receive a sure bet, I invest my money in it immediately.

1) Yes
2) No
3) Do not know/no response

11. Is the following statement true for your saving decisions?

Usually I leave the decision to others.

1) Yes
2) No
3) Do not know/no response

12. For what purpose do you hold your savings in Hungarian bonds? (multiple answers are acceptable)

1) I do not know yet for what purpose, but I set aside savings.
2) For real estate purchase, house construction, some more expensive consumer durable or a car.
3) For the purposes of my enterprise.
4) For financing / leaving inheritance for my children/grandchildren.
5) For repaying my debt.
6) For my old age, for my retirement.
7) For travelling.
8) For unexpected household expenses.
9) No response

13. If you do not hold any savings in Hungarian government bonds, why? (multiple answers are acceptable)

    1) I have no money to save.
    2) I have no confidence in the solvency of the Hungarian state.
    3) I refuse to loan any money to these politicians.
    4) Hungarian government bonds do not pay sufficient yields.
    5) Government papers are boring; I like to take risks.
    6) I am not aware that I can save my money in Hungarian government papers.
    7) I would rather keep my money in my bank account.
    8) Do not know/no response

14. How often do you check the status of your investments?

    1) More than once a day
    2) Once a day
    3) Once a week
    4) Once a month
    5) Less than once a month
    6) I do not check their status at all
    7) I have no investments.
    8) Do not know/no response

15. To what extent would you describe yourself as a good investor compared to the average?

    1) Above-average
    2) Average
    3) Below-average
    4) Do not know/no response

16. Which statement describes your view of life and investor attitude the best?

    1) I am not interested in investment issues; money is irrelevant in my life.
    2) High risks are to be avoided in investments. The guaranteed repayment of the principal is of primary importance; yields are secondary.
    3) It is necessary to take risks in life. I have an understanding of and therefore I also undertake riskier investments.
    4) I seek riskier investments that will allow me to get rich faster.
    5) Do not know/no response

17. How do you obtain your information in financial matters?

    1) I regularly consult with a financial advisor
    2) From the internet and newspapers
    3) My close friends, relatives or co-workers tip me off
    4) I only act on my own intuition
    5) I am not interested in these issues
    6) Do not know/no response

18. Consider that you have 1 million forints in government bonds with a safe 5% annual return. You get a business offer, in which you are as likely to increase your capital by one third or lose one third of your capital. Would you sell your government bond in order to invest in this business opportunity?

    1) Yes
    2) No
    3) Do not know/no response

19. Consider that you have 1 million forints in government bonds with a safe 5% annual return. You get a business offer, in which you are as likely to increase your capital by one and a half or lose half of your capital. Would you sell your government bond in order to invest in this business opportunity?

    1) Yes
    2) No
    3) Do not know/no response

20. Consider that you have 1 million forints in government bonds with a safe 5% annual return. You get a business offer, in which you are as likely to increase your capital by 10% or lose 10% of your capital. Would you sell your government bond in order to invest in this business opportunity?

    1) Yes
    2) No
    3) Do not know/no response

21. How would you respond if a credit rating agency downgraded the government security held by you?

    1) I would buy even more bonds in view of the expected increase in yields.
    2) I would sell all of my government bonds immediately and would invest the funds in a safer instrument.
    3) I would sell some of my government bonds and invest in another instrument to diversify the risk.
    4) I would continue to hold the same amount of government bonds.
    5) Do not know/no response

22. Consider that you have a Hungarian government bond maturing in two years that is worth HUF 1 million. What would you do with your Hungarian government bonds if Greece slipped into another debt crisis?

    1) I would buy some more.
    2) I would sell my existing securities.
    3) I would hold my existing securities (neither buy, nor sell)
    4) Do not know/no response

23. Consider that you have a Hungarian government bond maturing in two years that is worth HUF 1 million. What would you do with your Hungarian government bonds in the case of another global economic downturn?

    1) I would buy some more.
    2) I would sell my existing securities.
    3) I would hold my existing securities (neither buy, nor sell)
    4) Do not know/no response

24. Consider that you have a Hungarian government bond maturing in two years that is worth HUF 1 million. You have read that a prominent investor has started to buy Hungarian bonds. What would you do with your Hungarian government bonds?

    1) I would buy some more.
    2) I would sell my existing securities.
    3) I would hold my existing securities (neither buy, nor sell)
    4) Do not know/no response

25. Consider that you have a Hungarian government bond maturing in two years that is worth HUF 1 million. You have read that most Hungarian households are purchasing Hungarian government bonds. What would you do with your Hungarian government bonds?

    1) I would buy some more.
    2) I would sell my existing securities.
    3) I would hold my existing securities (neither buy, nor sell)
    4) Do not know/no response

26. Consider that you have a Hungarian government bond maturing in two years that is worth HUF 1 million. You have read that a German investment fund has started to purchase Hungarian government bonds. What would you do with your Hungarian government bonds?

    1) I would buy some more.
    2) I would sell my existing securities.
    3) I would hold my existing securities (neither buy, nor sell)
    4) Do not know/no response

27. What would you do if a close acquaintance explained that he had a completely opposite opinion in an investment matter?

    1) I would change my investment decision, agreeing with his opinion.
    2) I would stick with my own decision and would try to validate that it is correct.
    3) It would crush me, the criticism would hurt my feelings and make me confused.
    4) Do not know/no response

28. Do you agree that it is the patriotic duty of a Hungarian person to buy Hungarian government bonds?

    1) I agree
    2) I do not agree
    4) Do not know/no response

29. Which form of saving would you prefer if you had to make a decision about half of your existing funds (or, for lack of any funds, about your 6-monthly income)?

    1) I would invest my funds in 5-year government bonds with a safe 5% return.
    2) I would purchase real estate (participate in a real estate purchase transaction) and sublet the real estate, undertaking the risk of a potential real estate market devaluation, the payment of periodical renovation expenses and tenants' potential payment delays in the next 5 years.
    3) I would invest my funds in stocks: according to the current outlook, stock prices will either double or halve in the next 5 years.
    4) I would engage in high-leverage foreign exchange trading. If I make a loss, my debt will exceed even my existing funds – but if I make a profit, I will increase my funds tenfold. According to the outlook, a currency is as likely to weaken as it is to strengthen.
    5) I would join a poker game or engage in gambling or sports betting where I either lose all the money for good or increase my money by a hundredfold.
    6) Do not know/no response

The Euro and the Euro Area: Flawed Construct or Unfit Members?*

Tamás Bánfi

The introduction of the euro was a political rather than an economic decision. Central banks opposed it, and European Union experts, including Sándor Lámfalussy, expressed their concerns that the harmonisation of the tax and fiscal policies leading to the economic union had not even been started, and Member States were reluctant to take even the initial steps. The establishment of the European Central Bank and the single monetary policy are necessary but not sufficient conditions for the operation of the euro area. The EU budget is inconsequential compared to the combined national budgets (one larger portion comprises the controversial agricultural subsidies), and it is unable to address the free movement of labour and capital within the integration or perform the necessary redistribution of income. Claiming that it is an optimum currency area does not hold water either. First, the political nature of the euro area dominates in the original formulation of the theory and also in today's focus, and second, in view of the present and its envisaged future, the euro area is based on the logic of geographical location. One question entailing profound consequences was not posed or answered during the introduction of the euro: what will happen if the individual economies of the members do not converge to the developed ones based on either real or nominal indicators, but rather diverge from them, and as a result the financing requirement of the balance of payments in certain countries steadily increases? No exchange rate adjustment can be performed, and the national government is unable or unwilling to reduce wage and income transfers, which would be an option for adjustment. Taking a look at the forced exchange rate adjustments in the more advanced European countries in the 30 years prior to the birth of the euro area, it should come as no surprise that after past and future enlargements of the euro area the real and nominal productivity developments of certain members exhibit divergence, the impact of which should be addressed.

Journal of Economic Literature (JEL) codes: E42, E52, F33, F45

Keywords: euro area, optimum currency area, euro, exchange rate

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1. Introduction

In 1999, the euro area was established within the European Union. At the beginning of the first phase, it only affected banks, as bank money changed to the euro. In the second phase, from 2002, cash transactions started using the euro, which thus replaced the national currencies of members in all payments.

The introduction of the euro to supplant the national currencies in euro area countries was a simple process from a technical perspective. The exchange rate between the euro and the national currencies of the 11 founding countries was determined and fixed on 31 December 1998, based on which market prices, financial assets and liabilities and the monetary value of assets were converted into euros from 1 January 1999, i.e. the nominal values previously measured in national currencies were divided by the fixed euro exchange rates.

There is no precise method for determining the fixed euro exchange rates. One possibility is to base the calculation on the averages for the predetermined time range, and later country-specific adjustments may be performed taking into account the external and internal features of the national economy, but these are not necessary or compulsory. For want of a better formulation, nothing more can be stated than the fact that the conversion rates were realistic at the outset, and expressed the market share of the legacy currencies.

2. Lámfalussy's view on the introduction of the euro

Sándor Lámfalussy is often referred to as the father of the euro. This is unjustified, since he bears no responsibility for the introduction of the euro. That was a purely political decision, while experts, primarily national central bank representatives and also Lámfalussy, did not support the idea under the conditions in 1999.

Responding to a concrete question, Lámfalussy gave an answer succinctly outlining his professional stance: "It was a political mechanism. There never would have been a single currency if the decisions had been left to the central banks. Never. That's entirely clear. There was real interest in it among the governors, but it was principally those representing the smallest countries. The Belgians had that in mind… But Belgium is a small country. The Dutch certainly had doubts. They wanted to give themselves stability by tying themselves entirely to the Deutschmark. […] On the French side, the Banque de France was entirely dependent on its government. It did not have a shred of independence. They would do whatever they were asked to do. Finally, the Germans did not want the single currency. The motivation was political, and the one man who played a very important role in persuading the people was Jacques Delors. […] When Delors felt that one or the other of them – and this was particularly true of Karl Otto Pöhl and his colleagues at the Deutsche

Bundesbank – really did not want Monetary Union, he would explain the situation to Kohl. Kohl would then instruct Pöhl – irrespective of the independence of the Deutsche Bundesbank – to keep quiet. Once the governors had sensed that there was a political mandate, they remained essentially disciplined and participated in the establishment of the euro. They made a positive contribution, but they were not overjoyed about it…" (*Lámfalussy – Maes – Péters, 2014, pp. 128–129*).

Lámfalussy expressed his official expert opinion in a study entitled "Macro-coordination of fiscal policies in an economic and monetary union in Europe", and according to an interview on the study, "it stressed the weakness of the structures that were in the process of being created: we had a monetary pillar that was perfectly constructed, but no suitable economic pillar had been established. The problem of the policy mix stemmed from that. A policy mix involves both monetary policy and budgetary policy. The text explains why the coordination of budgetary policy is indispensable, and why an economic union needs to be created – i.e. a single budgetary and fiscal policy which acts as a counterpoint to monetary policy, allowing a combination of the two. So long as there is no coordination of fiscal policies, the outcome in terms of the overall fiscal impact is entirely uncertain. In fact, I compared the functioning of the EU with countries with federal structures, such as Germany, the United States and Switzerland, and I showed the percentage of public expenditure and public income that passed via the federal level and the percentage that remained in regional entities. It was clear that the federal level was the main element that the government was able to operate. By comparison, in the European structure, the percentage that passed via the Commission only accounted for around 1.5 or 2 per cent of GNP, and much of that related to the agricultural policy… The text was annexed to the report, and I'm fairly proud of it" (*Lámfalussy – Maes – Péters, 2014, pp. 128–131*).

In the end, the experts backed down in the face of political pressure. To the question whether the fact that experts failed to underline the necessity for an economic union in parallel with a monetary union was because they did not want to scare off politicians, thereby undermining the whole plan, Lámfalussy's answer was generally affirmative: "… we did say – and I've checked; I wrote this in my own note – that EMU would not be able to function without the coordination of fiscal and budgetary policies. Evidently, what was in the minds of some of us – myself included; I was no different – was that we hoped things would develop in that direction. That is to say, that once Monetary Union had been established, it would become increasingly clear that Monetary Union needed to be supplemented by an economic union. We hoped that there would be a move in that direction" (*Lámfalussy – Maes – Péters, 2014, pp. 130–131*).

3. Drawbacks of centralised monetary policies – Attempts at harmonising national fiscal policies

Political decision-makers, principally at the convincing insistence of Jacques Delors, accepted that after the European single market is created, the single currency can be introduced if the European-level central bank pursues a single monetary policy. Experts' contrary opinion, for example the Lámfalussy study cited here, was not taken into account.

The birth of the euro area and the euro-harmonised monetary policy, as the interest rate policy of the European Central Bank, led to virtually the same interest rate levels across all members. Political and economic decision-makers assumed that the advantages emerging in the short run (reduction in transaction costs, elimination of exchange rate risk) would accelerate the convergence processes among members, that the Structural and Cohesion Funds would mitigate, and even eliminate in the longer run, the differences between the core and the periphery, and that the assumed positive effects arising from the operation of the single financial market would be beneficial irrespective of the business cycle. These expectations were highly exaggerated.

Both Hungarian and international literature analyse the consequences in detail and show how the assumptions were flawed. "Within the euro area, the euro is weak for the developed countries and strong for the group of southern countries, while the former group, in particular the German economy, is providing financing to the southern countries in the euro area. The crisis emerging in the euro area at various levels, for example the crisis of the welfare state and the internal crisis of the euro, has combined and become open in the southern Member States of the euro area, whereas it has remained hidden in the northern and western Member States, although it is starting to show in the growth and productivity data. […] The euro area was designed for positive economic performance and was not prepared for crises. The introduction of the euro occurred between 1999 and 2001 during a period of exceptionally strong, simultaneous economic growth, and they were unable to devise an institutional system for the efficient functioning of the currency union and its ability to handle crises. This shortcoming is now evident, and it is the reason behind the continuous partially open, partially hidden crisis affecting the euro" (*Matolcsy 2015, pp. 46–47*). "In the European Union, the crisis was also influenced by the substantial differences in the inflation of the countries using the single currency in the years before the crisis, on account of the surplus inflation generated by the convergence processes and the increasing labour costs in certain countries. Inflation was substantially higher in Greece, Ireland and Portugal than, for example, in Germany. In the context of a common monetary policy and a uniformly low key interest rate, this made the real interest rate negative in the countries concerned, i.e. the countries were able to borrow and become indebted with a negative real

interest rate. This was the main driver behind their growth, which ultimately led to the accumulation of significant amounts of debt and a considerable decline in competitiveness due to the lack of structural reforms" (*Lehmann – Palotai – Virág* (*eds.*) *2017, pp. 77–78*). The significance of gross flows and stocks as compared to net balances should be underlined. The net external balance changes in line with the combined balance of the current account and the capital account, however, financing should be provided in line with gross developments, since the debt of one sector cannot be offset against the assets of another (*Boros 2017, p. 88*).

In contrast to the centralised monetary policy, national fiscal decisions remained practically at the national level. The introduction of the Stability and Growth Pact, which expected members to meet the figures determined for fiscal deficit and government debt in each cycle, can be attributed to either caution or a lack of confidence. The Pact's failure was indicated by the fact that in 2009, five Member States (United Kingdom, Greece, Ireland, Latvia and Spain) had a double-digit fiscal deficit. There were no sanctions, and there could not be any after the ECOFIN Council had voted against penalising Germany and France for their excessive deficits in 2003.

In the wake of the 2008 global financial crisis, the previously hidden shortcomings in budget management surfaced, therefore the reform of the Stability and Growth Pact became inevitable. In 2011, several regulations and Directive 2011/85/EU were adopted. The directive pertains to budgetary planning and management techniques and not to the Maastricht criteria, which may only be amended together with the Treaty (*Pulay 2015*). The criteria had to be made stricter without amending the Treaty, therefore first the so-called "six-pack" strengthened economic policy coordination, then the two-pack bolstered the supervisory powers within the euro area. The "six-pack", which considerably revised the Stability and Growth Pact, includes fiscal indicators as well as nine macroeconomic criteria. Failure to meet these or to take steps to improve them may be sanctioned. In 2012, 25 Member States signed an intergovernmental agreement called the "Treaty on Stability, Coordination and Governance in the Economic and Monetary Union" (*Győrffy 2013, Jankovics 2013*).

The practice of fiscal oversight was tightened in the new system to facilitate prevention. The so-called "European Semester" was introduced, under which Member States have to submit their stability and convergence programmes by mid-April every year. Based on these, the Commission may conduct preliminary controls, make compulsory recommendations for the sake of coordination and consistency, and evaluate the steps governments have taken in response to the recommendations from the previous year. In addition to the clear-cut warnings, two quantifiable measures were introduced. The first compares the growth rate of the expenditure net of debt servicing, unemployment benefits and the EU subsidies flowing through the budget to the medium-term plans of the Commission. If Member States wish to introduce measures that increase the deficit, decisions

offsetting this (by reducing expenditure or increasing revenues) must be made. The other benchmark refers to the gradual sinking of the portion of debt in excess of 60 per cent. These quantifiable obligations may be significant when it comes to the applicability of sanctions.

4. The dilemma: Is the euro area a system that strengthens or at least does not weaken in the long run, or merely a short-term construct that exists due to political pressure?

The lack of coordination between tax and fiscal policy leads to detrimental tax competition on the one hand, and impedes the redistribution facilitating social and economic convergence among participating countries on the other hand. Moreover, the "federal budget" is insignificant in size as compared to the combined amount of national budgets, and tax competition limits the volume of tax revenues and thus also budgetary spending despite greater needs. There is an undeniable need for a single fiscal policy in line with the single monetary policy. At the same time, it is unfathomable why no efforts were made to develop the corrective mechanism essential for smooth functioning, and why the members were not forced to avoid a change in the economic parameters determining the conversion coefficient between the national currency and the euro calculated at the birth of the euro area, or subsequently for later joiners, which reduces the external competitiveness of a country in the world market.

This condition may be easier to grasp from another perspective. The conversion cost of the currencies among each other notwithstanding, the introduction of a single currency and the following solution are equivalent: members keep their national currencies but the fluctuation band of the exchange rates among each other is zero, and the fixed exchange rates cannot be changed in the long run, essentially during the whole lifetime of the economic union. In this scenario, the condition for smooth functioning is the introduction of a single currency, there is basically no difference. But what can be expected in reality?

According to textbooks, exchange rates depend on interest rates in the short run, and on purchasing power parity through balance of payment positions in the longer run, i.e. these determine exchange rate developments. Short-term effects falling under the scope of exchange rate speculation can now be disregarded. In the longer run, economic developments differ across members in an economic union both in terms of direction and magnitude, while the exchange rates of the currencies among each other are fixed, they cannot be affected by changes; therefore certain currencies are overvalued, while others are undervalued. The overvaluation or undervaluation of members' currencies can be prevented by stability in real productivity, which fundamentally determines international competitiveness, and unchanged prices, or changes affecting countries to the same

extent. If the conditions are not met, a smaller increase (or a greater reduction) in real productivity and/or a more substantial price increase (minor price decrease) overvalues participating countries' currencies, and conversely, a more robust increase (or a smaller fall) in real productivity and/or a lesser price increase (greater price decrease) undervalues participating countries' currencies. If a single currency was chosen and introduced in an economic union instead of keeping members' national currencies, the single currency becomes overvalued or undervalued relative to the conversion rate determined and employed at the outset.

However, the measures addressing the effects of the symmetrical changes vary widely, depending to some extent on the magnitude of the changes. In theory, adjustments are always possible; in practice, however, they may prove impossible due to political reasons. There is no intense pressure to intervene in the case of undervaluation, while in the case of overvaluation, the export–import and capital export–capital import imbalances may cause a rising current account deficit, which has to be financed. The growing current account deficit continuously raises both the cost and amount of financing, and its upper limit is the amount of loans that can be obtained. Intervention or, ultimately, the need for intervention call for a reduction in wages, income other than wages and public transfers in line with the extent of the overvaluation.

The application of the theory to the European Union and the euro area leads to two conclusions:

- The euro is the common payment instrument in the economic union. The single and common fiscal and monetary policy are linked to an EU-level balance of payments. Similar to the state budgets in the US, Germany or Switzerland, members may only collect local taxes to finance aims in their local interest; or
- Member States using the euro pursue a common monetary policy, while tax and fiscal policy remain largely at the national level, and the balance of payments is continuously settled at the expense of the common foreign reserves.

The first is viable even in the long run, while the second is not. A continuous transition may lead from the first to the second, where euro area countries gradually harmonise tax and fiscal policies in addition to the common monetary policy, and converge in terms of price developments using income policy instruments. If necessary, the balance of payments is supplemented from the common foreign reserves. If the transition is not a real "transition" because some members do not accept the harmonisation and fail to make the necessary domestic national economy decisions, the members concerned have to leave the euro area, or those who are still outside are denied access to the currency area. The result is a two-speed European Union. The first group comprises the economic union countries, while the second includes the other Member States.

Prior to the introduction of the euro, why was the possibility of depreciation in certain Member States and appreciation in others and thus the continuous imbalances in the balance of payments not even discussed? This mistake is especially baffling in view of the period between the 1960s and 1999. It can be seen that in all three periods (the repeated depreciation and appreciation of national currencies at the end of the 1960s, the currency snake, the European Monetary System) exchange rates fluctuated substantially, and currencies had to be depreciated and appreciated repeatedly. According to one possible answer, experts forgot the balance of payments requirement, just like it was not included in the convergence criteria for Member States. The other is a perhaps even more absurd assumption. Politicians kept instructing the "independent" central banks, which engendered defiance in central bankers, who forgot a critical issue, the balance of payments requirement. None of those involved in these developments will ever admit this, therefore everyone is free to think whatever they choose.

5. The optimum currency area theory and the euro area

Economic literature clearly attributes the optimum currency area theory to Robert Mundell's 1961 study. Many people have "tampered" with the original theory since, supplementing and expanding it in various ways. Despite the fact Mundell did not join the discussion on fixed and flexible exchange rates, he based his thinking on it, as a currency area requires that its member countries (territorial units) fix the exchange rates between themselves or use a common currency. Somewhat contrary to the public perception, Mundell stressed the importance of the political goal rather than an economic one. The integrated financial (currency) system is mainly optimal from a political perspective, and the same cannot be proven from an economic viewpoint, if it can be interpreted at all.

The two dimensions must be differentiated when understanding the concept of the optimum currency area. The political and economic entity of a democracy comprising a federation of several states (a typical example is the US) where the single currency is backed by a uniform institutional system, a single monetary policy and the federal budget is fundamentally different, from an integration of independent national economies based on their geographical location. While maintaining national identity, independent financial policy has to be renounced, which can only be warranted by the short- and long-term economic interests of the individual nation states.[1]

One acceptable synthesis of the debates surrounding the theory on optimum currency areas is provided by the textbook "Economics", which is able to satisfy

[1] The most prominent of the wide range of studies on optimum currency areas are the works by *McKinnon* (*1963*), *Kenen* (*1969*), *De Grauwe* (*2012*), *Krugman – Obstfeld* (*2003*), and the different approaches and supplements are discussed in detail in *Boros* (*2017*).

the widest range of interest in economics: Group of regions or countries with high labour mobility among them, or that may be subject to similar, simultaneous aggregate demand and supply shocks. Under such circumstances, no large exchange rate movements are necessary in rapid macroeconomic adjustment, therefore they can fix the exchange rates of their currencies or use a single currency (*Samuelson – Nordhaus 2012, p. 608*).[2]

The establishment of the euro area was a political decision, and the subsequent enlargements were influenced by politics, too. "The Six" forming the core are at the centre of continental Europe, while later joiners are peripheral countries with very different parameters compared to "the Six" and to each other, therefore the composition of the euro area was exclusively based on geographical location rather than the criteria defined in the optimum currency area theory. Of course, the euro area can be analysed to see whether it meets the criteria of optimum currency areas – it clearly does not – but mitigating the consequences arising from the differences across members is in the common interest. We should once again quote the textbook by *Samuelson – Nordhaus* (*2012*): "Perhaps the greatest advantages may be political integration and Western Europe's stability – the region has lived in peace for six decades after waging wars against itself during a large part of its written history" (*p. 525*). Europe may look somewhat more attractive from Europe than from the US, but the outside opinion could be more realistic and true, thus it should be accepted.

6. Development of nominal and real productivity in euro area countries

The national currencies of the founding members of the euro area and of the countries that joined later were linked to the euro by predetermined and mutually accepted coefficients. The established coefficients were presumably realistic, although there is no precise method for their calculation. There is only a basis, the exchange rates of the national currencies between each other in the case of the founders, and the market rate of the national currencies and the euro in the case of later joiners. In the period directly preceding the introduction of the euro, without knowing the official exchange rate, the market rate may move up or down or even "oscillate nervously" for speculative or hedging purposes, but the average level of a longer period (3–6 months) is a market reality which countries can and should deviate from. That said, the extent of this deviation is limited. A large divergence would be unwarranted and unjustifiable.

[2] This justification is similar to the explanation of the smooth functioning of the international financial system based on the gold standard before the First World War: the four countries generating the overwhelming majority of global flows (UK, US, Germany, France) were in the same phase of their business cycles, therefore their mutual goods and capital flows increased or decreased in harmony, and there were no substantial balances of cross-border payments (*Ford 1965*).

After the accession, the economies of members function with unchanged or slowly changing conditions and effectiveness, and based on that the prices and wages converted into euros at the outset change continuously. It is reasonable to assume that the direction of the changes does not vary much across members, while their extent typically does; this affects the flow of goods and capital among the members and outside the euro area differently, while the euro expresses the original ratios. Even if there are no spectacular signs yet, some non-negligible data points should be considered.[3]

One well-known tension arises from the latent overvaluation of the economy in Greece, where the situation is much more severe than suggested by the data, and the circumstances may be similar in Spain, and possibly in Portugal and Italy as well. However, predictable and unpredictable events can cause much bigger tensions than currently observed. If, instead of a "two-speed Europe", all the Member States of the European Union are encouraged to introduce the euro, the coefficients can probably not be determined at the time of their accession at a level acceptable to the Member States, which would thus most probably exclude a future overvaluation of the economy. Furthermore, some Member States may even split up (Spain, Belgium, Italy). If that happens, and, for example, Catalonia secedes from Spain, the euro has to be adjusted not only for Catalonia but also for the "rest" of Spain.

Of course, without the achievement of economic integration (which is realistic based on our current knowledge), several national economic policy goals and instruments can cause tensions, which can be adjusted by eliminating the latent overvaluation. Without going into details, one only needs to mention the well-known anomaly that interest rate levels derived from the single monetary policy of the European Central Bank are largely the same, while inflation rates vary across countries.

7. Conclusions

At the time of their accession, euro area countries converted the prices, wages, income transfers and the whole stock of assets valued in the national currency to the euro, using a predetermined coefficient. As national economies function, the parameters determining the effectiveness of this functioning vary, and labour productivity and prices depending on market developments also fluctuate. The European Union's subsidy policy aims to foster changes in the direction of convergence more or less successfully. The achievement of the common goal may be hampered by insufficient subsidies, inappropriate use of funds and misguided economic policies that do not help convergence but cause the affected countries

[3] See the data series in the *Eurostat* database:
Real labour productivity per person: http://ec.europa.eu/eurostat/tgm/refreshTableAction.do?tab=table&plugin=1&pcode=tipsna70&language=en,
Nominal labour productivity per person: http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=tec00116&plugin=1.

to lag behind. This can be observed in lower labour productivity growth (or in a worse-case scenario, even a drop in labour productivity growth) as compared to more advanced national economies, which constrains the competitiveness of exporters and boosts that of importers. This entails a financing requirement for the balance of payments deficit, which signals the latent overvaluation of the euro. The overvaluation can be increased by a potential higher inflation rate than in other participating countries, which creates a need for intervention. In the absence of an adjustment tool, the only option is to cut the wages of public sector workers and the income transfers paid from the government budget, to which the private sector can only adjust with a lag and to a lesser extent.

The government's decisions are aligned with the four-year political terms, i.e. they avoid drastic interventions and postpone them as long as possible, which further undermines the external position of the participating countries and increases the extent of the necessary adjustment. The development, adoption and compulsory application of a mechanism independent from national governments is inevitable.

The adjustment tool and technique cannot change, there is no other option, however, instead of a voluntary approach, the EU can and should intervene with a regulation across the integration. Based on its review of members with growing external debt, the EU institution designated for this task would, at predetermined intervals, for example every five years, establish the implicit overvaluation of the common currency (the euro) and its extent. In line with the decision of the EU institution, the government would cut the wages, incomes and budgetary transfers with a coefficient below 1, which expresses the overvaluation, using legal regulation. Although market forces reign supreme in the private sector, the minimum wage can be reduced there as well.

The forced intervention may cause disagreement among stakeholders, but more advanced Member States can expect less developed ones to converge gradually by using the subsidies financed from the tax revenues of net contributor countries appropriately.

8. Looking back: The instability of the exchange rate regime in the decades before 1999[4]

From 1967 to the introduction of the ±2.25 exchange rate band. After the Bretton Woods Agreement was signed, the parity adjustments accelerated from 1967, as on 18 November the pound sterling was devalued, for the second time, less than

[4] The thirty-year-old history of Western European currencies' exchange rates is nothing more than a warning sign. The genuine or feigned haste of the countries in the European Union to get into the euro area does not promise fewer exchange rate tensions than in the past. Expecting to eliminate the need for exchange rate adjustments for good by requiring countries to spend two years in an "ante-room" before accession is overly optimistic, or perhaps even naïve. No references will be included in this historical section, as the description of the events can be found in old economic dailies.

necessary. The weakening of the pound was halted, but the process continued with the French franc. Similar to the pound, the currency crisis was caused by a decline in export competitiveness rather than by speculation. Monetary reserves diminished by USD 2.5 billion in a year, the exchange rate of the franc on the currency market nosedived, and as a last resort, the central bank raised the interest rate from 3.5 to 5 per cent. The franc stabilised, but soon another "bombshell" hit when the news of the Deutschmark's appreciation started spreading.

The Deutschmark was undervalued relative to other currencies, especially the US dollar, the pound sterling and the franc. The FRG's balance of payments surplus increased every year due to the surplus of the trade balance. On account of the balance of payments surplus, foreign reserves rose close to USD 10 billion in 1968, while the exchange rate was above parity and below the upper intervention point. Even the possibility of appreciating the Deutschmark was considered an attack on overvalued currencies. While the news on the devaluation of an overvalued currency entails heightened instability in the given currency and temporarily strengthens other overvalued currencies, news on the appreciation of an undervalued currency weakens all the undervalued currencies.

The franc experienced another crisis on news of the Deutschmark's appreciation. The franc was exchanged en masse in the fourth quarter of 1968. The exchange rate of the franc started to fall, the central bank raised the interest rate from 5 to 6 per cent, and foreign reserves were depleted at breakneck speed. The foreign exchange market was closed on 20 November 1968, and was reopened only five days later. The public was convinced that the franc would be devalued, however, the French government scrapped the idea for political reasons. The appropriate devaluation was opposed by several countries, primarily the US. The original parity remained, and the Group of Ten provided a loan of USD 2 billion to support the exchange rate. The government introduced administrative measures.

Despite being devalued, the pound sterling did not stabilise. Instead of improving, the trade balance of the UK showed an unprecedented deficit. On 20 November 1968, the foreign exchange markets in the UK were closed for three days. The currency turbulences abated by early 1969.

On account of the French presidential elections, the franc's devaluation was considered once again, as a result of which speculative money turned towards the FRG. The Deutschmark's exchange rate was at the upper intervention point, the West German central bank's foreign reserves increased, and the appreciation of the D-Mark came into focus again. The pound sterling weakened on the news, its exchange rate against the Deutschmark sank to the lower intervention point. This is because the West German central bank was only willing to undertake a partial intervention, and maintained the limit only against commercial banks; the pound sterling's exchange rate against the Deutschmark breached the intervention point.

With a surprise decision on 8 August 1969, the French government devalued the franc by 12.5 per cent. On the eve of the West German election, 25 September 1969, the foreign exchange markets were closed. Four days later, on 29 September, they were reopened, but the West German central bank did not intervene on the foreign exchange market. The exchange rate of the Deutschmark rose above the intervention point against all currencies, and the exchange rate was allowed to float freely. The temporary nature of the floating could be expected, as the West German government appreciated the Deutschmark by 8.5 per cent.

On 9 April 1971, France made a spectacular announcement, namely that it was not willing to pursue a lending or foreign exchange policy dependent on the international situation, therefore it did not deem it necessary to lower the interest rate from 6.5 per cent. The French tried to go their own way once again, and failed this time as well. The crisis was prevented by the announcement of the West German Institute for Economic Research, namely that the only way of limiting dollar inflows and reining in inflation was to introduce a floating exchange rate regime for the Deutschmark. Upon hearing the announcement, speculators launched an attack, converting liquid funds into Deutschmark. The Bundesbank bought almost USD 1 billion at the lower intervention point (DM 3.63). The next day, capital flows continued, and on 5 May, after the opening of the foreign exchange market in Frankfurt, the West German central bank was forced to convert over USD 1 billion, therefore the foreign exchange markets had to be closed. The British and the French central banks were still willing to exchange the USD, therefore their dollar reserves bloated significantly. The West German foreign exchange market could not be opened at unchanged parity.

After considering the different options, on 10 May 1971 the FRG government decided to open the foreign exchange markets but suspend central bank interventions, and allow the exchange rate of the Deutschmark to rise, i.e. to float. On the same day, the Deutschmark appreciated against the dollar by 4 per cent.

In August, the US announced the suspension of the gold conversion of the USD and the introduction of a 10-per cent import duty. Following the International Monetary Fund's approval, two exchange rates were introduced for the franc on 23 August. The fixed parity was left unchanged on the official market where official and trade-related foreign exchange transactions were conducted, while the exchange rate was allowed to fluctuate on the free market as guided by the forces of supply and demand. The Benelux countries formed a monetary bloc, floating the exchange rates of their currencies against the outside world.

The "currency snake". After the Western European measures, all the countries concerned, now including Japan, called for an agreement, but due to their different views they were only able to agree that the devaluation of the US dollar was an essential precondition for monetary settlement. This need was coupled with a serious

demand, and it was satisfied on 19 December 1971: the dollar was devalued against the other currencies by 7.9 per cent. At the same time, the floating of the yen and the Deutschmark was abandoned, and the two currencies were appreciated by 7.66 and 4.61 per cent, respectively. The French maintained the double exchange rate, and had no fixed exchange rate for only one currency, the Canadian dollar. With the exception of these two currencies, the fixed-parity exchange rate regime was restored, but the prevailing ±0.75-per cent floating range was increased to ±2.25 per cent. The devaluation of the dollar dispelled the myth that it was impossible to do so. However, the adoption of the ±2.25-per cent range concerned particular interests. The broadening of this range violated the long-term goal of the European Economic Community, i.e. the achievement of the currency union, and also the prevailing system of settlements. The ±2.25-per cent (4.5-per cent) band means that the exchange rates of all the currencies against the dollar should be kept within that range. In this system, with the exception of the dollar, the exchange rate between any two currencies could move in a 9-per cent range. For example if the Deutschmark is at the +2.25-per cent limit against the USD and the French franc is at the –2.25-per cent limit also against the USD, the position of the Deutschmark and the franc may change, with the Deutschmark sinking to the –2.25-per cent lower limit and the franc rising to the +2.25-per cent upper limit, thus the two currencies' exchange rates change by 9 per cent (4.5–4.5 per cent) relative to each other.

The 9-per cent fluctuation range was too broad for the members of the European Economic Community, therefore they decided to reduce the exchange rate fluctuation band between the currencies of the members to half that, i.e. 2.25 per cent (±1.125 per cent) from 24 April 1972, by harmonising foreign exchange market interventions. Thanks to that measure, the exchange rates of the EEC currencies could fluctuate within the ±2.25-per cent band determined in December 1971, i.e. they could move up and down against the dollar as a group, by observing the allowed ±1.125-per cent difference relative to each other. The Benelux countries maintained the larger range against other countries, while the band for the fluctuations against each other was called, figuratively, the "snake in the tunnel". If the limits of the fluctuation relative to each other are reduced to half of the figure for the outside world, the narrower band is called the neutrality point, and in this case the fluctuation bands against each other and against the dollar are the same.

The relative calm in 1972 was disrupted by the floating of the pound sterling in June. On 22 January 1973, Italy followed the French example, and the double foreign exchange market was introduced for the lira. In contrast to trading flows, the exchange rate of the lira was not protected in the case of capital flows, it developed in line with the current supply and demand. On 12 February 1973, a "bombshell" hit as the USD was devalued, for the second time in 14 months, by 10 per cent. After this, the finance ministers of the EEC decided to float the six strong currencies together against the dollar, i.e. to "let the snake out of the tunnel". The pound

sterling, the Irish pound and the lira were left out of this. As a precaution, the Deutschmark was appreciated by 3 per cent.

The weakness of this combined float is that the extent by which the currencies in the Community can fluctuate relative to each other is limited, it cannot breach the upper and lower limit of the band, which, however, depends on the developments determining the position of the balance of payments. The inadequate adjustment of members may also prevent the float in bands. This is supported by the second appreciation of the Deutschmark by 5.5 per cent on 19 June 1973 in order to save the combined float, as well as by the French measure on 20 January 1974 when the franc left the "snake".

The European Monetary System. The internal exchange range rigidity of the currency snake required a new scheme, which, unsurprisingly, was established by the agreement between the German chancellor (Helmut Schmidt) and the French president (Valéry Giscard d'Estaing) on the predecessor to the euro area in March 1979. Beyond the general economic and social policy principles, the aim was to bind the currencies of the Member States closer together and to mitigate the overall exchange rate movements. The weighted basket of European currencies, the ECU, was developed. The ECU did not exist in the form of banknotes and coins, it was exclusively a unit of account.

The exchange rate of the ECU was determined by the weighted average of members' foreign exchange rates. The weights were determined based on trading flows within the Community and adjusted every five years. The initial proportions were modified twice until 31 December 1999. Members' currencies could deviate from the exchange rate expressed in ECU by ±2.25 per cent (with the exception of the Italian lira, for which 6 per cent was established. Tacitly, the Deutschmark dominated this set-up.

Summary. The conclusion summarising the practices of the past 30 years is evident. In the late 1960s and early 1970s, more advanced European countries were repeatedly forced to adjust their exchange rates. The currency snake used in the 1970s has proven that the narrower range of exchange rate movements introduced in order to achieve the currency union is too narrow and cannot be maintained for a long time in a system that excludes the possibility of currency parity adjustments. By changing the weighting of the currencies in the ECU basket, the European Monetary System sought to achieve the inevitable adjustment of currency parities, and these efforts were supported by members through continuous market interventions protecting exchange rates, and credit lines. In the 30 years before the introduction of the euro, the parity adjustments allowing exchange rate movements were necessary, and if they were constrained ("currency snake"), the system became unsustainable. Based on the experiences, there is no explanation for the optimistic assumptions in connection with the introduction of the euro.

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The Contribution of Thaler to Behavioural Economics*

Gábor Neszveda

Richard Thaler was awarded the Nobel Memorial Prize in Economic Sciences in 2017 for his contribution to behavioural economics. The main purpose of behavioural economics is to build a bridge between economic thinking and the results of psychological research. Below, I present the fields where the work of Thaler stands out the most, such as limited rationality, lack of self-control and social preference. In addition, his findings also laid the foundations for behavioural finance. His unwavering, successful and high-standard research over more than forty years has laid the foundations for a number of new research directions, not only in sciences. The elaboration of the theory of libertarian paternalism, among others, is also associated with his name, which has substantially shaped many decision-makers and regulations over the past decade.

Journal of Economic Literature (JEL) codes: D03, D90, G02, G40

Keywords: behavioural economics, behavioural finance, limited rationality, social preference, lack of self-control, Nobel Memorial Prize

1. Introduction

Richard Thaler was awarded the Nobel Memorial Prize in Economic Sciences in 2017 for his contributions to behavioural economics. Behavioural economics builds a bridge between psychological and economic approaches. Psychological research tends to apply descriptive approaches and observes how people take decisions. Then it categorises the observations, but often fails to develop a formal normative model. By contrast, economic models prefer to apply a normative approach and try to describe how economic systems and decision-makers should operate under a given set of assumptions. This train of thought leads to the creation of the homo oeconomicus. Homo oeconomicus behaves in line with the assumptions of the economic models, but completely ignores human characteristics. As opposed to this, Thaler proposes placing the observation of human behaviour into the focus of

* The views expressed in this paper are those of the author(s) and do not necessarily reflect the offical view of the Magyar Nemzeti Bank.

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economics, instead of analysing the homo oeconomicus. In his research work, Thaler has incorporated psychological theories into economic questions, and promoted the use in economics too of approaches accepted in psychological research. As a result, experiments became more accepted in economics, and economic models started to incorporate human behaviours observed in psychological research.

Behavioural economics is a fairly new but increasingly popular field of economic sciences. A clear sign of this is that 15 years ago, in 2002, Daniel Kahneman and Vernon L. Smith were also awarded the Nobel Memorial Prize in recognition of their contribution to behavioural economics and experimental economics. Their names and scientific achievements are often linked to the emergence of behavioural economics. Thaler and Kahneman have co-authored a number of studies and their research topics are closely related. The research work of Kahneman has mainly been recognised for its results achieved in the field of risk preferences, while the work of Thaler is mostly known for the findings in the field of time preferences. But the common denominator of the two scientific lifetime achievements is that they both argue for reviewing the assumptions of economic models. They refuse to accept the assumption that decision-makers always follow their own interests and that they always consciously take the decision which is best for them. In their view, decision-makers take into account not only their own selfish interests but also the interests of the community. Besides, humans frequently tend to resort to simplifications, which rarely leads to the best decision. These principles appear on financial markets and in investor psychology too. Thaler is also considered the founder of behavioural finance for his research conducted in this field. Using the summary of the *Royal Swedish Academy of Sciences* (*2017*) as well, in this paper I present the three main areas of Thaler's work as well as the impact of his research results on decision-makers and financial thinking. First, I review the theory of limited rationality, and as part of this, the endowment effect and the theory of mental accounting. Then, I present research studying the lack of self-control, and thirdly, his research conducted in the field of social preference. Finally, I give a short overview of the impact of his results on various public issues. My study does not extend to a detailed analysis of the mathematical models.

2. Limited rationality

Mainstream economics assumes the complete rationality of decision-makers. Although this assumption entails a number of mathematical advantages in the model, it is not supported empirically. Behavioural economics assumes that in the case of more complex and complicated issues, people use simplifications, or heuristics and take their decisions based on these[1]. One of the most frequent

[1] *Golovics* (*2015*) gives a detailed overview of the topic.

reasons behind simplification is the insufficient level of cognitive capacities. A number of economic models assume that decision-makers reach their ultimate decision by resolving serious optimisation problems, but in contrast, it is difficult to believe that an average person optimises in reality prior to taking a decision.

2.1. Endowment effect

The endowment effect is the hypothesis that people ascribe more value to things merely because they own them. One of the most famous examples of the endowment effect was when the participants to the experiment were randomly given a cup or a pen that they could trade (*Kahneman et al. 1990*). What they observed was that participants asked twice as much for items they owned than what they would have been willing to pay for when they wanted to buy. This means that the participants of the experiment overvalued the cup or the pen once they owned it, but undervalued those they did not yet own. Thaler had already examined this phenomenon in his doctoral thesis (*Thaler 1980*), but still in the form of hypothetical questionnaires.

According to the neoclassic approach, nothing can have two different values at the same time, depending on the method of questioning. By contrast, the example also supports the fact that the value we are willing to pay for something is a lot lower than the value at which we are willing to give it away. This is what we call the endowment effect.

Thaler explains the phenomenon in that people tend to be loss-averse. If we own something, then giving it up is already a loss, so it is a lot more painful than if we only wanted to obtain it. This has been examined again and again in a large number of experiments. *Tuncel* and *Hammitt* (*2014*) reviewed 76 published experiments containing 337 estimations of how much more people would ask for something than what they would be willing to pay for it. The difference was huge, more than threefold on average. The correlation is clear, this difference diminishes if the product has a well-known financial value, and increases with the difficulty in evaluating the product.

2.2. Mental accounting

One of the motivations of mental accounting is the empirical observation that people tend to group their expenses according to various categories, such as food, housing expenses, entertainment, etc. By assuming that people tend to have a number of individual accounts for the various categories with a separate budget, and converting between the different accounts is limited, the theory of mental accounting wants to capture this very feature. As a result, a given decision depends on how it is formulated and to which account it belongs.

For example, they found that taxi drivers in New York (*Camerer et al. 1997*) have a revenue target that they wish to attain for each day. According to the theory, each day is a separate account where revenues are kept, and every account is managed and optimised separately. As a result, taxi drivers will stop working sooner on days when they can obtain more money for a trip, since they can achieve their daily target faster due to the higher price. But this observation completely contradicts general economic thinking. Higher revenues should encourage them to work more to offset the more difficult days in the future.

A famous experiment of Tversky and *Kahneman* (*1981*) also supports the fact that people usually don't examine the joint effect, but instead, they narrowly interpret the effect of the decision. In this experiment, participants had two decision-making situations and the combination of the consequences of the two decisions determined the ultimate payment in the example.

In the first decision-making situation they were able to choose from the following two options:

a) A certain profit of $240

b) A 25 per cent chance of gaining $1,000, or a 75 per cent chance of gaining nothing

In the second decision-making situation, the participants could choose from the following two options:

c) Certainly lose $750

d) A 75 per cent chance of losing $1,000, or a 25 per cent chance of losing nothing

In the experiment, 73 per cent of the participants opted for (a) in the first case and (b) in the second case. But this decision is necessarily worse than if they had opted for options (b) and (c), because the combined effect of decisions (a) and (d) is that they have a 75 per cent chance of losing $750, or a 25 per cent chance of winning $240. By contrast, deciding for options (b) and (c) means that they have a 75 per cent chance of losing $750 and a 25 per cent chance of gaining $250. So, the outcome of choosing options (b) and (c) always offers a better payment than choosing options (a) and (d), still, the majority opted for options (a) and (d). It is difficult to interpret if the participants really took their decisions based on the combined effect, but it can be easily explained in so far as they evaluated the two decisions individually, because it is a known fact that people are risk-averse in the case of gain, and risk lovers in the case of loss (*Tversky – Kahneman 1979*).

The theory of mental accounting also had a tremendous impact on the analysis of financial markets since it questions one of the most fundamental assumptions of financial modelling. Financial modelling assumes that investors optimise the sum

of their decisions, i.e. the performance of the portfolio, and take their decisions based on that. By contrast, according to mental accounting, investors assess their decisions individually and keep track of every single stock purchase on a separate mental account.

One of the consequences of the theory of mental accounting on financial markets is that investors tend to sell stocks earning a return sooner than those generating a loss. When examining the decisions of investors on US stock exchanges, *Odean* (*1998*) has also empirically confirmed this consequence of the theory of mental accounting.

3. Limited self-control

It is a general observation that people tend to be "present biased". *According to the assumption of Strotz* (*1955*) it is an innate nature of humans to disproportionately overrate current consumption over future consumption. Based on the famous example of *Thaler* (*1981*), people would rather have one apple today than two apples tomorrow. As opposed to this, people would rather want two apples in one year and one day, than one apple in one year. In both cases, they offer a 100 per cent return in exchange for waiting one day. But still, people are impatient when they could obtain something in the present, and they are patient when in both cases they can obtain the apple only in the future. So this contradicts the generally accepted economic approach which uses exponential discounting to express the time value. The new discounting theorem, which also takes into account the present bias, is referred to as *hyperbolic discounting.*

We should also differentiate between the two discounting theories in terms of their role within modelling. Exponential discounting did not become widely used in economic modelling because it describes human behaviour well, but because it is the only discounting theory which is consistent (*Samuelson 1937*). So exponential discounting, as a normative model, wants to capture how people *should* think to avoid self-contradiction. As opposed to this, hyperbolic discounting (for example *Laibson 1997*) wants to describe *the behaviour of people accurately* and thereby provide a more precise forecast of the evolution of economic developments.

Formally, exponential discounting gives the present value of the usefulness of consumption according to the following principle:

$$\sum_{t=0}^{\infty} \delta^t u(c_t), \tag{1}$$

where δ denotes the discount factor, *t* denotes the time period and $u(c_t)$ denotes the usefulness of consumption in period *t*.

By contrast, hyperbolic discounting (*Laibson 1997*) provides the present value in the following form:

$$u(c_0)+\sum_{t=1}^{\infty}\beta\delta^t u(c_t)\,. \tag{2}$$

This formula only differs from exponential discounting in that it multiplies future consumption by a $0<\beta<1$ parameter, which means it undervalues future consumption beyond the time value over the present consumption.

One of the most important phenomena captured by hyperbolic discounting is the time-inconsistent behaviour. Hyperbolic discounting is able to model fairly well when someone decides what they would do in the future, but when they arrive at that point in time, they change their plan: for example, when someone wants to quit smoking, but keeps postponing the first step. Another famous example is when people decide to exercise more in the future, but in the end they fail to do so (*Vigna – Malmendier 2006*), also shows well why people save too little (*Laibson 1997*). In Hungary, for example, the popularity of foreign currency loans had a number of underlying demand, supply and institutional factors (*Kolozsi et al. 2015*), but the lack of self-control might also have contributed to its popularity, which must be handled on the regulatory level as well (*Fömötör et al. 2017*).

Experiments prove that animals also behave similarly (*Ainslie 1974*), and tend to have a present bias in their decisions. Thaler (*1981*) was the first one to demonstrate this in relation to humans as well. In addition, he also found that humans tend to discount their gains more than their losses. Moreover, we tend to discount smaller amounts more than larger amounts. Similar anomalies can also be observed in Hungary in discounting (*Neszveda – Dezső 2012*).

Thaler and Shefrin jointly developed the planner-doer model to explain our present bias (*Thaler – Shefrin 1981*; *Shefrin – Thaler 1988*). Based on the theory already used in psychology, they assume that people have two contradicting selves competing with each other. One is the planner self, while the other is the doer self. The planner maximises lifetime utility, while the doer self only wants to maximise current consumption. The planner self also knows this, so it maximises the utility account taken of this.

An alternative approach to the planner-doer model is when they assume hyperbolic discounting on behalf of people, but they also assume that people also know about themselves that they are present biased. The consequence of these models is the empirically observable fact that people tend to intentionally limit their future selves because they know that by the time they get there, they won't be able to take the right decision. For example, one tool helping this commitment is Antabuse, which causes nausea when alcohol is consumed. The saying "do not shop when you are hungry" captures this very phenomenon (*Royal Swedish Academy of Sciences 2017*).

4. Social preference

Numerous economic models assume that decision-makers act out of self-interest. This greatly simplifies the mathematical resolution of the models, and also proves to be a good approximation in the majority of the cases. But it can often be clearly demonstrated that people simply do not follow their self-interest but also consider fairness an important criterion. Before Thaler, *Adam Smith* (*1759*), and later on *Gary Becker* (*1974*) and *Amartya Sen* (*1977*) had mentioned the role of fairness too.

Similarly to their predecessors, the work of *Thaler, Kahneman and Knetsch* (*1986*) also strongly emphasises the role and significance of fairness in economic thinking. Their experiments extended to three key areas where they exerted strong influence. According to their findings, (1) people are often willing to act based on the principle of fairness even when they take their decisions anonymously and do not have to worry about the loss of their reputation or other losses; (2) they are willing to sacrifice their own resources to punish those who treated them unfairly; (3) they are even willing to give up their own resources to punish those who treated others unfairly.

One of the most important experimental mechanisms for examining fairness, i.e. the Dictator Game, is also partly related to Thaler (*Kahneman et al. 1986).* In the Dictator Game, participants are paired randomly and everyone remains anonymous throughout and after the experiment. One of the two individuals is given a quantity of money and is told that he must offer some of that money to the second participant. This offering takes place in the experiment in such a way that the other participant cannot be influenced in any way. According to the assumption of complete self-interest, everyone should keep the entire amount to himself. By contrast, the majority of the participants do not keep the whole sum, which shows that people are not entirely driven by self-interest, and fairness is also important to them. Based on 129 articles, taking into consideration the results of 616 experiments, *Engel* (*2011*) prepared a summary where he found that people offered on average 28 per cent of the available amount to the other person. Moreover, only 36 per cent of the participants kept the whole sum, while 17 per cent of the participants halved the money between the two of them. Over the years the Dictator Game became an accepted tool for measuring fairness (*Konow 2000*).

Another famous experiment next to the Dictator Game is the Ultimatum Game (*Kahneman et al. 1986*). In this game, participants are also paired randomly, and everyone remains anonymous throughout and after the experiment. In this case as well, similarly to the previous game, one member of the couple receives a sum of money and can decide on how to distribute it between them. But here, the other member of the couple can also decide whether to accept the offered sum or not. If they accept it, then the final payment takes place according to the offered

allocation. If they do not accept it, then both of them leave empty-handed and receive nothing. According to the economic theory built on self-interest, the other member of the couple should accept every sum offered which is more than zero. By contrast, people tend to only accept the offer if it is of a considerably higher value, even though they know that they will end up worse. This shows that people are even willing to give up financial gain to punish those who give an unfair offer (*Fehr – Gächter 2000*). Hungarian economists (*Ambrus-Lakatos – Meszerics 2003*) have come to the same results, in line with the international findings.

One of the most important methods for the mathematical modelling of social preferences is the Fehr-Schmidt model (*Fehr – Schmidt 1999*), where *N* number of participants are involved and x_i denotes the sum of money that participant number *i* receives. The utility of participant *i*:

$$U_i\left(x_i, x_j\right) = x_i - \frac{\alpha_i}{N-1}\sum_{j=1}^{N}\max\left(x_j - x_i, 0\right) - \frac{\beta_i}{N-1}\sum_{j=1}^{N}\max\left(x_i - x_j, 0\right), \qquad (3)$$

where α denotes how frustrated he is if the others receive more than him, while β designates how frustrated he is if he receives more than the others. So this means that people are frustrated if they receive more than the others (see the Dictator Game) but they are also frustrated if they receive less (see the Ultimatum Game).

5. Financial markets and behavioural finance

Behavioural economics and experiments and surveys similar to the ones presented above reveal a number of interesting correlations, but the (same) question always arises in relation to these results: what is their impact in real life, and to what extent can we take such an analysis seriously under real circumstances. The explanation of financial markets is one of the most exciting fields of behavioural economics. According to *Fama* (*1970*), financial markets remain efficient even though there are many irrational investors, because rational investors will always correct the effect of irrational investors.

By contrast, Thaler describes in many of his papers that this is not necessarily true. In his approach, investors do not necessarily behave according to the mainstream economic models and rational investors are unable to fully correct the effects so created due to the possibility of limited arbitrage. For example, according to the general assumption, the expectations of investors are accurate, which are always updated according to the Bayes rule whenever new information emerges on the market. *But the results of Tversky and Kahneman* (*1974*) suggest that this is often not true, and people tend to overestimate the relevance of a piece of news. *Bondt and Thaler* (*1985*) tested this very aspect on the financial markets. They found that shares sustaining a large loss realised a higher return later on compared to the shares which previously had appreciated strongly in value. This suggests that the

losing stocks (those sustaining a large loss in value) became undervalued because investors overreacted to the relevance of the information, while profitable stocks became overvalued because, again, the investors overreacted to the positive news. The same effect was also observed at the Budapest Stock Exchange (*Lakatos 2016*).

Benartzi and Thaler (*1995*) also give an explanation for the equity premium puzzle (*Mehra – Prescott 1985*) with their behavioural economics-based approach. The puzzle of the equity premium is that under the usual economic assumptions, equity market returns are disproportionately higher than the risk-free return. Benartzi and Thaler examined whether loss aversion and investor horizon can explain this high equity market return. Applying the usual loss-aversion coefficient, their model properly predicted the average higher equity market returns during a one-year evaluation period. So, their explanation for high returns on the equity market is that investors evaluate their decisions each year and assess their current losses, if any, as disproportionately painful. But this is considerably more frequent in the case of stocks compared to a risk-free return; therefore, they are only willing to invest in stocks assuming a very high expected return. During later research, *Barberis and Huang* (*2001*) also incorporated mental accounting into their model, thanks to which they are able to explain even more phenomena on the financial markets.

It is also thanks to the work of Thaler that a new field emerged from the crossing of behavioural economics and finance, referred to as *behavioural finance.* But of course, behavioural finance is not the only and not the generally accepted explanation for the phenomena described above, though it remains one of the most frequently used and researched areas within finance to date.

6. The impact of Thaler's work on regulations

From the perspective of regulations, it is important to know what the results of behavioural economics mean regarding human rationality. According to one of the approaches, people are irrational and are often unable to decide what is best for them. According to the other approach, the assumptions of the rational models are not yet appropriate, and people cannot be told what they know correctly or incorrectly. In agreement with many other psychologists, Thaler thinks that people often simply do not possess sufficient cognitive capacities or sufficient willpower. He clearly argues that people often do not know what is best for them.

But this raises a number of sensitive questions. Who decides what is good or wrong for others? What happens if someone knows what they want, but are still forced into a "generally good" decision based on some theory? In light of the benefits and the challenges, Thaler and his partners developed *libertarian paternalism* (*Thaler – Sunstein 2003*). According to this theory, useful changes can be achieved through minimal intervention. Based on the theory of libertarian paternalism, the

intervention (affecting behaviour) "tries to influence choices in a way that will make choosers better off, as judged by themselves" while limiting no one in their choice (freedom of choice).

One of the most typical examples for setting the decision-making structure is the *default effect.* The default decision, according to the default effect, is triggered if a given person does not dispose otherwise. So if someone wants another decision, they have to declare it separately. One of the best-known cases of the *default effect* is related to organ donation (*Johnson – Goldstein 2003*). In countries where the default case is that citizens donate their organs, the rate of usable organs is considerably higher than in those countries where it is not the default case that they donate their organs, and they have to give a separate declaration to that effect. The default effect results in a similarly strong difference for decisions related to pension savings (*Madrian – Shea 2001*). In line with international experience, 97 per cent of people in Hungary re-entered the state pension system (*Baksay – Palotai 2017*), which might have been attributable, among many other reasons, to the fact that this was also the default decision.

The findings of Thaler in the field of limited self-control had a tremendous influence on topics dealing with various financial decisions and financial awareness. They formulated their own program based on their research results, which can help people take better financial, and as part of this, better savings-related decisions. Their program "Save More Tomorrow", or SMarT, is composed of four main points.

The first and most important point: they ask people whether they would increase their savings when they receive their next salary raise. In response, people no longer decide between their current consumption and future consumption, but between two future consumptions. Based on hyperbolic discounting and present bias, this results in a considerably more patient decision, leading to a greater willingness to save.

The second point: because the rate of savings will only increase after a future salary raise, people do not deem this as a loss. This is important because according to behavioural economics, people are way too sensitive to losses.

The third point: the rate of savings keeps increasing after every salary raise. So according to the plan, the increases take place automatically. This makes continuous growth the default scenario, from which people always deviate less. And finally, the rate of savings can never increase beyond a predefined value, so the increase remains under control over the years.

The fourth point: participants can leave the program at any time, they take part in it on a voluntary basis as long as it is convenient for them. This guarantees that no one feels they are committing themselves to something they will regret later on.

In addition, it is also important that no-one is forced to do anything, not even the individuals who have different preferences or would take a rational decision anyway.

They tested the efficacy of the program at several companies, and based on the results, introducing the program increased retirement savings in the USA by an order of magnitude (*Benartzi – Thaler 2013*), and similar results were obtained in Denmark (*Chetty et al. 2014*).

Libertarian paternalism proved a popular theorem among the decision-makers of many countries. They started to use the theorem of libertarian paternalism mainly in the United States and the United Kingdom, primarily in the areas of retirement savings, healthcare and education. But there has also been much criticism of the theory for trying to intentionally influence consumers, thus threatening their freedom of choice (*Infante et al. 2016*; *Sugden 2013*). But the question may also arise as to which parameters the regulator should use to maximise the common welfare function over "individual errors", and whether it is possible at all to formulate such a welfare function. Moreover, many may resent being manipulated even though they agree with the objectives.

But next to criticism, many research results were also published underpinning the support for libertarian paternalism. Governments and regulators often try to shape processes using expensive instruments, but by contrast, the simple interventions used based on the results of behavioural economics may be considerably cheaper and more efficient. From that perspective, the interventions made based on the theory of libertarian paternalism can be accepted much more (*Benartzi et al. 2017*). In line with the critical observations, Thaler et al. have also found that not every change may be desirable, therefore the expected effects of the interventions must always be properly and thoroughly tested.

7. Conclusion

Richard Thaler's achievements and his contribution to economic research has enjoyed unwavering success over more than 40 years, with an h-index currently standing at 93. This means that he has 93 publications whose citation rate is 93. His most cited paper is the one presenting and laying down the foundation for libertarian paternalism (*Thaler – Sunstein 2008*), which was referenced more than nine thousand times. His second most cited publication presents the overreaction of stock exchange prices (*Bondt – Thaler 1985*), with nearly eight thousand references. His third most frequently cited paper, the study laying down the foundation for the theory of mental accounting (*Thaler 1985*) was referenced nearly six thousand times. These achievements also show that Thaler has not only achieved exciting and interesting scientific results with his work, he has really opened up new research areas within the field of behavioural economics. Moreover, with his scientific work,

Richard Thaler has incorporated the results of behavioural economics into the public sphere. With his theory of libertarian paternalism, he has greatly influenced the leaders and decision-makers of many countries. His research results have been used in practice to resolve numerous important social issues.

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A Unique Exploration of Public Good and Public Financial Management*

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Mária Bábosik (editor):
Vezetés a közjó szolgálatában. Közpénzügyi gazdálkodás és menedzsment
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With its innovative focus and ground-breaking content, ˝Vezetés a közjó szolgálatában. Közpénzügyi gazdálkodás és menedzsment (Management in the service of the public good – Public financial management)" takes a comprehensive approach to analysing and presenting a broad range of topics arranged in five parts and 27 chapters. It is a ground-breaking work, as starting from the serving of the public good and focusing on organisational integrity, it collects information that is indispensable in the day-to-day work of public decision-makers to ensure orderly, efficient and successful operations.

The Hungarian Chamber of Commerce and Industry as a public body representing the general interests of the economy has especially welcomed the publication of the book, since it can serve as a reference point for all economic operators and helps formulate a theoretical and practical approach as well as promoting the public good. This book provides theoretical knowledge that can be well used in practice and may thus contribute to promoting the public good, the highest social good. For this, of course, it is indispensable that current and future decision-makers acquaint themselves with the content and substance of the interrelations whose complex but logical network is explained in this book, on an everyday level too. Moreover, the book provides an important background for leadership and managerial activities, the development of organisational integrity, the evaluation of economic developments, the interpretation of the concept of public money as such, and for the incorporation of these issues into the processes of developing and planning an organisational strategy.

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The starting point of the book is that the Fundamental Law of Hungary defines clear principles in relation to organisations using public funds and assets. These are the principles of legality, expediency, efficiency, transparency, and clarity of the public sphere. The performance of leaders of organisations using/managing public funds or assets is judged based on how the organisations managed by them meet constitutional requirements concerning the use of public funds.

Writing about serving the public good and public financial management, the authors provide public decision-makers and junior staff with advice, and although the book was created for organisations managing public funds, it is also an excellent guide for leaders and financial managers of enterprises. In the textbook, the ethical and professional requirements for management are treated as a coherent whole. Public institutions need to strengthen public confidence in the respect that they operate in the service of the public good expediently and in a result-orientated way. Public confidence is based on two pillars: confidence in goodwill and in ability. It is a fundamental requirement for leaders of public institutions to be committed to serving the public good, and at the same time to have the necessary leadership and managerial competences.

In the textbook, public goods are viewed as a system, within the framework of which tangible and intangible public goods are provided in a concerted manner for the various communities of society and the members thereof. Thus, the definition of the public good can be interpreted clearly in practice. To this end, the book gives guidelines for leaders of organisations aimed at serving the public good. So the public good is not an abstraction, but an objective, and public institutions must make new efforts every day to achieve it.

The five big parts focus on areas crucially important for leaders of organisations managing public funds: serving the public good, resource management, leadership and management, constant renewal, and the efficiency of leadership work. Within these five parts, a total of 27 chapters cover the main individual sub-areas of the particular issue.

In Part 1 dealing with serving the public good, much attention is devoted to the ethics of public finances. By focusing on ethics, György Kocziszky in Chapter 1.1 points out the importance of ethical behaviour in managing public finances. The key conclusion is that incompetence slows down administration and increases costs. With a broad vision and thorough theoretical knowledge, Gyula Pulay, author of Chapters 1.2–1.6, highlights the need to incorporate the public good into the internal regulation of public institutions. This chapter can serve as a practical guide to be put into practice along the principles: the general model presented may help public service organisations develop a corporate governance system serving the public good. Chapter 1.5, “Equality, fairness, justice”, correctly interprets that in

the case of public services, equality primarily means equal (but not compulsorily free) access for all, irrespective of their financial situation, and in terms of locations, access from everywhere with reasonable effort. It is added that equal access is a necessary but not sufficient condition for equality, so equal opportunities are also a necessity. Bureaucratic coordination and its dangers are discussed in-depth. It would be difficult not to agree that a fair distribution of public goods taking human dignity into account is an essential part of serving the public good. Presenting integrity-based management is a constituent part of the book, which introduces a new approach to management activity (Chapter 1.6). In Chapter 1.7 written by Krisztina Szegedi, the chart entitled "The process of integrating social responsibility into the organisation" very aptly illustrates how different elements form a coherent whole.

The authors devote Part 2 to resource management. In Chapter 2.1, detailing the framework of the management of public funds, Diána Orosz presents and analyses the system and the role of leaders precisely and thoroughly, yet from a broad perspective. Leaders are provided with valuable and real orientation, since the author also presents, with similar professional thoroughness, the tasks of public asset management (Chapter 2.2). In Chapter 2.4, József Poór and Mártonné Karoliny discuss the issue of human resources management in a multi-faceted way and in a clear structure, adopting a corporate approach and obtaining the right balance by collating the public and private sphere.

Part 3 discusses the issues of leadership and management. In the very first chapter, Károly Barakonyi makes the readers think by asking questions on the themes of vision and strategy: What would be the objective of a public finance strategy? Whose job is it to elaborate it? Where is the public finance policy? "There is an absence of well-founded, forward-looking analyses in a number of areas falling within the realm of public finances...etc." – what are these areas? Are there any areas where a strategy exists? In Chapter 3.2, discussing the issue of decision-making, György Norbert Szabados and Csaba Berde are correct to take the view that "The de-politicisation of professional decisions may significantly improve […] the efficiency of decision-making. However, achieving this is not the responsibility of organisations but of the government."

Chapter 3.3 written by Erika Garaj features a clear and easy-to-follow aspect in relation to the project theory basics of project management. This is a chapter written with a practical approach and an exciting line of thought. As regards the success factors and pitfalls of the project, the project (although unspokenly) also includes the tender; the topic is presented by addressing real problems and drawing on several types of indicators. In Chapter 3.4, which examines management's control, Antal Tóth also adopts a practical, comprehensible and valuable approach, illustrating the process of drawing up a plan for a fiscal year. He discusses in depth

the tasks of controllers and the requirements placed on them, providing directly transferable knowledge for leaders. The question arises as to which hierarchical level has the necessary degree of autonomy to formulate a strategy when bargaining over the budget is the most typical element.

Control-based risk management presented in Chapter 3.5 by László Domokos – Melinda Nyéki – Katalin Jakovác – Erzsébet Németh – Csaba Hatvani is a key element of management activities. The authors provide excellent and valuable recommendations for the risk management of budgetary institutions, including guidelines which can easily be put into practice. They also provide an overview of the differences compared to the corporate sector. A particularly important take-away from this chapter is that parallel to serving the public good, public decision-makers must seek to exercise their functions set out in legislation with a focus on minimising the downside risk, while performing their tasks in a perfect way. In Chapter 3.6 – continuing this line of thinking – Margit Horváth investigates the system-level regulation of the internal control system and examines by means of illustrative practical examples the elements of the control system across the process of realising the objectives. In Chapter 3.7, by analysing the elements and types of communication systems influencing successful organisational communication as well as the role of the various types in the organisation's operations, Erzsébet Németh introduces readers to an issue that presents the theoretical and practical aspects of communication.

Csaba Lentner and Bianka Parragh review in a clear and logical manner the issues of interest reconciliation, consensus discussion and participation (Chapter 3.8), pointing out the challenges and expectations that generate changes. In this context, the integrity-based enforcement of interests can be taken as an example: "In contrast to before, the concept of enforcing interests is now placed in a new dimension related to integrity, and thus the integrity-based enforcement of interests, as a novel approach, is also closely related to the conceptual system of integrity".

Part 4, "Constant renewal", acquaints us with organisational behaviour in the public sphere. In the first chapter, Gyula Bakacsi describes aspects of motivational effects, the functioning of motivational tools and motivational ways. It needs to be pointed out that public services are rule-driven and not performance-driven organisations. Business process management, quality management, change management, innovation management, organisational competency building and learning are all important elements of leadership and managerial activities. These subjects are presented by Antal Tóth, Ferenc Farkas, Csaba Makó and Miklós Illésy (4.2–4.4), providing process structures and figures which can be transferred directly into practice. In Chapter 4.5, "Organisational competency building and learning" Mariann Veresné Somosi concludes that there is ultimately no conflict of interest

in the public sphere, and acting in a socially responsible way may be based on the shared interests of employers and employees. However, this poses a real challenge in terms of practical implementation.

Part 5 discusses the efficiency of leadership work. In the chapter "Management styles and organisational culture", József Nagy starts with an impressive quote – "If you think education is expensive, compare it with the cost of ignorance" – and he continues in this spirit. The author does a good job of presenting quotes (either verbatim or in substance) from well-known experts, drawing his own conclusions and providing techniques to be acquired. The content of the point "We ourselves are the organisational culture" directly addresses the practice. Here we see – at least in a parenthetical remark – an assessment of the actual situation: in times and situations of uncertainty, stress and continuous change (such as the current situation of public administration) it is relationship-oriented leaders who have the chance to achieve success in addressing tensions arising among employees.

In Chapter 5.2 and 5.3, the authors reflect upon the issues of time management (Gyula Király) and assertive communication (Erzsébet Németh). Both chapters convey expertise in an objective and readable manner, offering novel knowledge with a fresh approach. Both issues are of key importance in terms of the efficiency of leadership work and enhancing it, not only for the public sphere, but also for leaders in general, and it could perhaps be argued even for use in the secondary school curriculum, especially as regards assertive communication.

With its rich content, "Vezetés a közjó szolgálatában. Közpénzügyi gazdálkodás és menedzsment (Management in the service of the public good – Public financial management)" regards serving the public good as a basic principle, and based on this it presents information that leaders (or those who will become leaders) must possess to be capable of efficiently managing public funds and genuinely acting in the interest of the public good. In this way, enhancing the efficiency of the public sphere they contribute to increasing competitiveness and to the long-term sustainability of the convergence process of the Hungarian economy – as László Domokos, President of the State Audit Office and György Matolcsy, Governor of the Central Bank of Hungary state in the foreword.

The book provides new ways of addressing the serving of the public good and of public financial management. It provides experts in this field with a wealth of information which, in this form and collected in one place, has not been available until now. I warmly recommend the book to those who are specialists in this area or would like to gain more knowledge on these issues.

Map for Predicting Finances and Human Nature*

Dániel Felcser

Alan Greenspan:
The Map and the Territory 2.0: Risk, Human Nature, and the Future of Forecasting
Penguin Books, 2014, p. 432.
ISBN-13: 978-0143125914

Alan Greenspan was the Federal Reserve's Chairman for more than 18 years during the presidential cycles of four presidents in total. In his book, Greenspan attempts to answer why everyone was mistaken in their forecasts during the global financial crisis, and the lessons that can be drawn. The knowledge he has accumulated as a central banker helps him map this phenomenon. His thoughts can be grouped around three topics dealing with human nature, financial regulations and the importance of productivity.

Predicting human nature

Human nature demands foresight, therefore forecasts are badly needed, despite their imperfections. The economic models used for forecasts necessarily simplify the actual and complex economic relationships. During the financial crisis this was apparent in the forecasting errors stemming from the insufficient understanding of increasingly complex finances. Economies may be driven by rational economic decisions in the longer run, but human thinking is a lot more intuitive than that. So according to Greenspan, a detailed model must contain variables that capture human nature in a relatively stable way, even in the longer run. In his view, propensities without a rational basis (often referred to as "animal spirits"), such as fear or euphoria to mention two of the most important ones, play a crucial role in economic outcomes. This is especially true for financial matters that are based on fast decisions.

* The views expressed in this paper are those of the author(s) and do not necessarily reflect the offical view of the Magyar Nemzeti Bank.

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The 2008 financial crisis urged Greenspan to review his previous perspective according to which animal spirits are random and hence unmanageable in economic modelling. Some factors are measurable (risk aversion, time preferences) and can be modelled thanks to their systematic nature. But due to the vagaries of human nature, forecasts will always be uncertain. Euphoria will cause temporary booms on the market, also fed by herd behaviour in the good times, followed by sudden fear-induced declines when the bubble bursts. Greenspan argues that the accuracy of forecasting could be improved if we could integrate certain aspects of the animal spirits that can be modelled.

Regulating finances

At the onset of the financial crisis, the magnitude of the problem could not be seen clearly for a prolonged period. The securitised US subprime mortgages only triggered the crisis. According to Greenspan, a typical euphoric bubble characterised by intense demand and rising asset prices was created prior to the crisis. Even though a crisis might hit, financial companies expected that they would still have time to get rid of their problematic portfolios without substantial losses. But they failed to consider that market liquidity depends heavily on the level of investor risk aversion. In parallel with a jump in risk aversion, liquidity disappeared from the money markets, which pushed the global economy into a downward spiral. A dangerous animal spirit, the fear-induced run, manifested itself.

In his view, it was high time to tighten regulatory capital requirements, and regulations must be harmonised internationally. Greenspan points out that the financial crisis was caused by the flaw of an important pillar of a stable economy, i.e. rational financial risk management. To eliminate this flaw, the crisis triggered regulatory measures. The risks of an unstable financial system can be mitigated by increasing capital requirements, but excessive regulation can be just as counterproductive as the lack of regulation in the past.

By definition, regulations impose limitations on competition, and therefore a proper balance must be found between growth and stability considerations. In his view, the burden of massive new financial regulations must be lifted as it will increasingly create an effect contrary to that intended. Uncertainty must be reduced and bank lending must recover. He does not see any way of eliminating the irrational optimism unfolding from time to time without reducing the average rate of economic growth and living standards in the longer run.

Greenspan considers the “too big to fail” doctrine to be one of the most problematic developments of the crisis. On the one hand, the role of finances is to enable the most promising investments to obtain funds. On the other hand, the existence of the economic system necessitates that inefficient institutions can go bankrupt. But

there is no simple solution for handling systemically important financial institutions. To maintain financial stability and prevent serious real economic effects, the state intervenes in the insolvency of systemically important institutions, but this is in conflict with the above-mentioned considerations.

High level of uncertainty, low level of investments

Due to the high level of uncertainty, households and companies are refraining from long-term investments, which explains the weak business activity and the rise in the unemployment rate. In the USA, long-term investments have been replaced by shorter-term investments and greater emphasis has been placed on accumulating cash and repaying debts. Moreover, Greenspan also considers government measures aimed at speeding up the recovery and regulating finances as a retracting force. A more active economic policy was justified during the acute stage of the crisis because market forces were unable to move towards a new equilibrium while the market structure was impaired. But he reckons that financial markets became operational once again by early 2009. According to Greenspan, highly regulated markets substantially impair the automatic stabilisers of market processes.

The ultimate measure of economic success is productivity. It determines the average living standard and is a key feature that differentiates developed and emerging countries. According to his expectations, increased productivity would add more to material wealth over the coming decades than any other economic variable. The key component of productivity growth is innovation. Time is needed for innovations to spread, and efficient financial markets play a key role in that. Yet productivity is an economic variable that is extremely difficult to predict because its novelty represents the essence of innovation.

Greenspan draws attention to the fact that the good performance observed with businesses is attributable to low costs. Persistently subdued costs are supported by both competition and technology. However, in the longer run it does not seem feasible, despite some innovations, for companies not to invest more. The fact that productivity has declined from the levels seen between 1870 and 1970 causes tangible differences, to which the GDP-proportionate increase in social benefits and the decrease in the domestic savings rate may also have contributed. Decreasing capital investments and productivity are expected to result in a slower increase in living standards.

To increase living standards, emphasis should be placed on the accumulation of capital goods and savings instead of immediate consumption. The financial system is the link between savings and economic performance. In addition, culture may also bear decisive relevance as it influences risk appetite and innovations. The euro is only the latest example of the crucial role played by culture in the economy.

The euro could be regarded as one additional step towards European political integration. It was considered that the common currency would help break down economic and cultural obstacles. After the positive experiences of the initial period, when the crisis erupted the substantial differences in the competitiveness of the various member states became apparent, and there was growing concern over high government debts. The example of the euro also showed that culture was able to change more slowly than what the financial markets expected.

Inequality and Economic Growth*

Tamás Tóth – Dávid Benkő

Joseph E. Stiglitz:
The Price of Inequality. How Today's Divided Society Endangers Our Future
W. W. Norton & Company, 2012, p. 449
ISBN: 0393345068

Empirical studies have shown that despite the growing gross national product in advanced national economies, income inequality has increased in past decades (*Atkinson 2008; Cingano 2014*), as social groups have not benefited equally from economic growth, and the state redistribution of incomes could only mitigate this process. The 2008 global money and capital market crisis, which later turned into an economic crisis, temporarily reduced income inequality in society (*OECD 2016*), as the value of the assets held by the highest social class, who mainly own securities, suddenly dropped. However, from 2010, partly on account of the sustained negative economic and social impact of the global crisis, divergence returned. For example, income inequality in the US rose to levels unparalleled for 90 years.

The 2012 book by Stiglitz, "The Price of Inequality", focuses on the inequality developments in the US, but Stiglitz also applies his findings to developed countries. In his review in the *New York Times*, Thomas B. *Edsall*, (*2014*) an associate professor at Columbia University, states the following about this bestseller: "The single most comprehensive counterargument to both Democratic neoliberalism and Republican laissez-faire theories." Edsall argues that one of the key claims in the book is that politics shapes the market in ways that favour the richest at the expense of the less well-off majority. One feature of Stiglitz's book is that it uses practical examples to illustrate economic phenomena and its conclusions are based on empirical observations rather than mathematical correlations.

In the introduction to the book, Stiglitz asserts that income inequality in the US has soared in the past 3–4 decades. In the past 40 years, the income of the lower 90 percent increased by merely 15 percent in real terms, while the upper 1 percent's surged by 150 percent. For those in the nine lower income deciles, wage increases

* The views expressed in this paper are those of the author(s) and do not necessarily reflect the offical view of the Magyar Nemzeti Bank.

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did not follow the rise in productivity, therefore the economic effects of GDP growth did not filter down to middle- and lower-income groups. As a result, *the highest-earning 0.1 per cent's share from total income has increased from 1 to 5 per cent since 1980, whereas median income sank back to its 1990s level after the 2008 crisis*.

According to the author, inequalities, which increased due to regulatory shortcomings, played a role in both the emergence and the spread of the 2008 financial and economic crisis. The author highlights the significance of rent-seeking, meaning competition for rent (profits) generated artificially, i.e. independent from the forces of supply and demand, for example through state engagement. From the perspective of society, this leads to wasted resources. This is because rent-seeking strongly influences economic policy and inhibits efficient crisis management and stricter financial regulation, which is desirable for society as a whole but entails wealth and income losses for the economic elite. Stiglitz claims that the 2012 LIBOR scandal as well as the inappropriate procyclical management of the euro crisis based on austerity measures were European consequences of rent-seeking. He argues that the crisis management efforts entailed a considerable reduction in state spending, which led to higher unemployment, which in turn further increased inequalities and dampened aggregate demand, thereby deepening the recession.

The book underscores that high inequalities may dent economic efficiency and productivity. The Nobel Laureate economist analyses case studies in behavioural economics and concludes that a level playing field, subjective fairness (i.e. that employees consider the compensation for their work fair) and rising subjective well-being lead to higher productivity and growth. Stiglitz believes that the substantial productivity growth in the US during the Industrial Revolution manifested itself for the overwhelming majority of the population in the form of a proportional increase in income. On the one hand, this maintained the motivation for high-quality work, and on the other hand, when spent on consumption, it became the biggest engine of growth from the demand side. By contrast, in the context of the unequal income distribution typical today, subjective fairness is missing from the incentives of those earning the median income, which goes hand in hand with a fall in the efficiency of work and its negative impact on growth.

Stiglitz also identifies further channels through which huge social inequality can damage the economy and hamper economic growth. The elite's rent-seeking behaviour influences and distorts the regulatory environment and the legal framework, and guides fiscal policy towards less efficient methods. Stiglitz finds that the "American Dream" based on social mobility and equal opportunities in the first half of the 20th century offers real hope and opportunities for less and less people, since the benefits of growth are mostly reaped by higher-income groups.

Stiglitz's findings concerning income inequality tally with the literature that maintains that a reverse correlation can be identified between the extent of inequality and economic growth. Among others, *Herzer – Vollmer* (*2010*) point out this negative correlation and conclude that inequality affects growth negatively in the long run, irrespective of the level of development. The research by *Bagchi – Svejnar* (*2015*) suggests that the negative impact of income inequality on growth is more pronounced if the state redistribution of income is determined by political ties.

The literature under review lists the following as the *main channels of social inequality influencing real economic growth*: (1) social mobility; (2) social cohesion and public confidence; (3) political field; (4) technological progress; (5) productivity and efficiency.

(1) The *social mobility* channel: According to the human capital accumulation theory, income inequality enters the social dimension, which exerts an impact on growth through education (*Galor – Moav 2003*). In the context of rising inequality, the educational investments of low-income households drop significantly. The resulting decline in social mobility and the limitation of skills allocation have a negative impact on economic growth in the longer run through the diminishing supply of skilled labour necessary for technological progress. *Wilkinson – Pickett* (*2009*) also confirmed it empirically that high inequality entails low social mobility.

(2) *Social cohesion and public confidence* channel: Public confidence in decision-makers falls as inequality increases, and as a result, in extreme cases, the deeper social tensions, the deteriorating domestic security, rising crime and political destabilisation may restrain growth (*Kumor et al. 2007*). According to the endogenous fiscal policy theory, on account of higher inequality many voters reject more state involvement, as they interpret the phenomenon of inequality as a negative consequence of redistribution. *Wilkinson – Pickett* (*2009*) empirically confirm the theory that in societies with lower income inequalities, public confidence in the political and institutional system is typically stronger.

(3) *Political field* channel: According to the median voter theorem (*Ferreira 1999*), in the context of greater inequality the median income is below the average. In such a case, the median voter is interested in higher tax rates and redistribution. This can be distortive and act as a disincentive, and the process can stifle economic growth. The median voter theorem's claims run partly counter to the endogenous fiscal policy theory. In a nutshell, in the median voter model voters still trust the public institutional system (and its policies reducing inequality), whereas in the endogenous fiscal policy theory, a lack of public confidence can be identified.

(4) *Technological progress* channel: The minimum income theory maintains that the precondition for the widespread use of advanced technologies is the provision of an appropriate level of income (minimum income) (*OECD 2015*). In the model, the adequate purchasing power is provided by earned income, which is affected negatively by high inequality, due to the previously mentioned lack of subjective fairness. The marginal propensity of high earners to consume is considerably lower than in the case of low-income people, thus, if the surplus income materialises for the former group, it increases consumption only slightly.

(5) *Productivity and efficiency* channel: The efficiency wage theory model examines the relationship between wages and motivation (*Raff – Summers 1986*). Better paid workers work more efficiently, while the uncertainties surrounding livelihood due to low wages burden employees too much, both mentally and physically, therefore they threaten labour efficiency. According to the theory, those earning low wages permanently will sooner or later face social and health problems, which further hinders their social mobility, so they enter a negative spiral of the social mobility channel.

All the channels listed here appear in Stiglitz's work, however, he attaches special significance to the (1) social mobility and (5) productivity and efficiency channels. In the former dimension, growth is supported through facilitating social mobility, while in the latter, according to Stiglitz, increasing subjective well-being leads to higher productivity and growth through equal opportunities and subjective fairness. In a summary thesis, Stiglitz argues that the state redistribution model does not support the rise of earned income and social mobility in line with growing productivity, and this hampers economic growth in the US through the continuously widening income inequality.

Nevertheless, it has to be noted that in contrast to the above argument, several authors claim that inequality stimulates growth (*OECD 2015*). The typical channels of the positive relationship are as follows: (1) The possibility of rising inequality is a strong incentive for harder work, investments and taking risks in the hope of greater yields (*Mirrlees 1971; Lazear – Rosen 1981*). (2) If the productivity advantage of the high-skilled is substantial, the emerging significant differences in wages may encourage more people to take part in education (*OECD 2015*). (3) High inequality may increase the value of aggregate savings, and thus also capital accumulation supporting growth (*Kaldor 1955; Bourguignon 1981*).

Finally, according to several studies and theories, the impact between inequality and growth is not unidirectional, i.e. growth also affects inequality. The seminal work of the discussion on this aspect of the relationship between inequality and growth was written by *Simon Kuznets* (*1955*). According to the development theory

by Kuznets, during the first phase of industrialisation, the benefit derived from growth is distributed unevenly within countries, since the technological advantage is concentrated in a small group. Over time, however, the impact of economic growth driven by improving productivity exerted on employment and wages filters down to lower-income groups as well, reducing inequalities. This theory was supplemented by *Piketty – Saez* (*2003*) with a third stage, in which globalisation and the financial integration of the top economies leads to another increase in inequality, coupled with a rise in GDP per capita. Analysing the correlation between inequality and GDP, *Pini's* (*2014*) analysis shows that in the 1980s higher GDP per capita was coupled with lower inequality, i.e. income disparities between social groups were smaller in richer countries. Yet by the 2000s, the strength of the correlation between the two variables had considerably diminished, as inequality started growing again in several developed countries.

During the discussion about the direction and sign of the two variables' impact on each other, the need for establishing an *optimal level of inequality* emerged naturally. The theoretical framework for this was provided by the so-called "inverted-U hypothesis", according to which overly low inequality can constrain economic growth just like overly high inequality, therefore the optimal level can be found at the top of the inverted U (*Persson – Tabellini 1994; Banerjee – Duflo 2003; Barro 2008; Freeman 2012; Hasanov – Izraeli 2012*). Nonetheless, Hasanov – Izraeli maintain that in the longer run, lower inequality is more favourable, since it can facilitate improvement in the qualitative parameters of social cohesion, mobility and human capital. The "inverted-U hypothesis" and the corresponding models examine the effect of income inequality on growth, while the proponents of the Kuznets curve employ a reverse causal relationship and identify the levels of inequality observed in the individual growth stages in a sort of evolutionary approach. Another material difference is that while the inverted-U hypothesis aims to arrive at the level of inequality maximising growth, the Kuznets curve does not adopt a clear stance regarding the optimal level.

All in all, economists have not arrived at a consensus in relevant literature during the examination of the relationship between inequality and growth. Certain theories argue for an inverse relationship between the two phenomena, others believe in growth coupled with a high level of inequality, while some assert that an optimal level of inequality, where maximal growth can be achieved, can be identified (*Berg – Ostry 2011*). *In his work, "The Price of Inequality", Stiglitz clearly argues for the negative relationship*, and he believes that the income inequality seen in the US in past decades has restrained the growth rate of the real economy. The author contends that income inequality impacts growth through hampering social mobility and labour productivity. Stiglitz writes that in the US the level of state redistribution

is too low, its efficiency is inadequate, and this constrains economic growth through the continuous rise in income inequality. His proposals include raising the level of redistribution, curbing rent-seeking by the elite and strengthening subjective fairness (i.e. increasing compensation for work in real terms and lower difference in incomes).

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Report on the Lámfalussy Lectures Conference held on 12 February 2018*

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This year, the Lámfalussy Lectures Conference was staged for the fifth time. Under the title "Great Transformations", the 2018 event featured leading financial professionals and academic researchers from all over the world, focusing on major transformations taking place across the globe, with particular emphasis on the shift in the weight of the world economy towards the East.

The opening address was given by Magyar Nemzeti Bank Governor *György Matolcsy*. He pointed out the major transformations we are witnessing in the world, the EU, and Central and Eastern Europe. A new wave of globalisation is underway, one of the main drivers being technologies such as 3D, robotics or artificial intelligence; additionally, future developments will be shaped jointly by economic policies, monetary policies and geopolicies.

Following the Governor's address, the Deputy Governor and two Executive Directors of the Magyar Nemzeti Bank gave an account of the transformation that has taken place in the Hungarian economy over the past few years. MNB Deputy Governor *Márton Nagy* gave an overview of twelve areas in which the Hungarian economy was stabilised by the action taken, including the labour market, the tax regime, the system of incentives, public finance, public debt, public deficit (EDP procedure), monetary policy, lending, the foreign exchange structure of consumer lending, the central bank balance sheet, economic growth and convergence. The measures have laid down not only the foundations for sustainable growth but also significantly reduced Hungary's vulnerability, and this may become particularly valuable in more turbulent future periods.

MNB Executive Director and chief economist *Dániel Palotai* presented the measures taken by the targeted and innovative central bank policy in recent years. The base rate has reached a historical low, and inflation is currently below the central bank's 3 per cent target, which justifies maintaining accomodative monetary conditions in the future. In this context, the MNB decided to apply targeted nonconventional measures. The central bank's Self-financing programme has helped reducing the share of FX-denominated public debt from 50 per cent to below 22 per cent, which

* The views expressed in this paper are those of the author(s) and do not necessarily reflect the offical view of the Magyar Nemzeti Bank.

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decreases further over the forecast horizon and demonstrates good cooperation between the two branches of economic policy. The central bank's Funding for Growth Scheme was necessary to avoid a credit crunch and reach a turnaround in lending. The integration of the financial supervisory authority into the central bank has given the MNB more objectives and a greater variety of tools at the same time, the scope of the central bank supervisory function includes the regulation of macroprudential, microprudential and resolution areas, which in turn led to a more stable financial system.

MNB Executive Director *Barnabás Virág* presented the key pillars of sustainable convergence. The initial years of the period dating from 2010 were characterised by efforts to decrease vulnerability and bring about a turnaround in fiscal and monetary terms, with growth driven by improved labour intensity, i.e. an increase in the employment rate and tax reforms to provide incentives for work. Going forward the focus will be on capital-intensive growth, including greater productivity, improvements in competitiveness, research and development, better trained labour, innovation and creative industries. The country is facing multiple parallel challenges: demographic trap, global lack of skilled labour, the trap of low domestic value added, duality and financial trap, and weak social cohesion. However, new global megatrends: the rise of global middle-class, the scarcity of essential resources, urbanisation, industrial revolution 4.0–5.0, new forms of globalization, fundamental changes in the energy-mix, modern infrastructure, the new global economic map and the age of low interest rates. The 21st century provides new interfaces though, like biotechnology, e-mobility, digitalisation, robotisation, fintech, recycling, tourism and the health industry. Through growth-friendly policy, continued tax reforms and wider e-government, the State is providing the foundations to hold up the five pillars of human capital development, industry and export strategy, innovation capabilities, modern infrastructure, and geostrategy; these pillars are associated with competitive financial intermediation. This is an opportunity for the country to be a bridge between China and the West.

Morning session: "Great Transformation: East"

The talks of the MNB executives were followed by a keynote presentation by *Li Yang*, President of the Institute of Political Science at the Chinese Academy of Social Sciences, on China's deleveraging. Li Yang pointed out the fact that deleveraging is a challenge not only for China but throughout the world. Although countries worldwide committed themselves to reducing debt in the aftermath of the crisis, debt has continued to increase globally due to the headwind that deleveraging has been creating to economic stimulus. China's debt as a percentage of GDP is not particularly high in an international comparison, given the higher level of aggregate debt in a number of developed economies, including the US, Italy, France, the

UK and Japan. Other than debt to GDP, it is appropriate that the balances of the economies are also taken into account, considering both the liabilities, i.e. debt, and the assets that an economy has. In China, a major part of debt has been used to finance investments. China's public assets are estimated at USD 35.8 trillion and its liabilities at USD 20.3 trillion, providing public equity of an estimated USD 14.6 trillion. China is pursuing the broader objective of economic growth, one pillar of which is financial stability and therefore the management of financial risks, as part of which China has committed itself to economic deleveraging at the highest political level. In terms of deleveraging, favourable trends can be observed in the corporate and public sectors, while consumer lending continues to grow for the time being.

In her talk, Senior Fellow *Alicia García-Herrero* from European think tank Bruegel discussed the question of how Europe could open to the East in a 21st century that will likely belong to Asia. Europe is seen as increasingly small from an Asian perspective. Virtually all aspects of global growth between 2015 and 2025 may be dominated by Asia, which is expected to account for 63 per cent of economic growth, 60 per cent of the middle class globally, and approximately 40 per cent of the 500 largest corporates of the world in 2025. China and India are becoming the two main economies. The EU's relations with China may be crucial for the EU to be able to benefit from Asia's century. For the time being though, Europe has a significant trade deficit with China. A breakthrough could be provided with the export of services; but the share of the segment remains small and so it needs to be increased. While major growth potential can also be identified in foreign direct investments, efforts are still needed to create a more level playing field and to clarify the rules, and in addition a bilateral investment agreement might be appropriate.

Park In-kook, Chair of the Korea Foundation for Advanced Studies, discussed the new characteristics of global changes. The first key change is the political transformations taking place worldwide. While the advances made in the fields of democracy, free trade and globalisation used to be seen as a unidirectional process, more authoritarian political forces have gained ground in a number of countries. Another important change has been the shift in China's attitude to global developments. Up to 2009, China had simply taken an open stance, whereas since that year it has become increasingly resolute in asserting its interests, which is more likely to lead to a conflict with the United States. The third key change is the potential spread of nuclear weapons. The emergence of North Korea as a nuclear power could drive other countries in the region, such as South Korea, Japan or Taiwan, to build up sufficient retaliation capabilities. Within the fourth group of parallel developments, mention should be made of the drawbacks of globalisation that are felt on a large scale, including the destabilising effects of dependencies, weakening national independence, increasing wealth inequalities, and the growing

power of monopolies; among other things, these developments contribute to further impetus for protectionism.

Lawrence J. Lau, Professor at the Lau Chor Tak Institute of Global Economics and Finance of the Chinese University of Hong Kong, confirmed the trends described previously, i.e. that while Europe and the United States are losing their prominence in the world economy, Asia is gaining. A number of Asian countries emerged after WWII. The talk explored the common characteristics that facilitated the convergence process. The argument highlighted the shared features of high savings rates, a significant volume of available labour, an increased commitment of resources to research and development, ensuring macroeconomic stability, economies opening up and becoming export oriented, and continuity in political governance. Apart from potential drawbacks, a constant governing power may provide a number of benefits, including the continuity of economic policy, and greater predictability for the private sector.

In his talk, *Renwei Huang*, former Vice-President of the Shanghai Academy of Social Sciences, currently Chair of the Academic Committee and a Senior Fellow for international strategic studies, gave a summary of the development and characteristics of the Belt and Road Initiative. The Initiative was announced by China's president, Xi Jinping in 2013. The Asian Infrastructure Investment Bank (AIIB) and the Silk Road Fund were set up by 2015. In November 2017, the 19th National Congress of the CPC also confirmed the importance of the Initiative. According to the participants' shared vision, economic globalisation is entering a new phase, there is a need to discover a new way of global governance, a new infrastructure network may be established between Europe and Asia, there may be shifts in the weight of industrial chains and departments and in the weight of international capital flows, while the new structure may require both bilateral and multilateral cooperation, and international business may need new rules based on a mutual understanding between cultures. The new regime offers plenty of opportunities for acceding countries; for example, benefits are currently available to Central and Eastern Europe through infrastructure investments. According to the lecturer, the gradual approach to progress may be effective. However, it is worth noting that the regime is very much influenced by specific characteristics of Chinese culture, such as building bridges before riches, giving more and taking less, avoiding pressuring others in fields that we do not want for ourselves, or preference for internal improvement over external change.

Afternoon session: "Great Transformation: West"

The afternoon session opened with an address by the Central Bank of Poland's Governor *Adam Glapinski*. In a changing world, it is important for a central bank to act as an anchor of stability, and not to overreact the momentary volatile

movements of the markets. In Poland, the base rate has remained constant at 1.5 per cent for around 3 years. Over these years, the central bank has come under multiple pressures, initially towards easing and then towards tightening; however, it resisted and pursued a consistent policy of no change, which it saw as the best way to achieve its objectives. While a constant policy rate may superficially appear old-fashioned and boring, council members in fact considered the options at each rate-setting meeting, yet each time, based on the analyses available, the central bank came to the conclusion that the best option was no change. The results of recent years have confirmed the central bank's position.

In his keynote address as Chair of the afternoon session, *György Szapáry*, Chief Advisor to the Governor of the Magyar Nemzeti Bank, pointed out the need for the renewal of the EU and the euro area in order to increase their resilience and improve their operations for the long term. While consensus has been reached over certain issues such as the completion of the Banking Union and the establishment of the Capital Market Union, or the transition from ESM to EMF, opinion has remained strongly divided regarding numerous other key matters, i.e. expanding the ECB's lender of last resort role, tax harmonisation, eurozone budget, financial incentives for joining the eurozone, EU enlargement to offer membership to Balkan countries. Szapáry demonstrated that growth in the EU is being driven by new Member States, given the significant transfers of human resources from the CEE to western Member States. He added, that besides these, the European Union must face other challenges, such as Brexit, migration and a two-speed Europe.

Former President of the Eurogroup Working Group and of the EU Economic and Financial Committee, *Thomas Wieser*, underlined the pressing need for deeper integration within the EU due to the developments previously explained, i.e. the shift in the weight of the world economy towards the East. Strengthening the internal market is a prerequisite for ensuring the EU's greater weight internationally, in the meantime though, Brexit poses the risk that the EU's international weight will diminish further. Apart from external challenges, the EU also needs to respond to many internal challenges such as the division of opinion between North and South, low productivity, and the efficient distribution of responsibilities between Brussels and nation states. At this point, many of the major global issues are being answered without any EU involvement; EU Member States are small in a global sense, but may be strong if united.

Marco Buti, Director-General for Economic and Financial Affairs at the European Commission, thinks that it is early to lament over the decline of Europe. We should not underestimate ourselves, as current developments in the economy are favourable and enable sufficient progress to be made on integration for Europe to rise to international prominence. EMU must deal with its internal issues as the current status is unsustainable: there is a need for a more appropriate distribution

of risks to individuals and communities, monetary policy is overburdened, the adjustment mechanisms are insufficient and there is no central fiscal stabilisation function. Regarding a financial union of greater depth, the most urgent priority for EMU is to establish the Banking Union and the Capital Market Union, as the mitigation of income shocks via financial markets remains low. One advantage of a fiscal union is that it may improve the resilience of the economy and the ability of the region to stabilise itself. The achievement of stronger economic and fiscal cooperation may be followed by further efforts to deepen cooperation on institutions and governance.

Reza Moghadam, Vice-Chairman for Global Capital Markets at Morgan Stanley, argued that Brexit was in fact the result of the UK's identity crisis. Currently the UK lacks a clear consensus on the nature of the relations it should have with the EU; moreover, power is being held by a minority government, which makes virtually any outcome possible as regards Brexit negotiations: a beneficial agreement, a so-called hard Brexit, or even a new referendum. Despite the uncertainty over the short-term outlook, he considers the UK economy to be resilient in the longer term. Business requires clear perspectives and a legally enshrined vision for the sake of predictability.

John Lipsky, a Senior Fellow with the Johns Hopkins School of Advanced International Studies, and former first Deputy Managing Director of the International Monetary Fund, addressed EU developments from a US perspective. He explained that despite the criticism voiced by some US economists about the construction of the euro, it was mostly welcomed by participants in the business community. While a single currency may support the deepening of the single market, there would be benefits in knowing the EU's ultimate intentions concerning a deeper union. The EU banking system was deeply hit by the crisis, which may call for a more effective distribution of risks and a greater degree of federalism. The Banking Union and the Capital Market Union could be game changers.

The conference was concluded with a few words of thanks by Governor Matolcsy. He pointed out that while the conference talks highlighted the major transformations taking place worldwide, there are deadlocks in other fields at the same time, such as Brexit or the relations between Brussels and the V4. He proposed moving forward out of these situations, calling for new visions, strategies and structures. In view of the unpredictability of the future, several visions may co-exist, and the next conference may provide a good opportunity to discuss them.

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- 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.
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