2 FINANCIAL AND ECONOMIC REVIEW

June 2018
Vol. 17 Issue 2

Financial and Economic Review

Scientific journal of the Magyar Nemzeti Bank

Publisher: Magyar Nemzeti Bank
Publisher in Charge: ESZTER HERGÁR
H-1054 Budapest, Szabadság tér 9.
www.hitelintezetiszemle.hu
ISSN 2415–9271 (Print)
ISSN 2415–928X (Online)

Cover design: MARIANNA IZSÓNÉ BIGAI

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Published regularly in every three months.
HU ISSN 2415–9271 (Print)
HU ISSN 2415–928X (Online)

Page setting and printing:
Pauker – Prospektus – SPL consortium
H-8200 Veszprém, Tartu u. 6.

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The Hungarian Model: Hungarian Crisis Management in View of the Mediterranean Way*

György Matolcsy – Dániel Palotai

This paper examines the crisis management measures used by Mediterranean euro area countries and Hungary. Such a comparison is justified, because in certain periods of the crisis these countries faced similar challenges necessitating rapid economic policy intervention as previous practices proved to be unsustainable. However, the tools used – and thus also the results – were different. After 2010, Hungary sought to achieve economic balance by improving employment and growth, mainly driven by a tax reform and structural reforms of the budget and, from 2013, after the turnaround in monetary policy, also supported by targeted measures of the Magyar Nemzeti Bank (the Central Bank of Hungary). Overall, the harmonisation between the two main branches of economic policy gave rise to an innovative, growth-friendly economic policy, which since 2013 has created a balance between macro-financial equilibrium and growth not seen for a long time. By contrast, the Mediterranean countries using the euro basically opted for traditional crisis management: they sacrificed growth for balance, yet even the latter was achieved much later than in Hungary. In their case, recovery was also hampered by monetary policy constraints due to euro area membership. The targeted Hungarian steps may provide a good example to other countries facing similar challenges.

Journal of Economic Literature (JEL) codes: E52, E58, E62, H21, O23

Keywords: fiscal policy, monetary policy, economic policy coordination, Hungarian economic history, Laffer curve, crisis management

1. Introduction

The global financial crisis posed an enormous challenge, primarily for those countries where economic growth had to be restored in parallel with fiscal and macro-financial stabilisation. Traditional crisis management tools are only able to

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

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The authors wish to thank Gergely Baksay, Ákos Szalai, Róbert Hausmann, Dávid Berta and Gábor Meizer for their contribution to this paper.

The Hungarian manuscript was received on 4 April 2018.

DOI: http://doi.org/10.25201/FER.17.2.542

achieve one of these goals, and only at the expense of the other. The introduction of a new model to Hungarian economic policy with innovative and targeted tools after 2010 resulted in effective crisis management in an international comparison, illustrating that with the appropriate approach, this crisis management dilemma can be resolved, and economic balance and growth can be achieved at the same time.

Ten years after the crisis, it is now time to draw the lessons. Economists are still reassessing and developing economic models by integrating previously neglected areas, such as the financial intermediary system, inequalities or the impact of the cyclical variation in fiscal multipliers. In a similar fashion, economic policymakers need to take stock of what they learned about crisis management and how to avoid a new crisis.

The study compares the Hungarian crisis management measures and results to the experiences of those European countries which, in many respects, faced similar policy challenges during the crisis. The comparison is based on the Mediterranean countries (Greece, Italy, Portugal and Spain: ClubMed), where – due to private sector or budgetary reasons – a similarly rapid economic policy intervention was necessary during the crisis, as the then prevailing practices had proved to be unsustainable.

The Mediterranean countries[1] *faced similar economic problems as Hungary.* The financial crisis was especially severe in the countries that struggled with macro-financial imbalances and financing difficulties, and whose room for economic policy manoeuvre was constrained. The pre-crisis situation was not exactly the same in all of the Mediterranean countries under review, but over time similar problems emerged, even though as euro area members they could rely on the support of the European Central Bank to some extent. The banking systems faced problems in all four countries, and large real estate bubbles formed, especially in Spain and Greece. Italy and Greece had the highest levels of public debt in the European Union (*Sávai – Kiss 2017*). Greece, Portugal and Spain were characterised by a current account deficit of around or over 10 per cent of GDP. The labour market participation rate and employment were substantially lower in Greece and Italy than the Western European average (*Table 1*).

[1] The analysis needs to take into account the fact that these countries cannot be treated as a homogeneous group in every respect, as the source of macroeconomic instability as well as the tools chosen differed in a number of aspects.

Table 1
Main macroeconomic indicators of Hungary and the ClubMed countries as an average of 2008–2010

	Hungary	Greece	Italy	Portugal	Spain
Government debt (% of GDP)	76.5	127.4	110.1	83.8	50.8
Real GDP growth (%)	–1.7	–3.4	–1.6	–0.3	–0.8
Average annual inflation (%)	4.9	3.4	2.0	1.1	2.0
Net external debt (% of GDP)	54.1	86.1	42.0	79.6	86.8
Budget balance (% of GDP)	–4.2	–12.2	–4.1	–8.3	–8.3
Unemployment rate (%)	9.7	10.0	7.6	10.5	16.4
Employment rate (%)	55.4	60.4	57.6	66.5	61.1
5-year CDS spread (bps)	272.3	311.8	139.5	114.7	112.1
Current account balance (% of GDP)	–2.5	–12.9	–2.7	–10.9	–5.8

Source: Eurostat, MNB

As a result of the flawed economic policy of 2002–2008, Hungary faced all of the problems characteristic of the Mediterranean countries at the onset of the crisis (*Matolcsy 2008*). Hungary had one of the lowest employment rates in the EU, a most severe factor inhibiting production, while also experiencing a persistently high general government deficit and current account deficit (twin deficit). The unsustainability of the Hungarian economic policy had been revealed earlier, already in 2006, and the lack of structural reforms as well as the flawed structure of the fiscal adjustment implemented at that time reduced the growth rate of the Hungarian economy to around 0 even before the crisis. By the end of 2008, Hungary was characterised by weakened economic fundamentals and limited room for economic policy manoeuvre and was confronted with the global financial and economic depression, which resulted in a synchronised financing, debt and real economy crisis. As a consequence of the high external and internal indebtedness, the lack of market confidence and the freezing of the government securities market, Hungary was among the first countries which had to request financial assistance from the IMF and the European Union.

On account of the global financial crisis and the 2011 debt crisis in the peripheral countries, real economy output slumped, causing turmoil in the financial system and the functioning of money markets through various channels. As a general consequence, willingness to lend and to take risks declined, while the risk of the prolonged deflation emerged in the countries which were more affected by

the crisis. Meanwhile, government bond yields in certain euro area countries significantly surged, and due to the losses on government securities holdings on their balance sheets as well as non-performing loans, commercial banks curbed lending. In many places, the economic crisis was coupled with a political crisis, and finding the appropriate economic policy responses was also difficult because of frequent changes of government in some countries (after 2010, there were six different heads of government in Greece, and five in Italy).

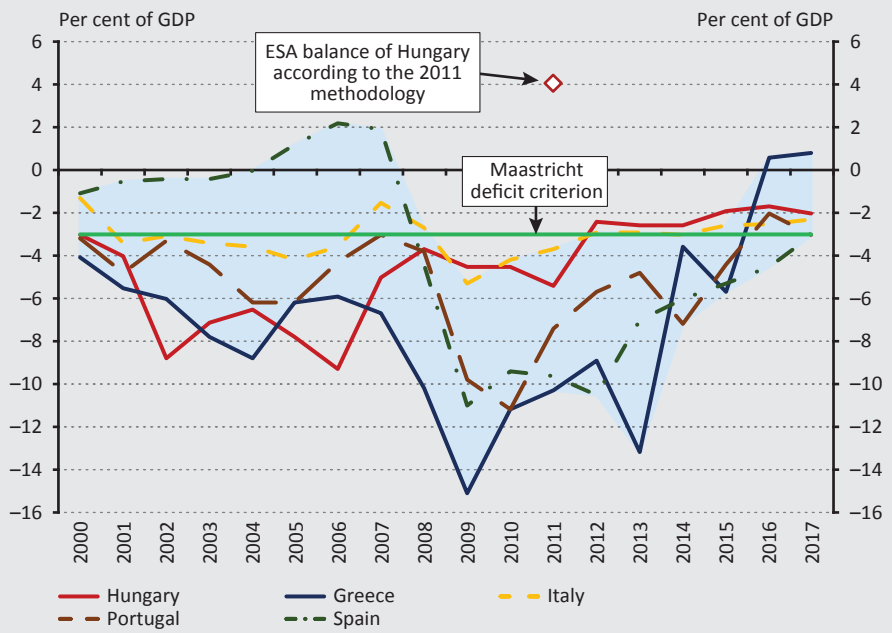
After 2010, Hungary introduced growth-friendly fiscal reforms and, starting from 2013, the Magyar Nemzeti Bank (*MNB*) *achieved a monetary policy turnaround with its innovative, targeted measures. As a result, the country's crisis management proved to be more successful than in Mediterranean peers.* By contrast, the Mediterranean countries sought to consolidate their budgets through traditional austerity measures, and their monetary policy was determined by the European Central Bank (ECB), which only belatedly used unconventional tools. We believe that the fiscal, employment and growth figures clearly show that the growth-friendly Hungarian crisis management model based on the harmony between fiscal and monetary policy was more effective than the traditional approach used in the Mediterranean countries. Reforms similar to those in Hungary would probably have reduced the growth sacrifice of stabilisation and thus borne fruit sooner in their case, too. The comparison should take into account the fact that the Hungarian measures have been based on strong political continuity and stability since 2010.

This paper highlights the differences in the crisis management practices of the Mediterranean countries and Hungary, and how effective they proved with respect to the achievement of the objectives. The second chapter presents the basic crisis management dilemma, i.e. that there is often a trade-off between stimulating economic growth and macro-financial stabilisation, and how this dilemma can be resolved. The third chapter lists the major fiscal measures, while the fourth details monetary policy steps. Both sections demonstrate that there were significant differences in the crisis management efforts. With respect to monetary policy, this was partly given for euro area members, since the use of a single currency does not allow autonomous crisis management, but the independence and room for manoeuvre of fiscal policy were very similar. Chapter 5 describes the results of the reforms, i.e. the macroeconomic situation achieved in recent years. Finally, Chapter 6 summarises the findings.

2. The basic crisis management dilemma: balance or growth?

The largest challenge faced by the unstable countries during the crisis was to mitigate the recession and at the same time restore economic balance or, more concretely, reduce fiscal deficits. Countries with a stable macro-financial balance could afford to increase their budget deficit to cushion effects of the economic downturn (i.e. to pursue a countercyclical economic policy). This was typical for the advanced countries, while the Mediterranean countries also tried to adopt this approach (*Figure 1*). However, in 2010 euro area economies started focusing on improving the fiscal balance, neglecting the effects on the real economy, assuming that reducing the deficit does not materially affect economic growth. However, this assumption and the resulting procyclical fiscal policy proved to be one of the key mistakes in European crisis management.

Figure 1
Budget balance in Hungary and the Mediterranean countries, % of GDP



Note: In the graphs that enable international comparison the blue bands show the area indicated between the lowest and the highest recorded yearly value of the Mediterranean countries.

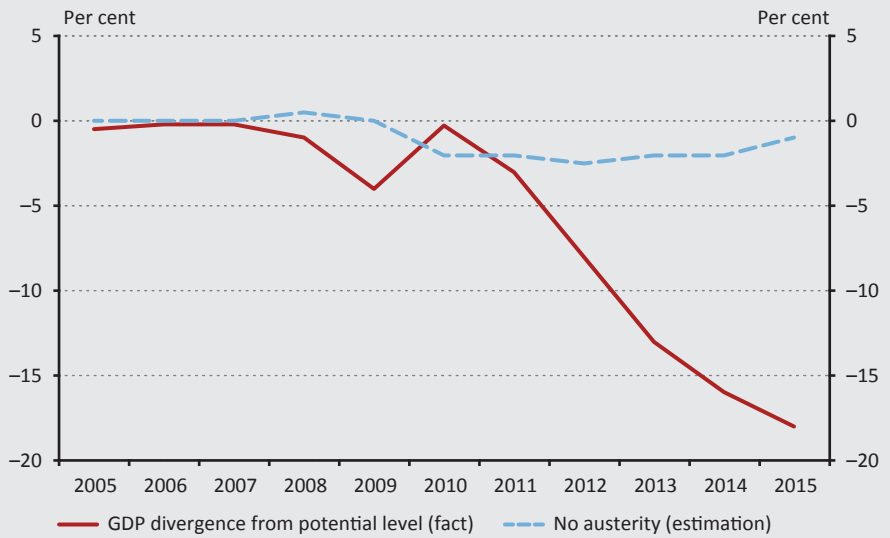
Source: Edited based on Eurostat data

Those countries applying austerity measures strongly underestimated fiscal multipliers in a recessionary environment. The fiscal multiplier measures the effect of a unit change in government expenditure or revenues on economic growth. However, among other factors, the size of the multiplier depends strongly on the cyclical position of the economy, and it is the strongest in times of recession (*Ilzetzki et al. 2013; Auerbach – Gorodnichenko 2012*). This means that in a crisis, the deficit-reducing measures without economic stimulus elements hamper economic growth to such an extent that they undermine fiscal consolidation through the contraction of tax revenues.

Empirical evidence shows that the economic downturn was aggravated by fiscal austerity more than expected. Blanchard and Leigh (*2013*) concluded that the International Monetary Fund (IMF) estimated the fiscal multiplier to be substantially lower than in reality, thereby also underestimating the recession caused by the fiscal adjustment. Their study showed that the larger the fiscal consolidation, the larger the shortfall in growth compared to the forecast. In Greece, for example, GDP growth in 2010–2011 was by 7 per cent lower than projected, while the budget balance was more or less in line with expectations. The authors estimated the fiscal multiplier to be between 0.9 and 1.7 and not around the level of 0.5 previously assumed by the IMF.

Without austerity measures, the recession could have been largely avoided, and a tax reform would have even boosted economic growth. House et al. (*2017*) modelled how much smaller the downturn would have been in the European Union Member States without austerity measures (raising taxes on labour, cutting wages and pensions). They found that without austerity measures, economic output could have fallen short of its potential level in the Mediterranean euro area countries (and Ireland) by a mere 1 per cent instead of the actual 18 per cent (*Figure 2*). The authors also point out in their paper that an independent monetary policy would have reduced the downturn by even more. The *European Commission's* (*2013*) analysis also attests that a growth-friendly tax reform would have exerted a positive real economic impact in Spain and Italy.

Figure 2
The combined economic performance of Mediterranean euro area countries and Ireland relative to the equilibrium with austerity measures (actual data) and without them (estimation)



Source: House et al. (2017)

Between 2006 and 2009, i.e. in an earlier period than the Mediterranean countries, Hungary was characterised by austerity in fiscal policy that deepened the crisis. Between 2002 and 2006, the Hungarian budget deficit was at unsustainably high levels, at 7.9 per cent of GDP on average. The measures of 2006 aimed at reducing the deficit had a flawed structure, as they were solely based on raising tax revenues, and therefore their impact was similar to the subsequent austerity in Mediterranean countries (*Matolcsy 2015*). As a result of these measures, in 2007, i.e. the year before the crisis hit, economic growth already dropped to around 0 per cent, and it continued to stagnate below 1 per cent in 2008. The Hungarian budget responded to the real economy recession entailing the global financial crisis in 2009 with a different approach than most European countries. While elsewhere the recession was sought to be mitigated by increasing the deficit, the EU-IMF programmes imposed too tight fiscal measures on Hungary, which stood in stark contrast to the previous loose fiscal policy. This second wave of austerity-based fiscal consolidation focused on decreasing expenditures. International examples showed that in times of crisis, fiscal austerity curbs the economy's performance and deepens the recession especially severely. Partly on account of this, the Hungarian economy saw one of the largest downturns in the European Union in 2009, when GDP declined by 6.6 per cent. Overall, in 2006 and 2009 the Hungarian economy experienced what

became reality in the Mediterranean countries only after 2009. The flawed timing and structure of fiscal austerity hampered growth and deepened the recession.

The new conservative Government that took office in 2010 performed a fiscal turnaround that reduced the deficit and stimulated economic growth at the same time. The Hungarian fiscal turnaround wished to solve the economic dilemma about the trade-off between economic balance and growth. The dilemma was resolved by the new Government by boosting employment, which not only led to economic growth but thus also to a larger tax base, improving the budget balance. The Government shifted the focus in tax centralisation from taxes on labour to consumption taxes, while also cutting the tax rates and simplifying the tax regime for Hungarian SMEs. On the expenditure side, fiscal balance was supported by the rationalisation of the loose social transfers that served as disincentives to employment (as part of the Széll Kálmán Plans). The details of the tax reform are presented in the next chapter where they are also contrasted with the measures in Mediterranean countries.

All in all, only Hungary managed to improve the budget balance and the dynamics of economic growth at the same time after 2010. Despite the average fiscal adjustment of around 9 per cent of GDP in the Mediterranean countries, their budget deficit was still over the 3 per cent Maastricht threshold in 2015. Meanwhile, the austerity measures also hampered the recovery. The real economy performance of Mediterranean countries continued to gradually deteriorate until 2013, and at the end of 2016, only Hungarian economic output was above the pre-crisis levels among the countries under review (*Figure 19*).

2.1. The Laffer curve

The Laffer curve illustrates the theory that there exists a tax rate that maximises government revenues under certain assumptions. However, a higher rate leads to lower tax revenues. The Laffer curve describes a non-linear relationship, first positive then negative, between the tax rate and the tax revenues realised.[2]

Beyond a point, high tax rates become particularly distortive for both the real economy and the budget. The reversal of the curve, i.e. when the relationship between the two variables turns from positive to negative, is based on the observation that an excessively high tax burden results in a smaller tax base on account of the negative dynamics that appear in such situations (e.g. diminishing labour supply, growing shadow economy). In case *labour income* is taxed excessively, the willingness to work declines in parallel with the drop in net wages. Depending on the tax rate, this drop may happen at either the intensive or the extensive

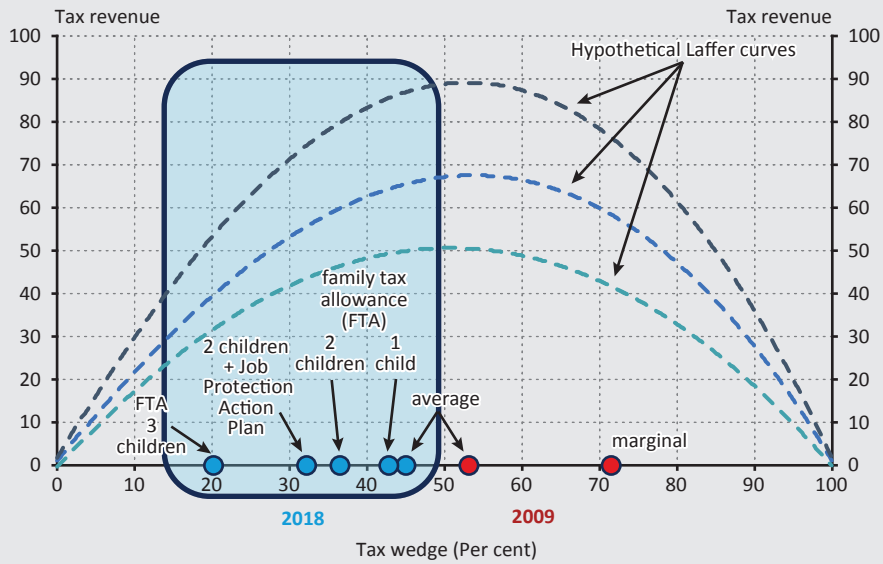
[2] The theory behind the Laffer curve was present before economist Arthur Laffer used it, but in the 1970s he advocated for the use of the theory in economic policy, pointing out the counterproductive effect of excessive taxation.

margin of labour supply. And in case *capital income* is taxed excessively, companies' willingness to invest falls on account of the expected decline in profitability.

The tax burden on economic actors is especially relevant in times of crisis. In an environment characterised by subdued demand or liquidity constraints, the fiscal multiplier is typically higher because economic actors are more sensitive to fiscal policy measures in the absence of financing. As a result, the excessive tax burden on income or a tax increase are especially detrimental to economic growth and the budgetary position due to the size of the tax base. Therefore growth-inducing measures, i.e. ones that reduce the tax burden, and a simultaneous budgetary consolidation is warranted to mitigate the crisis, and this stabilises the economy as well as the budget balance through the dynamic positive effects.

According to empirical experience, the Laffer curve peaks at around 50–60 per cent. Before the crisis, the Hungarian tax wedge is likely to have been in the declining part of the curve, however, it has been cut to a more favourable range. The shape (height, slope and skew) of the Laffer curve may vary between countries and periods, as it is substantially influenced by the given national economy's tax regime, the functioning of the tax authority, the extent of tax evasion and the elasticity of taxable income. International experience shows that in the case of the taxes on labour, the curve peaks at a tax rate of around 50–60 per cent (*Trabandt – Uhlig 2012*). In view of this, it is worth examining where Hungary was on the curve before 2010 and where it is now. In 2009, the average Hungarian tax wedge was 53 per cent for the average wage, while the marginal tax wedge was over 70 per cent. The latter was between 75 and 80 per cent in the mid-2000s. By contrast, the average tax wedge has declined to 45 per cent; in fact, it is even lower (20–43 per cent) in the targeted groups (thanks to the introduction and expansion of the family tax base allowance and the Job Protection Action Plan). The lower tax rate for the targeted social groups (families with children and those who are more vulnerable on the labour market) is consistent with the government's social policy objectives and priorities (improving demographic developments, full employment). The marginal tax wedge has equalled the average tax wedge since the introduction of the flat-rate personal income tax regime (*Figure 3*).

Figure 3
Illustrative Laffer curves based on international examples, and the Hungarian tax wedge in 2009 and 2018



Source: Edited based on MNB data

3. Hungarian crisis management: economic balance and growth

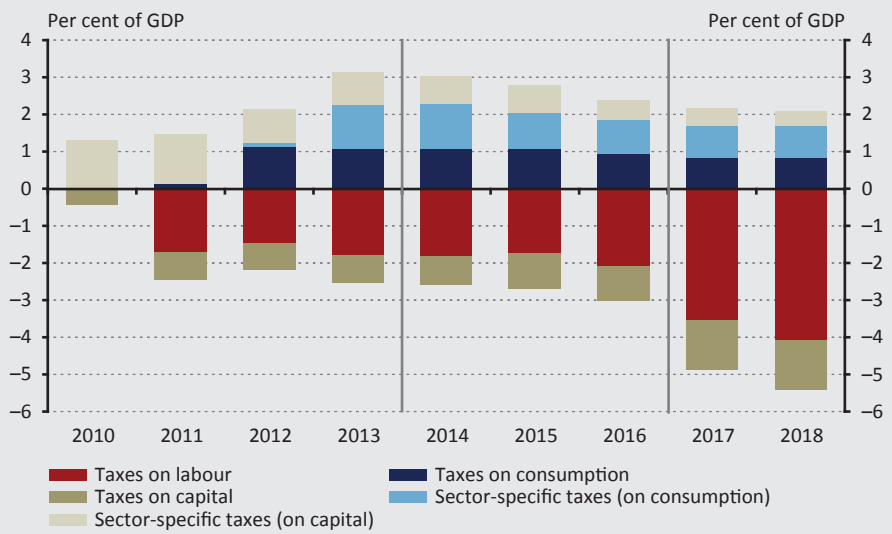
After 2010, Hungarian fiscal policymakers chose an innovative, growth-friendly approach to crisis management (*Matolcsy 2015; Kolozsi et al. 2017*). The new economic policymakers soon realised that under these extraordinary circumstances only extraordinary, targeted and unconventional tools can achieve results. This is because the traditional fiscal policy built on austerity measures eliminates economic growth, especially in times of crisis (*Eyraud – Weber 2013*).

The main objective of the tax system reform was to develop a tax structure that ensures fiscal balance and supports economic growth. Achievement of these two goals in parallel hinged on boosting employment (*Palotai 2017*). The low employment rate was a structural problem in all of the economies under review, but high unemployment became an even more pressing social issue during the crisis. In the mid-2000s, the Hungarian participation and employment rates were the second lowest in the EU (at 61 and 57 per cent, respectively, on average in 2003–2007), which was largely attributable to the high taxes on labour and the excessively loose social transfer system. This permanently damaged the Hungarian

economy, as the availability of active labour in adequate quantity and quality is a cornerstone of competitiveness and successful convergence.

Raising the number of people in employment and reducing unemployment became a priority for Hungarian economic policy and the tax reform, and the most important tool for this was shifting the focus of the tax structure from taxes on labour towards consumption taxes (*Figure 4*) (*Szoboszlai et al. 2018*). Cutting the personal income tax rate not only encourages employment, this kind of tax shift also improves external competitiveness. This is because lowering the taxes on labour makes producing for export cheaper, while imports become more expensive due to higher value added taxes, which ultimately boosts the competitiveness of the national economy on export markets[3] (*OECD 2010; Prammer 2011*). In addition to the tax shift, fiscal balance was ensured by sector-specific crisis taxes levied on more resilient service sectors (banking, insurance, energy, telecommunication and retail sectors). Also, the first steps were taken to improve the efficiency of tax collection, which culminated in parallel with the recovery. The structural transformation of the tax regime was implemented in 2010–2013 and was later followed by parametric fine-tuning.

Figure 4
Estimated static, cumulative fiscal impact of the Hungarian tax reforms after 2010 by tax types



Source: Edited based on MNB data

[3] This is the so-called fiscal devaluation.

3.1. Transformation of the taxes on labour

The most significant step in cutting the taxes on labour was the introduction of the *flat-rate personal income tax regime,* which reduced the single rate to below the former lowest rate. The elimination of progressivity in several stages (with a complete phase-out of tax credits and ''super-grossing'')[4] acknowledged and encouraged additional work and performance, i.e. it raised the effective labour supply of those already in the labour market (affecting the elasticity of labour supply at the intensive margin as well). It also reduced the willingness to conceal income on the part of both employees and employers.

One key targeted programme which strongly supported employment was the *Job Protection Action Plan* (JPAP), which bolstered the demand side of the labour market from 2013. The targeted employers' contribution allowances introduced with the JPAP provide significant support to vulnerable groups in the labour market (those under 25 or over 55, mothers returning from maternity leave, the unskilled, the long-term unemployed and agricultural labourers). For the most targeted groups, the programme waived the full amount of the social contribution tax up to the first HUF 100,000 of monthly income, and half of it in the other groups. Employment increased overall but especially in the affected groups, by as much as 40 per cent since the introduction of the programme, and 900,000 workers in total benefit from the framework of allowances.

The introduction of the *family tax base allowance* (*FTBA*) is mainly a family policy measure for tackling long-term demographic challenges, but by nature it also helps to increase the labour supply. This is because the benefit paid for child(ren) is not universal, as it is conditional on the beneficiary parent having a reported, legal income tax base. Linking benefits to employment encourages active labour market participation and the reporting of undeclared income.

In the Mediterranean countries, the highly progressive structure of personal income tax was not transformed as in Hungary. Similar to Hungary, the Mediterranean countries also used a multi-rate, progressive personal income tax regime before the crisis: Greece had 3 brackets, Italy had 5, Portugal had 7, and Spain had 4. While the progressive nature of the Hungarian income tax regime was eliminated after

[4] *Tax credits* were universal tax allowances reducing personal income tax. The gradual phasing out of this allowance substantially raised the marginal tax wedge, which rose to over 60 per cent above the average wage in 2010, while the marginal tax rate was almost 70 per cent due to the reduction of tax credits to zero and the introduction of the upper bracket of personal income tax. The system of tax credits was completely eliminated in 2012, which contributed to the simplification of the personal income tax regime and the cutting of the marginal tax rate.
Super-grossing was a "hidden" form of raising the taxes on labour, because, instead of the income tax rates, the tax base was raised through administrative measures. The system expanded the personal income tax base by 27 per cent, amounting to the same percentage as employers' social contributions in 2010, raising the average burden at all income levels uniformly. Super-grossing was introduced in 1 January 2010, and it was completely phased out by 2013 in two stages, contributing to the lowering of the taxes on labour.

2010 and replaced with a flat-rate system fostering more proportional public burden sharing, Mediterranean countries retained the multi-rate, progressive personal income tax regime. After the crisis, Greece started using a system with 10 brackets, with Italy having 6, Portugal 7 and Spain 5 brackets, mainly on account of the introduction of special taxes. The amendments increased not only the progressivity and complexity of the system, but also the taxes on labour (*Table 2*).

Table 2
Personal income tax regimes in Hungary and the Mediterranean countries before the crisis (in 2007) and afterwards

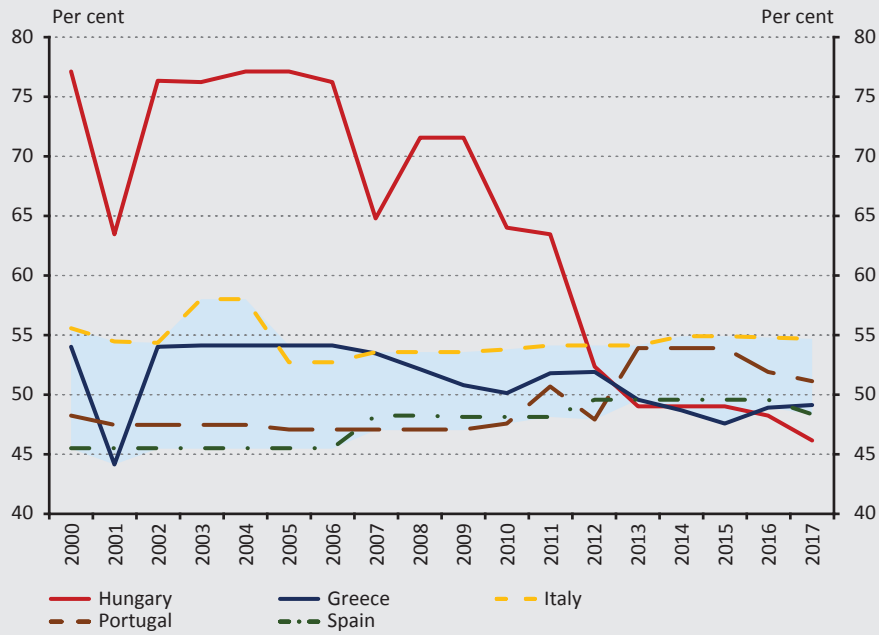
	Number of personal income tax rates and surtaxes	PIT rates before the crisis	PIT rates after the measures
Hungary	2+1 rates -> flat rate	18% and 36% + 4%	15%
Greece	3 rates -> 4+6 rates	29%–40%	22%–45% + 10%
Italy	5 rates -> 5+1 rates	23%–43%	23%–43% + 3%
Portugal	7 rates -> 5+2 rates	10.5%–42%	14.5%–48% + 5%
Spain	4 rates -> 5 rates	24%–43%	19%–45%

Note: The + "x" percentages in the table show the special PITs. The special PITs marked after the measures show the highest possible values.

Source: Edited based on OECD (2017) data

As a result of the Hungarian Government's measures reducing taxes on labour, the marginal tax wedge (the tax burden on a unit of additional income) was lowered considerably after the crisis. By contrast, the tax rate on additional income stagnated or rose in the Mediterranean countries (*Figure 5*).

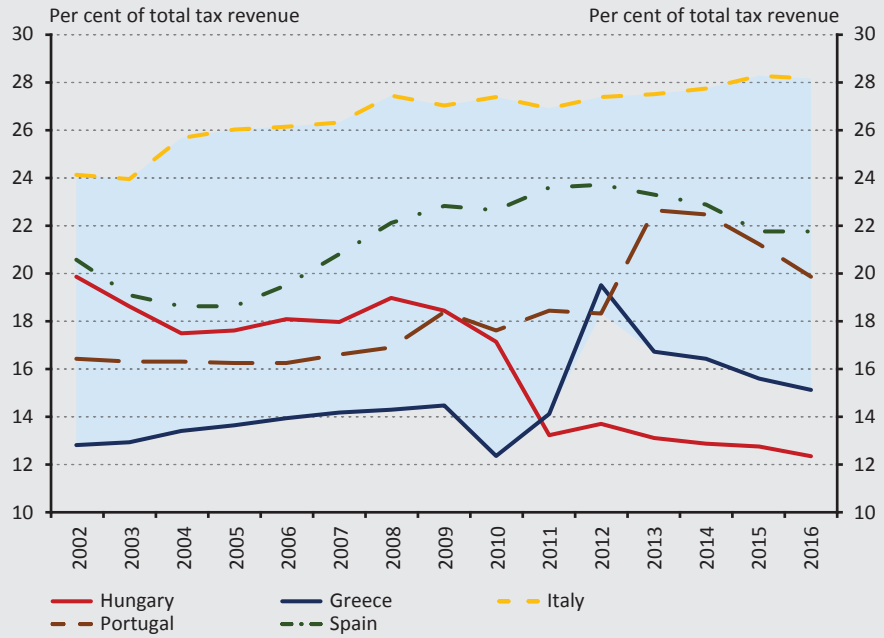
Figure 5
Marginal tax wedge for single childless employees earning the average wage in Hungary and the ClubMed countries



Source: Edited based on OECD (2017) data

The reduction in the personal income tax (PIT) after 2010 can also be clearly seen in the transformation of the tax structure. Before 2010, PIT revenues in Hungary amounted to around 18–19 per cent of all tax revenues, which puts them in the middle of the range of the Mediterranean countries. However, by 2011, the Hungarian figure had dropped to roughly 13 per cent and by 2016 it had fallen to around 12 per cent, making the share of Hungarian PIT revenues the lowest. By contrast, the PIT revenues of Mediterranean countries moved in the opposite direction, having stagnated or risen in the crisis. Among the countries under review, Italy relies especially heavily on personal income tax for financing the budget (*Figure 6*).

Figure 6
Personal income tax revenues in Hungary and the Mediterranean countries (as a percentage of total tax revenue)



Source: Edited based on European Commission and DG TAXUD data

3.2. Corporate taxes in Hungary and the Mediterranean countries

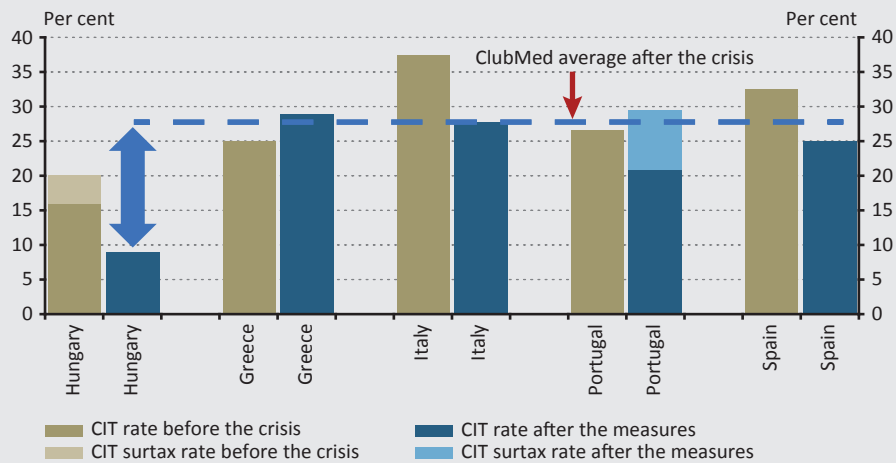
Hungarian economic policy also made significant steps in fostering employment and job creation as well as increasing corporate profitability and capital accumulation by reducing taxes on the country's micro, small and medium-sized enterprises. The special support provided to the SME sector is warranted, among other things, by the fact that two-third of Hungarian workers are employed in this sector.

In 2010, the Government already substantially expanded the group of SMEs eligible for a preferential corporate tax rate. In the second half of 2010 the eligibility criterion for the 10 per cent preferential tax rate was increased from HUF 50 million to HUF 500 million in revenues (those above this limit were taxed at a rate of 19 per cent), which considerably expanded the group of firms paying the low corporate tax rate. In 2017, the corporate tax rate was reduced uniformly to 9 per cent, making it the lowest corporate tax in the EU. While the 2010 measure mainly provided a substantial tax relief to micro, small and medium-sized enterprises, the 2017 tax cut

principally supports the ability to raise capital and corporations' competitiveness (*Mosberger 2017*).

Just as in the case of the personal income tax, the Mediterranean countries also missed the opportunity to significantly lower corporate taxes during the crisis (*Figure 7*). In Portugal, the average pre-crisis tax rate of 26.5 per cent had risen to around 30 per cent by the end of the crisis. In the same period in Greece, the corporate tax was raised from 25 to 29 per cent. In the other two Mediterranean countries under review, Spain, and Italy, the corporate tax rate dropped somewhat, but still remained high (25 per cent in Spain and 27.8 per cent in Italy).

Figure 7
Corporate income tax (CIT) regimes in Hungary and the Mediterranean countries before the crisis (in 2007) and afterwards



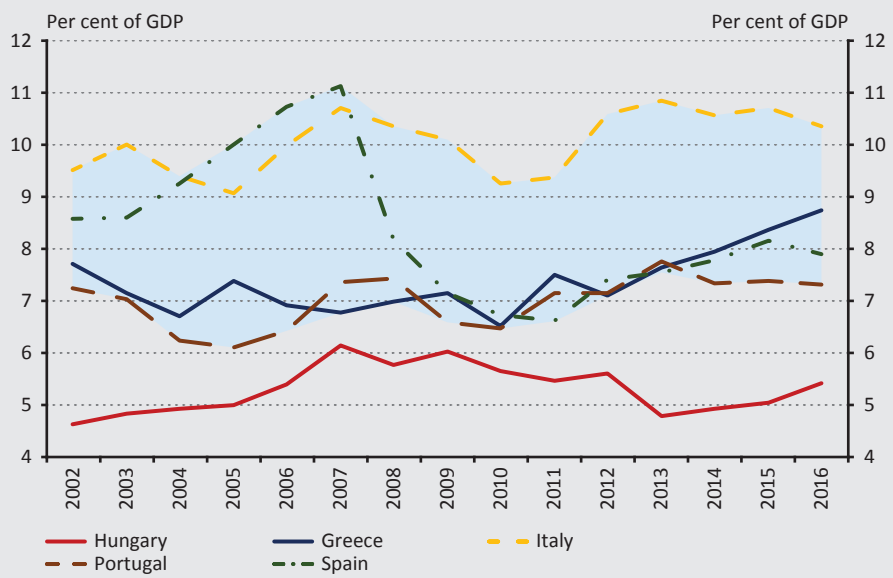
Source: Edited based on OECD (2017) data

The 2013 introduction of two important, targeted forms of taxation, the small taxpayers' itemised lump sum tax (KATA) and the small enterprise tax (KIVA) further reduced and simplified the tax burden on the Hungarian SME sector's capital income. These targeted small enterprise taxes have become more and more popular, since with these taxpayers can pay taxes in a simplified manner with less administration and lower rates, as they replace several other reporting and payment obligations at the same time. The small taxpayers' itemised lump sum tax is especially simple, as it offers a fixed-rate tax to the smallest companies (HUF 50,000 per month up to an annual income of HUF 12 million when the taxpayer works full time). By

paying the KATA, taxpayers are exempt from corporate personal income tax, the corporate tax, the dividend tax or lump sum tax, the personal income tax, the personal contributions, the healthcare contribution, the social contribution tax as well as the vocational training contribution, i.e. the administrative burden is significantly reduced. The other new tax type, the so-called small enterprise tax was designed for slightly larger companies, and, with its current 13 per cent rate instead of the 16 per cent upon introduction, it replaces three traditional taxes: the corporate tax, the employers' social contribution (social contribution tax) and the vocational training contribution.

Thanks to the measures, capital taxes were lowered in Hungary, leaving more income for businesses to invest and increase their headcount. Both before and after the global crisis, the share of capital taxes relative to GDP was lower in Hungary than in the Mediterranean countries. In 2010, taxes on capital income were lowered in Hungary, while Mediterranean countries' capital taxes relative to GDP gradually increased (*Figure 8*).

Figure 8
Capital taxes relative to GDP in Hungary and the Mediterranean countries



Source: Edited based on European Commission and DG TAXUD data

3.3. Consumption taxes and sectoral taxes for achieving fiscal balance

Hungary required additional budgetary resources to finance the measures fostering employment and growth, as the first few years of reforms typically entail lower budgetary benefits than costs. There were three possible options for compensating for the lost budgetary revenues:

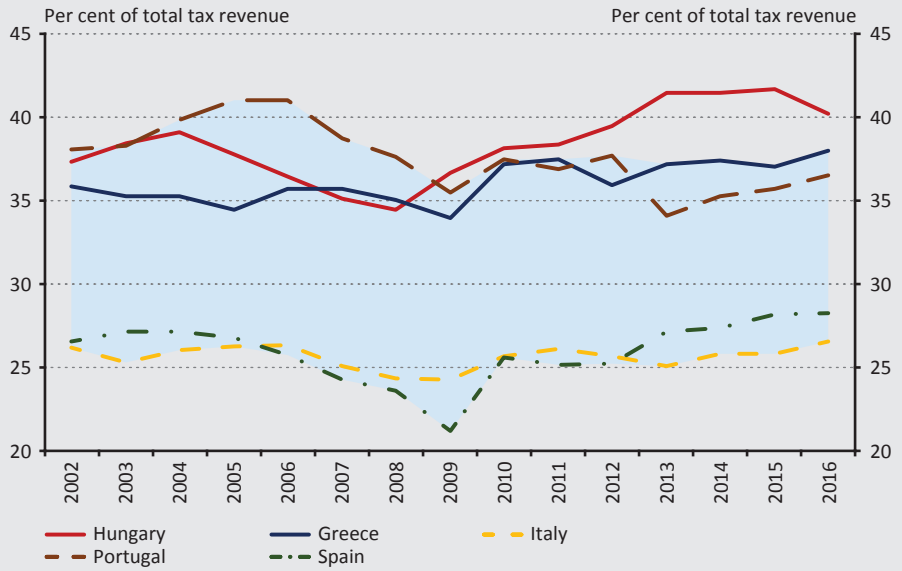
- introduction of traditional austerity measures;
- high deficit, growing external indebtedness;
- *increasing consumption taxes and using alternative, innovative tools (sectoral taxes).*

Running a high deficit or introducing austerity measures go against the objectives of the economic policy pursued after 2010, aimed at improving economic balance and stimulating the economy. Therefore, the additional space for fiscal manoeuvre was created by raising consumption taxes and introducing sectoral taxes. Consumption taxes distort economic actors' savings and investment decisions to a lesser extent, and they have an adequately broad tax base, as they also involve into tax paying those who are not formally employed in the labour market (*European Commission 2011*). The use of sectoral taxes was warranted because well capitalised sectors with lower effective tax rates (banking sector, energy sector, retail sector) were much more resilient than households and thus better fit to bear the additional tax burden. Lowering households' disposable income would have been counterproductive in the crisis years due to the high fiscal multiplier, as was shown by the example of the Mediterranean countries.

The increase in consumption taxes significantly shifted the Hungarian tax structure towards consumption taxes (Figure 9). The most important step was increasing the VAT rate from 25 to 27 per cent. The growing proportion of consumption taxes was also influenced by the fact that the sectoral taxes has been largely phased out from 2013, to be replaced by new consumption and turnover-type taxes (e.g. insurance tax, telecommunications tax, financial transaction tax).[5]

[5] Eurostat lists the special taxes, such as the financial transaction tax, the advertising tax, the accident tax, the insurance tax, the telecommunications tax and the public health product tax, among consumption taxes.

Figure 9
Consumption tax revenues in Hungary and the Mediterranean countries (as a percentage of total tax revenue)



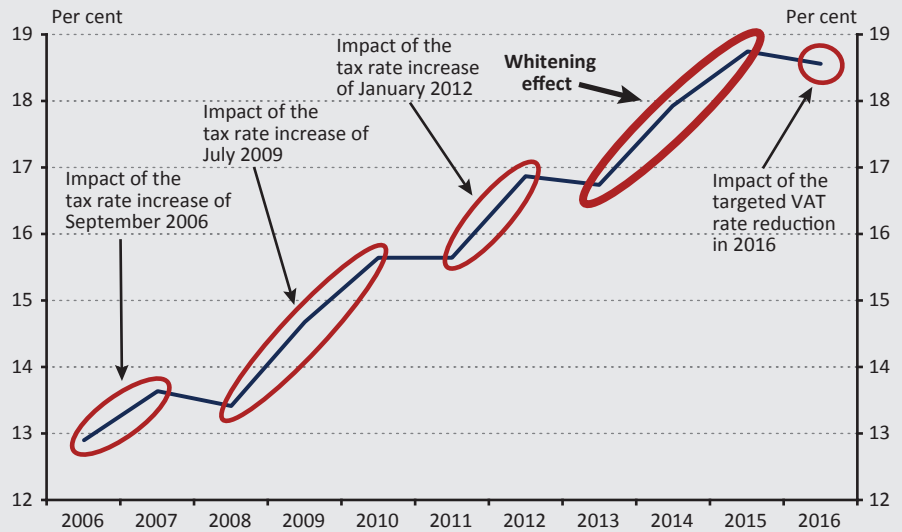
Source: Edited based on European Commission and DG TAXUD data

Tax revenues were increased without raising the tax rates, by the effective steps taken to reduce tax evasion. The most important measure against shadow economy was the establishment of an online link between the retail sector's cash registers and the tax authority in several stages. As a result, there were more than 200,000 controlled cash registers in operation by 2016 (*Szalai – Kolozsi 2016*). Another factor that contributed to combating the shadow economy was the introduction of the Electronic Trade and Transport Control System (EKÁER)[6] as well as the use of the reverse charge on VAT in several areas. Due to these measures, the Hungarian shadow economy diminished significantly after 2013. According to the European Commission's calculations, the Hungarian VAT gap[7] dropped from 21 to 14 per cent between 2013 and 2015 (*European Commission 2017*). Furthermore, estimates about the effective VAT rate calculated as the tax revenues divided by the estimated tax base also show that the shadow economy is shrinking. The effective rate rose by over 2 percentage points between 2013 and 2015 without any change in the VAT rates (*Figure 10*).

[6] The EKÁER is a government infrastructure aimed at reducing the shadow economy in Hungarian transport activities and increasing food safety, which was developed in harmony with the Széll Kálmán Plan, and which started functioning on 1 January 2015. Transport data need to be recorded in a central electronic system before transportation, which strengthens the position of law-abiding market participants, the transparency of the trade in goods and facilitates the identification of tax evaders.

[7] One tool for measuring the shadow economy is the calculation of the VAT gap, which is the difference between the potential and actually collected VAT revenues.

Figure 10
Developments in the effective VAT rate and the underlying causes of its changes in Hungary



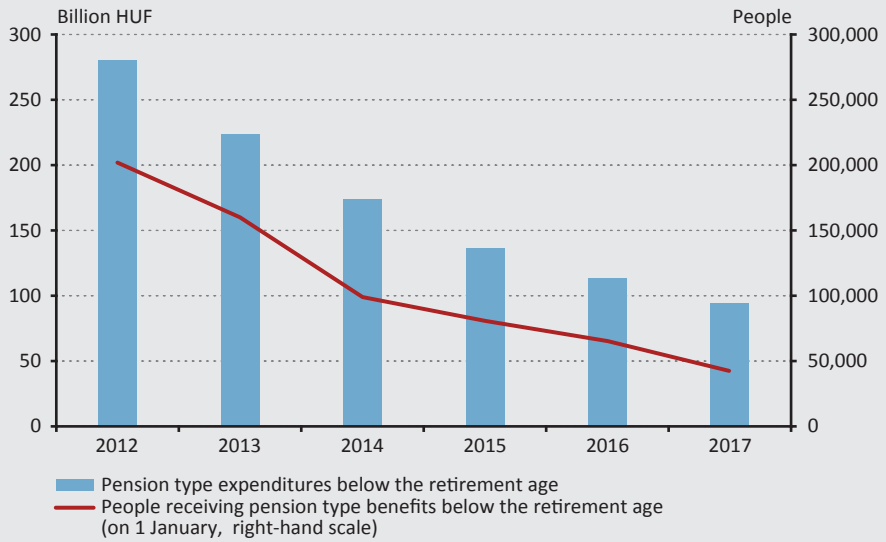
Source: Edited based on MNB data and Matolcsy – Palotai (2016)

3.4. Structural reforms versus austerity measures

Hungary and the Mediterranean countries also chose different paths in terms of transforming budgetary expenditures. The traditional method of stabilising the budget is to cut spending. In a crisis, when fiscal austerity affects the economy especially strongly due to the general lack of demand and funds, such measures point towards deepening the recession. If the demand of the private sector is not strong enough to offset the fall in government demand, the recession continues to deepen. Therefore, expenditure cuts need to be coupled with structural reforms, which result in the more efficient utilisation of expenditures and resources.

Hungary linked the reduction in budgetary spending to competitiveness reforms stimulating the labour market. Before 2010, the unreasonably loose social transfer system resulted in high budgetary expenditures and low labour market participation rates. The targeted reforms of the Széll Kálmán Plans reduced spending and also increased labour market participation. The rules for early retirement were significantly tightened, the eligibility criteria for disability pensions were reviewed, and both the maximum duration and transfer amounts of unemployment benefits were cut. As a result, Hungary managed to substantially lower the number of people receiving early retirement benefits (*Figure 11*), while the participation rate increased, which increased the labour supply and the number of workers waiting until old-age retirement and contributed to the stabilisation of the budget balance.

Figure 11
Number of people receiving early retirement benefits and budgetary expenditures on their benefits



Source: Ministry for National Economy, Hungarian State Treasury

The private pension fund reform not only helped to stabilise the budget, but also eliminated a wasteful, low-efficiency system. The funds invested a large portion of their guaranteed inflows in government securities, which financed the mounting debt exactly because of the contribution revenues foregone in favour of the funds (*Banai – Palotai 2018*). The sector was characterised by weak competition and high operating costs, which increased the budget deficit by 1–1.5 percentage points every year. The elimination of the compulsory private pension fund membership and the preference of the option of returning to the state system contributed significantly to bringing down the budget deficit to below 3 per cent and placing the government debt on a steadily downward path.

The Government spent a portion of the savings from the structural reforms on expanding and developing the public work programme. Economic policymakers wished to provide *"work instead of benefits"* even to those who had previously been inactive, creating an opportunity to return to the labour market. The programme is by nature temporary in the sense that it does not aim to tie down labour in this form for a long time: the number of participants has been gradually declining since 2016. It aims at offering an opportunity to participate on the primary labour market (the share of which has been gradually increasing, as the number of public workers has dropped from around 220,000 to below 160,000, meanwhile the participation rate jumped while the unemployment rate fell). It is also an effective tool for cushioning the effects of the economy's cyclical fluctuations exerted on the labour market and

reducing hysteresis. On account of the reforms, participation and employment have increased spectacularly, while the unemployment rate have fallen to among the lowest in the European Union (3.9 per cent) by early 2018.

Instead of targeted reforms, the Mediterranean countries sought to balance the budget through austerity measures, but this entailed huge growth sacrifices. In *Portugal* in 2011, public sector wages were reduced by 5 per cent on average and pensions were frozen. In 2013, pensions were reduced in a progressive system, and public sector wages declined further (also in a progressive system). Meanwhile, the number of public sector employees dropped by 10 per cent between 2011 and 2014. *In Spain,* pensions were frozen in 2011. In parallel with this, the number of public sector employees fell by 375,000 between 2011 Q3 and 2013 Q1. *In Greece,* in addition to the cuts in public sector wages, pensions over EUR 1,000 were reduced in 2011, then the 13th and 14th monthly pensions were completely abolished in 2012. In 2013, 15,000 public sector jobs were terminated. The following year, public sector wages and pensions were frozen for another four years.

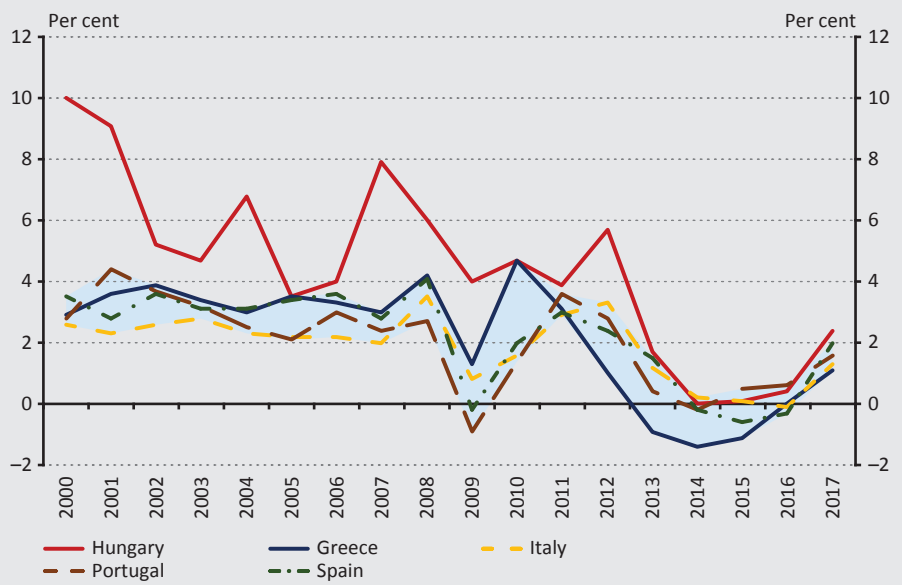
All in all, the Mediterranean countries chose the traditional path of fiscal consolidation, while Hungary undertook structural reforms. Although in the first years of the crisis, similar to others in the EU, the ClubMed countries loosened their fiscal policy, this seemed to be unsustainable due to the previously accumulated imbalances, and therefore they were forced to rethink their economic policies after 2010. Based on the recommendations by international organisations, the Mediterranean countries started a major fiscal tightening without domestic reforms, which – similar to the crisis management efforts in Hungary in 2008–2009 – curbed GDP, i.e. deepened the recession, even more than expected.

The Hungarian fiscal turnaround could be, and turned out to be, successful because it stimulated growth and employment, while also broadening the tax base. One of the cornerstones of the domestic reforms was shifting the focus of tax centralisation from the taxes on labour towards consumption taxes. The goal was to vitalise both the supply and the demand side of the labour market and to combat the shadow economy. In addition to supporting employment and families, the Government also fostered the profitability of the SME sector by reducing the corporate tax in several steps as well as by developing simplified, preferential small enterprise taxes. The achievement of fiscal balance was aided by higher consumption taxes and the larger tax burden (sector taxes) on the sectors with greater social resilience (banking, energy, telecommunication and retail). Fiscal balance was supported by further measures aimed at reducing the shadow economy (e.g. the introduction of online cash registers and the EKÁER) from the revenue side, and by the structural reforms included the rationalisation of early retirement and disability retirement (Széll Kálmán Plans) from the expenditure side.

4. Different monetary policies in Hungary and the euro area

Hungary and the Mediterranean region of the euro area faced the crisis with strikingly different monetary policy frameworks, which to a great degree determined the possibility of consistency between fiscal and monetary policy, which became key for crisis management. As the fiscal rules represented a strict constraint on stimulating the economy, the role of monetary policy has gained in relative importance in recent years. While the single monetary policy of euro area countries is determined by the European Central Bank, the Magyar Nemzeti Bank can conduct autonomous and, when necessary, effectively targeted monetary policy in Hungary. The fixed exchange rate regime required autonomous central bank objectives and the free choice of tools to be given up, which narrowed economic policymakers' room for manoeuvre. Moreover, these economies generated no inflation through their fiscal policies either which without the appropriate easing of monetary conditions led to the emergence of a strongly disinflationary and then deflationary environment in this region, with the risk of a vicious deflationary spiral (*Figure 12*).

Figure 12
Average annual inflation in Hungary and the euro area Mediterranean countries



Source: Edited based on Eurostat data

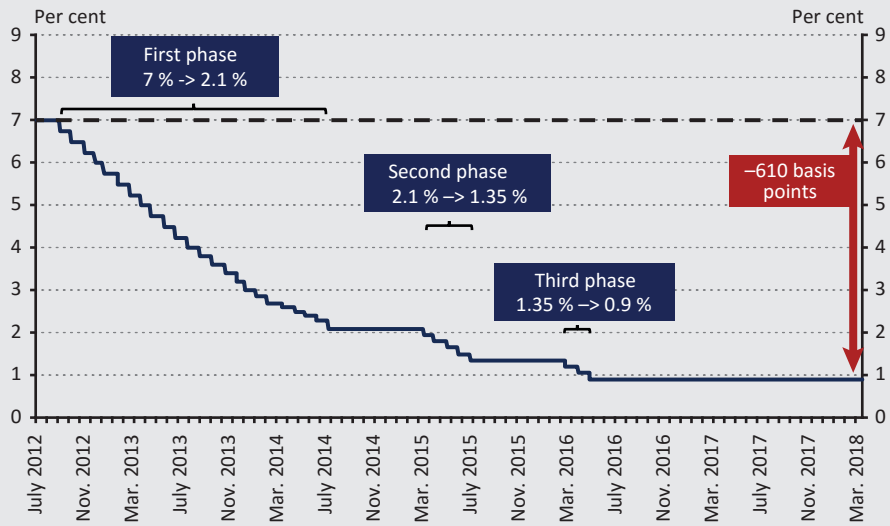
The autonomous monetary policy enabled Hungary to develop a constructive consistency between fiscal policy and central bank policy. However, this could only be achieved in 2013, when the new central bank leaders took office. From 2013, the MNB started introducing innovative programmes fostering stability and economic growth, and therefore Hungary's crisis management could be more effective than the Mediterranean model. The MNB has supported the total economy through the interest rate cutting cycles, the Funding for Growth Scheme (FGS) stimulating corporate lending and investments, the Growth Supporting Programme, the Self-Financing Programme reducing the macro-financial vulnerability of the country as well as the forint conversion of household FX loans conducted in cooperation with the Government.

4.1. Monetary policy turnaround and targeted measures in Hungary

Budgetary stabilisation and the independent monetary policy paved the way for a monetary policy turnaround in Hungary after 2013, which was based on the significant reduction of the policy rate and targeted measures.

The lower policy rate reduced the interest burden in all sectors of the economy while also supporting investments and consumption. Low inflation and the improving risk perception of the economy after the fiscal consolidation provided ample room for manoeuvre for the Magyar Nemzeti Bank to create steadily favourable monetary conditions actively supporting growth. The first and traditional tool for this was the prudent and gradual decrease of the central bank base rate from 7 per cent to the historic low of 0.9 per cent between 2012 (i.e. from the interest rate cuts launched with the support of the then new external members of the MNB Monetary Council) and 2016 (*Figure 13*). Government securities yields followed the development of the base rate in the context of low inflation, the favourable international money market environment and Hungary's improving risk perception, which showed that investors also considered monetary policy sound and credible. The falling yields considerably reduced the government's interest expenses. Total savings have amounted to 4.5 per cent of GDP since 2013 (HUF 1,600 billion).

Figure 13
Central bank base rate in Hungary

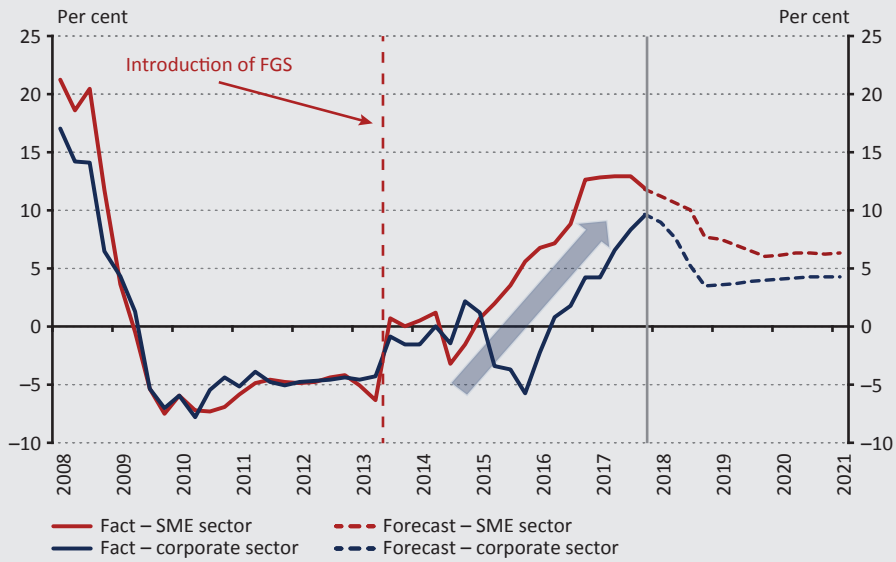


Source: Edited based on Magyar Nemzeti Bank (2017) and current data

The Funding for Growth Scheme and later the Growth Supporting Programme were targeted tools supporting the SME sector that helped avoid the risk of a creditless recovery. Similar to some foreign central banks, in addition to the general, traditional tools, the Magyar Nemzeti Bank used targeted, unconventional measures to effectively address the unprecedented money market and real economy crisis. Such measures included the MNB's Funding for Growth Scheme announced in the spring of 2013, which sought to alleviate commercial banks' insufficient SME lending. This was necessary because there was a real danger of the credit market (which had contracted by around 6 per cent annually since mid-2009) freezing completely, which would have entailed a persistent growth sacrifice and also undermined potential growth. To address this issue, the MNB offered refinancing loans to the commercial bank sector at 0 per cent, which had to be lent to the SME sector with a premium of up to 2.5 per cent (for fixed capital formation, working capital acquisition, FX loan refinancing and prefinancing EU funds). Within the framework of the programme, around 40,000 SMEs obtained preferential loans amounting to HUF 2,800 billion (8 per cent of GDP) in total. Thanks to the success of the FGS and the Growth Supporting Programme (GSP) introduced in 2016, which aimed to gradually phase out the FGS and smoothly shift corporate lending to market financing, the contraction in credit was reversed, and by the end of 2016, SME lending had started increasing dynamically (*Figure 14*).

According to *Magyar Nemzeti Bank* (*2016*) estimates, the rate-cutting cycles and the central bank programmes fostering lending activity contributed to around half of the economic growth in recent years, directly and indirectly, and they also exerted a positive impact on potential growth.

Figure 14
Growth rate of loans outstanding of the whole corporate sector and the SME sector in Hungary



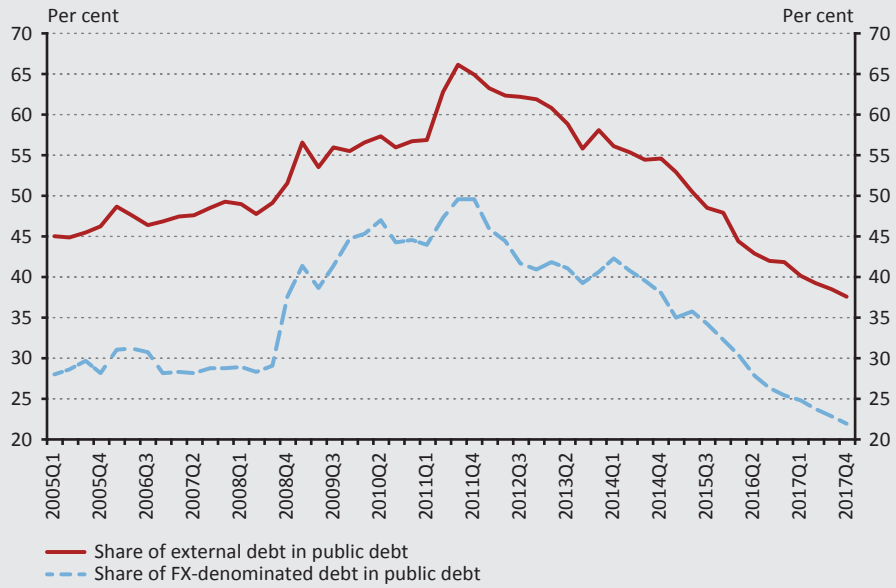
Note: Annual change on a transaction basis

Source: Edited based on MNB data

The Magyar Nemzeti Bank's Self-Financing Programme aimed to reduce the external vulnerability of the economy. The Self-Financing Programme was introduced by the central bank in mid-2014 and was then expanded in 2015 and 2016 in several stages. The primary goal of the programme was to reduce external vulnerability and improve the risk perception of the total economy, and to mitigate the central bank's FX reserve requirements by lowering external financing and expanding the domestic investor base. Therefore, the MNB encouraged commercial banks to keep their liquid assets in securities rather than in the central bank's sterilisation instrument. During the programme, the central bank policy instrument was transformed from a two-week bond into a three-month deposit, which considerably reduced its liquidity. Furthermore, the conditional central bank interest rate swap (IRS) was temporarily introduced to mitigate the interest rate risk of commercial banks arising from purchasing long-term, fixed-rate securities (*Magyar Nemzeti Bank 2015*).

The programme contributed substantially to enhancing the financing structure of government debt as well as to lower exchange rate exposure via a significant reduction in the share of foreign ownership and the foreign currency ratio in debt. After the extremely high figures at the end of 2011, both ratios are currently at historic lows (*Figure 15*).

Figure 15
Foreign ownership and foreign currency ratio of the Hungarian central government debt

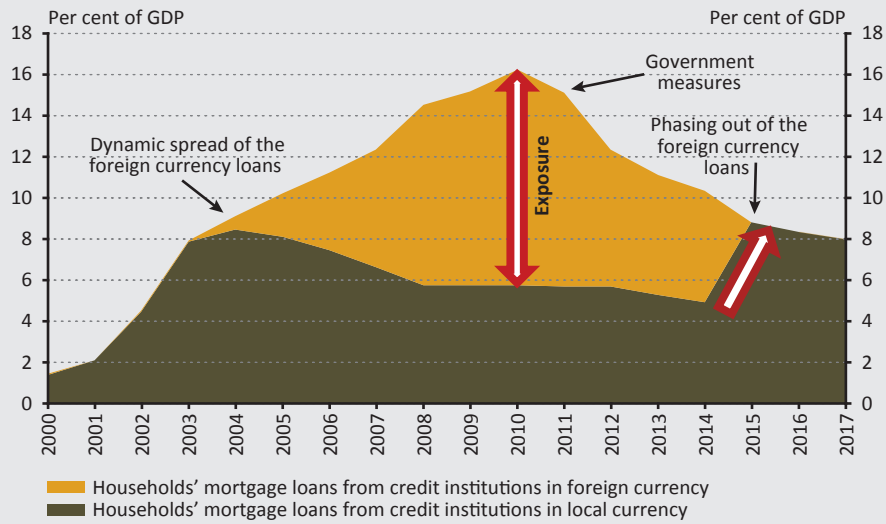


Source: MNB, Government Debt Management Agency

The phase-out of households' FX mortgages in cooperation with the Government and the banking sector saved the country from an economic and social catastrophe. As a result of the widespread, large-scale FX-denominated lending from 2003, by the time the 2008 global crisis hit, a large portion of the private sector had become indebted in foreign currency, which entailed a huge systemic risk even by international standards, due to the significant exchange rate exposure (*Figure 16*). This is because on account of the considerable weakening of the forint due to the crisis, the monthly payments of the debtors increased dramatically, making housing conditions uncertain for hundreds of thousands of people. In parallel with this, the rising payments also stymied aggregate demand, as they reduced the disposable income and consumption of debtors and drastically increased the ratio of non-performing loans (NPLs) (4–6-fold) in the banking sector, which jeopardised the

stability of the financial system. Meanwhile, the widespread FX lending impaired the monetary policy transmission mechanism, as Hungarian monetary policy could not influence the interest rates on the loans denominated in foreign currency. It became crucial for society and for economic policymakers to phase out the FX-denominated loans as soon as possible, but only the Government that came to power in 2010 was determined to go that far.

Figure 16
Household sector housing loans borrowed from credit institutions in Hungary (as a percentage of GDP)



Source: Edited based on MNB data

Since 2013, the Magyar Nemzeti Bank has helped with all its available means in settling the matter of households' FX loans. Before the Supreme Court's (Curia) uniformity decision in mid-2014, the MNB played a proactive role in the negotiations between the Government and the Banking Association, and then contributed significantly to the successful forint conversion of household FX loans by providing the necessary liquidity (EUR 9 billion) to the banking sector (*Kolozsi et al. 2015*). To ensure the success of forint conversion and prevent money market speculation, the conversion rate had to be fixed in advance and without informing market actors, which required close cooperation from the three players, the Government, the Central Bank and the Banking Association (*Nagy 2015*). FX loans started to be converted in the autumn of 2014 with the announcement of the FX tenders linked to the phase-out of household mortgages, and they were followed by personal and car loans in 2015, therefore by the end of 2015 Hungarian households basically had no FX loans on their balance sheets. The average monthly instalments on the previously Swiss franc-denominated housing loans plummeted by 25 per cent.

The importance of these measures was later underlined by the fact that all this was achieved before the Swiss National Bank discontinued the use of its exchange rate floor against the euro, after to which the appreciation of the Swiss franc would have had unpredictable consequences.

4.2. The European Central Bank's crisis management was insufficient for the ClubMed countries

The single monetary policy of the euro area practically gives no possibility to apply targeted central bank measures at the national economy level. This would be appropriate if the euro area were an optimum currency area, but the crisis has shown that this is not the case. The conditions for joining the euro area, i.e. the so-called Maastricht criteria, focus entirely on the financial stability of the economy, or more precisely on certain segments of that (inflation, yields, exchange rate stability, general government). However, we believe that the successful functioning of the currency area has further conditions. *Nagy and Virág* (*2017*) summarised these as follows: (i) real convergence, (ii) harmonisation of business cycles, (iii) similar levels of competitiveness, (iv) adequate financial sector, (v) available countercyclical policies. However, the euro area is characterised by considerable differences in these factors. Peripheral countries typically faced larger deflationary risks and higher unemployment rates. The economic situation and structure of northern and southern countries was different even at the time of their euro adoption and the crisis only amplified the differences. The euro area does not allow nominal exchange rate adjustment, but has not ruled out the possibility of huge real exchange rate differences emerging among its members. One of the main drivers behind the emergence of real exchange rate differences was divergent wage dynamics (*Sapir 2016*).

The European Central Bank only belatedly used unconventional instruments, which deepened the crisis in several Member States. The ECB responded to the crisis with rapid interest rate cuts, but it used other monetary policy instruments only belatedly (*Matolcsy 2015*), which kept monetary conditions relatively tight[8]. While managing the sovereign debt crisis, the ECB's measures aimed to reduce bond market spreads and restore the transmission mechanism to avoid defaults in peripheral countries. The ECB launched the Securities Markets Programme (SMP) in 2010, seeking to lower the excessive spreads by purchasing the government bonds from Mediterranean countries. Due to its size, the programme was only able to halt the rise in spreads and was unable to achieve a permanent drop in yields. The persistence of high yields in peripheral countries contributed to the unsustainably high levels of government debt and that these economies required external financing. The bonds purchased in the course of the programme amounted to

[8] This was exacerbated by the fact that the ECB attempted to launch the tightening cycle too early, in 2011.

EUR 217 billion, which proved to be insufficient with respect to the affected Italian, Spanish, Portuguese, Greek and Irish papers in the long run (*Lehmann – Mátrai – Pulai 2013*). The programme was not transparent, since the ECB did not communicate its purchases and their individual amounts, only the total holdings, and therefore no information could be obtained on the purchased amounts by country. The difference in market reactions is clearly shown by the fact that after President Mario Draghi's "Whatever it takes" speech and the announcement of the Outright Monetary Transactions (OMT) programme, the Mediterranean country yields started rapidly converging to core euro area yields. The two instruments differed in their amount, as one of the main messages of the OMT was that there was no upper limit on the planned purchases. The ECB repeatedly mentioned in its communication that these countries needed structural reforms and an overhaul of their fiscal policy. Yet one might still wonder whether it was worth waiting with an OMT-type measure until 2012. *Demertzis and Wolff* (*2016*) argue that the size of the first asset purchases relative to GDP was miscalculated, and the ECB only corrected this in 2016.[9]

All in all, due to the deepening debt crisis and the restrained monetary policy, not even the main objective, i.e. the inflation target, could be achieved in the euro area (Demertzis – Wolff 2016). The gradually introduced and expanded unconventional instruments helped stimulate the economy but their effect proved to be insufficient.

5. Success of the Hungarian reforms in view of Mediterranean countries' experiences

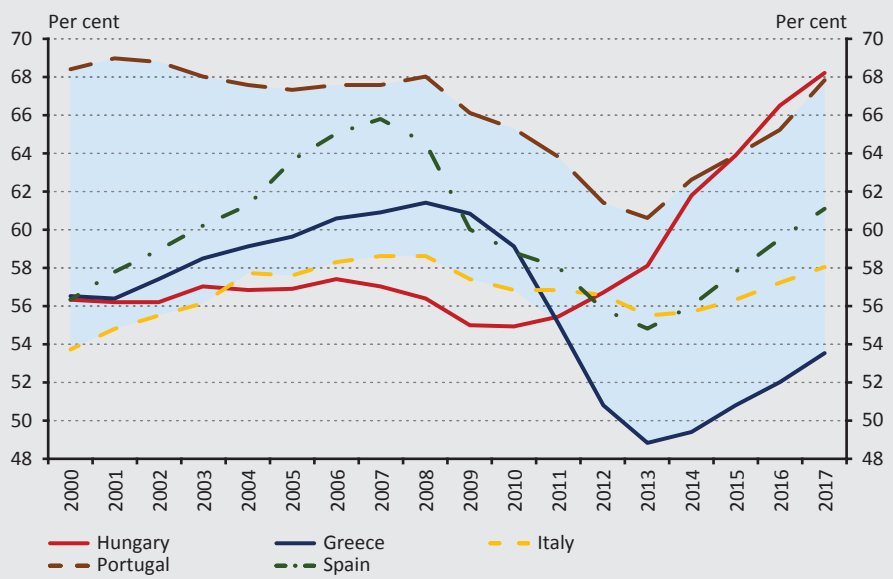
The different crisis management tools led to different results in the Mediterranean region and Hungary.[10] In contrast to the traditional crisis management logic, Hungary managed to stabilise the budget and restore economic growth sooner than Mediterranean countries. We believe that this was mainly due to the success of the employment policy turnaround, which was also heavily influenced by the economic policies supporting corporate investments. In contrast to the Hungarian measures, the adjustments in Southern Europe had a drastic effect on employment and also capital accumulation, which exerted a negative impact on both aggregate demand and long-term growth. Between 2007 and 2013, Hungary's investment ratio relative to GDP dropped by less than 3 percentage points (from 24 to 21 per cent), while the same figure in ClubMed countries decreased by over 9 percentage points on average (from 25 to 16 per cent). The indicator was then characterised by stagnation and moderate growth until 2017 in all countries. Only Hungary managed to exceed

[9] The comprehensive analysis of the European Central Bank's crisis management is beyond the scope of this paper. For more information on this, see Chapter 4 of *Magyar Nemzeti Bank* (*2017*).
[10] The figures in this chapter were based on György Matolcsy's presentation at the opening plenary session of the 2017 Annual Congress of Economists of the Hungarian Economic Association (*Matolcsy 2017*).

the 2010 level by 2017 (21.5 per cent), while the Mediterranean countries remain below that with 16.7 per cent on average.

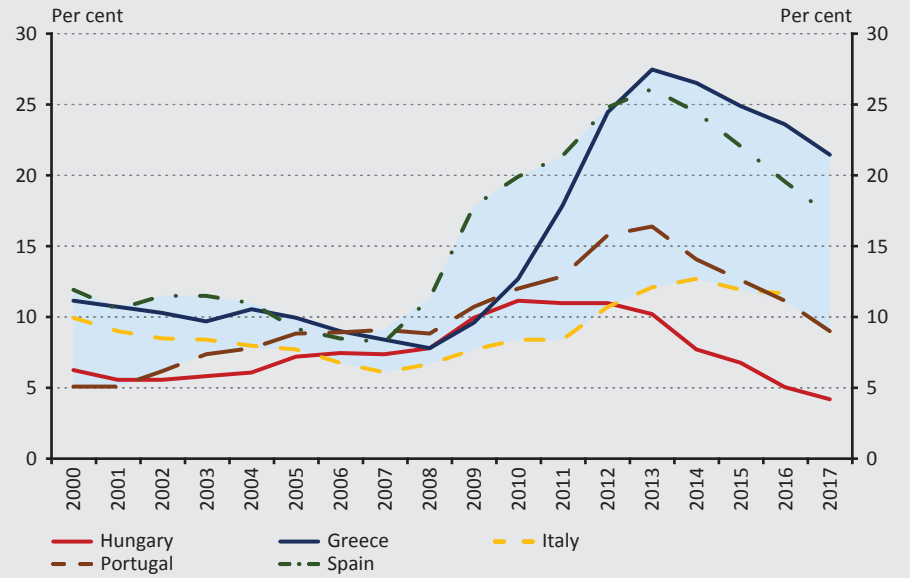
In line with the intentions of Hungarian economic policymakers, the economy practically reached full employment by 2018. The number of people in employment grew by roughly 20 per cent between 2010 and 2017 (from 3.7 million to 4.4 million), with the employment rate rising from 55 to 68 per cent. The Hungarian employment rate showed the second largest improvement in the EU, catching up with the average of not only the EU but also the country's Visegrád peers, and surpassing Mediterranean euro area members. In the case of Mediterranean countries, serious structural problems might be behind the fact that they still have not come close to their pre-crisis position with respect to the employment rate (*Figure 17*). An even more telling sign is that the Hungarian unemployment rate sank to an unprecedented low, 3.9 per cent, in early 2018. By contrast, in Mediterranean countries the 6–9 per cent characteristic in the pre-crisis period was not achieved by any of the economies (*Figure 18*).

Figure 17
Annual average employment rate in Hungary and the Mediterranean countries (among 15–64-year-olds)



Source: Edited based on Eurostat data

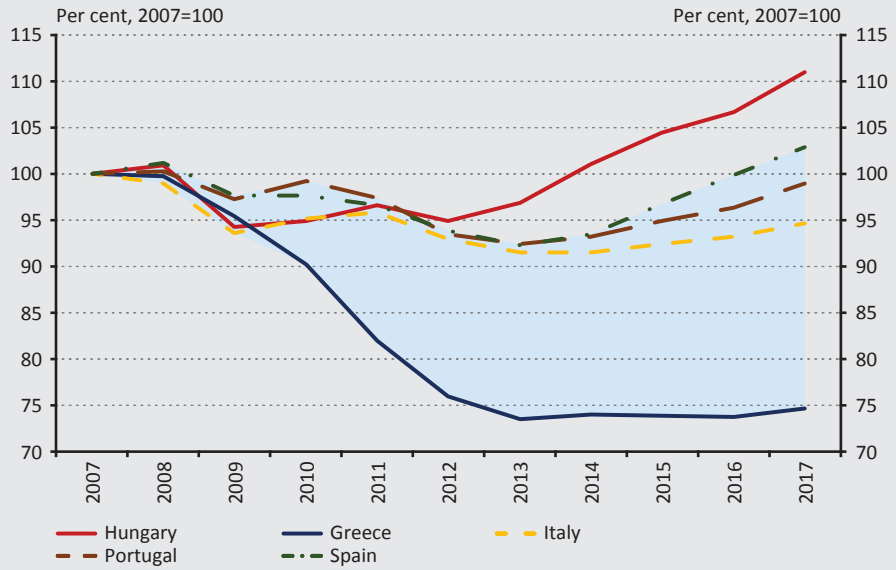
Figure 18
Annual average unemployment rate in Hungary and the Mediterranean countries



Source: Edited based on Eurostat data

The expansion of employment laid the foundations of economic growth in Hungary, while the Mediterranean countries' GDP still fell short of the pre-crisis level in 2016 (Figure 19). Hungarian GDP expanded by almost 17 per cent between the 2009 recession and 2017, which is 11 per cent higher than the pre-crisis level in 2007. Since 2013, the growth rate of the Hungarian economy has been significantly higher than the EU average, and, in contrast to the pre-crisis period, it is on par with the average growth in the Visegrád region. By contrast, the difficult recovery of the Mediterranean region is illustrated by the fact that with the exception of Spain, the ClubMed countries still have not been able to reach the 2007 level. Greece has suffered a 25 per cent setback in growth that it has not been able to offset since 2013.

Figure 19
Cumulative real GDP growth in Hungary and the Mediterranean countries

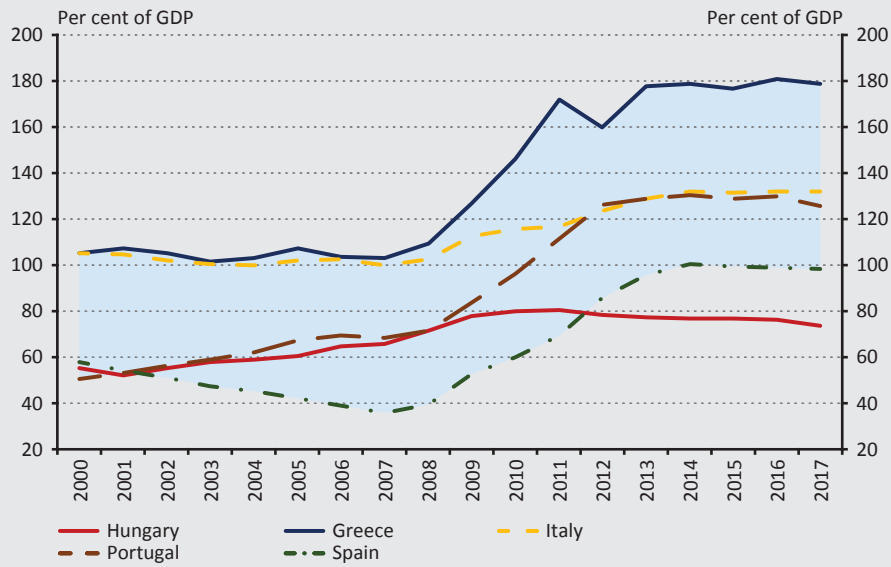


Source: Edited based on Eurostat data

After 2010, Hungary was able to create room for manoeuvre for the implementation of reform steps through the tax reform while ensuring fiscal balance. Since 2011, the Hungarian deficit-to-GDP ratio has been consistently below the European Union's 3 per cent Maastricht criterion. By contrast, most Mediterranean countries were able to meet the EU's deficit criterion only in 2016 (*Figure 1*). The 2010–2013 tax reform exerted its economic stimulus effect and thus padded budget revenues gradually, therefore tax revenues in Hungary increased by almost 2 per cent of GDP between 2014 and 2016 without raising the tax rates (*Palotai 2017*).

In Hungary, the previously upward trend in the government debt ratio was halted by the growth-friendly fiscal consolidation from 2011 (Matolcsy – Palotai 2016). The gross debt-to-GDP ratio fell from its historic peak of 80.5 per cent in 2011 to 73.6 per cent by the end of 2017. Hungary achieved the fifth largest debt reduction in the EU between 2010 and 2017 (the debt ratio decreased in 10 countries and increased in all the rest). By contrast, the government debt of Mediterranean euro area countries have been stagnating at the high level seen after the 2008 crisis (*Figure 20*).

Figure 20
Gross debt-to-GDP ratio in Hungary and the Mediterranean euro area countries



Source: Edited based on Eurostat data

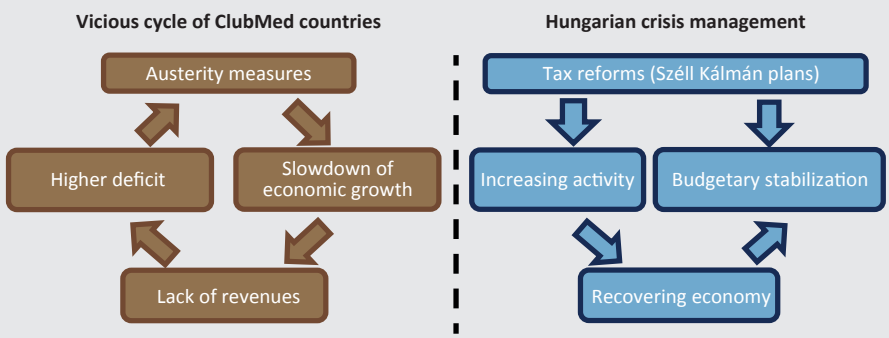
6. Summary

The new model in Hungarian economic policy introduced after 2010 which used innovative and targeted tools resulted in an effective crisis management in an international comparison. It has been ten years since the outbreak of the global financial crisis, and thus it is now possible to take stock of the crisis management efforts of Hungary and compare them to the results by other countries.

Despite the similar initial situation, the Mediterranean countries and Hungary chose different ways in almost all aspects of crisis management (*Figure 21*). The ClubMed economies under review have been part of the euro area, and therefore they could not conduct autonomous monetary policy. Moreover, they chose to address the fiscal challenges by taking the traditional route of cutting expenditures and raising taxes (to adjust their formerly unsustainably loose fiscal stance). By contrast, Hungary undertook a tax reform instead of raising taxes, and spent the fiscal savings on fostering employment. The fiscal reforms after 2010 were also supported by the monetary policy turnaround of the Magyar Nemzeti Bank in 2013, creating a vital and close coordination between the two main branches of economic policy (*Lentner 2017*). In addition to the interest rate cuts aiming at reaching the inflation target, SME lending, financial stability and the reduction of external indebtedness were

supported by innovative, targeted measures. These structural changes paved the way for sustainable economic growth. Nonetheless, in order to ensure successful convergence, the focus should shift to further improving the qualitative (i.e. non-price) competitiveness of the economy.

Figure 21
The vicious cycle of traditional crisis management and the successful Hungarian crisis management



Source: MNB

In contrast to the successful stabilisation in Hungary based on targeted, structural reforms, the crisis management of the Mediterranean euro area countries proved to be unsuccessful. This was mainly attributable to fiscal austerity, and the lack of structural reforms and an autonomous, targeted and efficient monetary policy. The belated and inefficient monetary crisis management and the traditional fiscal crisis management based on austerity measures entailed enormous real economy sacrifices, which led to a vicious cycle in the economy. As a result, the Mediterranean countries still struggle with growth and labour market conditions worse than before the crisis and high and stagnating government debt levels. We believe that if during the crisis the ClubMed countries had undertaken reforms similar to the Hungarian way after 2010, they would have been able to achieve fiscal stability and labour market consolidation sooner and with a smaller growth sacrifice.

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Regulatory Tools to Encourage FinTech Innovations: The Innovation Hub and Regulatory Sandbox in International Practice*

Péter Fáykiss – Dániel Papp – Péter Sajtos – Ágnes Tőrös

In our study, we assess the regulatory tools that can be applied to encourage FinTech innovations, also focusing on the aims of financial stability. After reviewing the opportunities and risks of FinTech innovations from micro- and macro-prudential aspects and in terms of consumer protection, we present the kinds of possible regulatory responses to the challenges raised by FinTech phenomena and the regulatory tools which are applied in international practice. We analyse these practices from the aspect of legal implementation, detailing their similarities and differences. Finally, we briefly present Hungarian regulatory initiatives encouraging FinTech innovations. An assessment of international cases reveals that there is no generally effective, standardised solution that meets every geopolitical requirement: when the concepts are developed, the special features of the financial intermediary system of the given country and the level of financial culture must also be taken into account.

Journal of Economic Literature (JEL) codes: K2, G28, F39

Keywords: financial stability, fintech, innovation hub, regulatory sandbox

1. Introduction

Until the end of the 20th century, the financial system was a trailblazer in the application of technological innovations, but at the beginning of the 21st century this was less typical. Starting from the 1960s, the banking system has relied strongly on innovations related to new technological solutions: key developments in past decades include the credit card, the ATM and the electronic system used for the management of settlements and these all clearly demonstrate the openness of the banking system to innovations, but a similar approach was dominant in the capital

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

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The Hungarian manuscript was received on 28 March 2018.

DOI: http://doi.org/10.25201/FER.17.2.4367

market and insurance sector as well (*Arner et al. 2016*, *MNB 2017*). However, in recent years the extremely rapid development and application of information and communication technologies have made a whole set of innovations essential in various sectors of the economy. The wide use of digital technologies is increasingly incorporated into everyday life, and it is slowly becoming essential for the society to be able to use the services via digital channels as well, the sector of financial products and services cannot avoid being subject to this trend. However, while technological innovations were incorporated into the operation of players in several other sectors, financial institutions and especially the banking system have not been able to deeply integrate such innovations into their daily operations (*EY 2016*).

After the crisis of 2008, there were several factors that prevented the financial sector from taking advantage of the opportunities of the digital revolution more keenly. On the one hand, the crisis resulted in a dynamic increase of the ratio of non-performing loans, which aggravated the capital positions of banks through impairment, and crisis management also soaked up significant human resources. On the other hand, the permanently low interest rate environment resulting from the crisis put the revenue side of banks under pressure, which could pose profitability challenges in the longer term with an unchanged cost level. Finally, the crisis also resulted in decreased trust by consumers in the banking system (*Stevenson – Wolfers 2011*), and regulatory expectations also increased significantly. These factors combined posed significant challenges to banks and other financial operators in the restoration of their profit-generating capability.

By intensifying competition, technological innovations could fundamentally change the business models of active players of the financial sector, inducing risks into the system that must be addressed with active regulatory control under any circumstances. The role of the regulatory authority should be assessed in the geographical dimension, since each of the Hungarian, the European Union and the international set of rules comprises a different geopolitical system, and therefore in specific cases a substantial need for harmonisation arises in international technological companies. The operation of the large technological enterprises (BigTech) and that of the start-ups highly rely on digitisation, as well as on the various online platforms; therefore, these market actors are able to operate at a low cost level, and their activities may have a price-reducing effect. As a result, incumbent institutions[1] should primarily adapt on the cost side (*European Parliament 2017*), since in their case high operating costs continue to pose a global problem (*EY 2016*).

The new technological solutions enable the actors in the financial sector to substantially improve their cost efficiency. In addition, the early adoption of new

[1] By incumbent institution we mean the regular financial institutions already present in the market.

ideas could even secure a permanent competitive advantage, and furthermore, a solution that offers significant benefits in terms of the competitiveness of the economy could influence the behaviour of several external stakeholders. If the regulatory authority also recognises these benefits, the developments could also be supported by the targeted modification of the regulatory environment, which could further expand the opportunities of the first responders, maintaining their initial competitive advantage (*Lee – Teo 2015*). The exploitation of benefits deriving from early adoption is also important because on the business side it is favourable for the incumbent institutions that in developed countries a significant part of the consumers insist on their usual bank, which could enhance the cooperation between banks and FinTech companies on the one hand, while on the other hand, the existing significant customer base could support the identification and exploitation of future development opportunities (*McKinsey 2016*, *FSB 2017*). Additionally, the role of commercial banks in money creation and in the financial intermediary system also provides a significant competitive advantage compared to non-incumbent undertakings (*MNB 2017*).

In this study, we assess the regulatory tools that can be applied to encourage FinTech innovations, also focusing on aims of financial stability. First, we review the opportunities and potential threats brought about by these innovations from micro-prudential, macro-prudential and consumer protection aspects. Subsequently, we present the possible regulatory responses that could be provided to address the challenges generated by the FinTech phenomenon, and the regulatory tools applied in international practice. After that, in terms of legal implementation we provide a deeper analysis of the regulatory solutions, detailing their differences and similarities. Finally, we provide a brief presentation of the domestic regulatory initiatives encouraging FinTech innovations as well.

2. The opportunities and threats of FinTech innovations

In the relevant literature, we cannot yet find a completely uniform, commonly applied definition of the concept of FinTech (financial technology) concerning financial innovations that have become more and more common in recent years. In general, by these we mean the exploitation of innovative technology in the framework of financial services (*Nicoletti 2017*; *MNB 2017*). According to the report of the Financial Stability Board (FSB), FinTech is a technology-driven financial innovation which may result in new business models, applications or products that could have a meaningful effect on financial institutions, financial services and financial markets (*FSB 2017*; *MNB 2017*). Considering the fact that innovation has always been a characteristic feature of the financial sector, it is possible to identify several phases in the FinTech phenomena along technological development. The appearance of the first period goes back to the second half of the 1800s with

the appearance of the telegraph, and later on the telephone. The developments registered in the second half of the 20th century and implemented as a result of the development of information technology can also be called FinTech 2.0 (e.g. ATM, telebank), while the rapid technological innovation seen in recent years is also mentioned in the literature as FinTech 3.0 (*Arner et al. 2016*).

The currently observable FinTech innovations can be assigned to the categories of efficiency innovation, sustaining technology and "disruptive technology" innovation (*Christensen 1997*). Efficiency innovations enhance an already existing technology: this category mainly includes solutions that build on existing infrastructure and improve its efficiency, whether these involve the expansion of payment opportunities, the optimization of account managing and administrative processes or the digitisation of back-office activities. Sustaining innovation is somewhat different, in which development is exclusively aimed at ensuring the viability of existing processes, for example, in cases when exogenous factors change. By contrast, disruptive technological innovations are capable of fundamentally changing existing business models. There are several solutions that are capable of providing financial services bypassing the regular financial service providers (e.g. P2P lending or insurance), or by automated data analysis and processing (e.g.: robo-advisory). From a regulatory perspective, it is primarily these latter innovations that merit special attention, since the market actors applying this kind of innovations are partially or fully outside the control of the regulatory and supervisory authorities, while they may have a significant influence on the entire financial intermediary system (*MNB 2017*).

Essentially, there is no technical impediment to FinTech innovations covering the entire value chain in terms of financial services, and therefore they may have a significant impact on the business models of incumbent institutions. The relevant solutions may be introduced at the level of a particular service type, but may also cover several financial functions and even become full substitutes for incumbent institutions (*MNB 2017*). From the funding side, in recent years investments in FinTech companies have increased significantly (with minor or major pauses), but significant differences can be registered globally. In fast-growing Asian countries with less deep financial intermediary systems and in North America an outstanding investment dynamic can be observed; by contrast, in Europe – including Hungary – activity is less intense (*KPMG 2018*).

In recent years, the efforts of both global and national regulatory authorities have substantially improved the resilience of the financial system to shocks. However, the appearance of new actors often applying disruptive technological innovations could have a meaningful impact not only on financial stability, but also on general cash demands, and through the structure of the financial system on monetary policy, or even on the framework of the central banks' lender of last resort function

(*Aaron et al. 2017*). Therefore, the aim of the regulatory authorities could be the development of a regulatory framework that supports innovation occurring in the financial sector without jeopardising financial stability (*MNB 2017*). In the following section, we present the opportunities and risks related to these innovations.

2.1. Possible positive impacts of technological innovations on financial intermediation

In several segments of financial intermediation, FinTech innovations have the potential to improve the level of decentralisation and diversification of the system, which could mitigate the impact of future financial shocks. The advent of new products, services, business models and market actors as a result of the innovations could generate alternative fundraising and investment opportunities with a low level of correlation compared to other asset classes. The agent of new products and market actors could reduce market concentration, and even the number of systematically important institutions could decrease (*FSB 2017*).

The new products and services could facilitate financial integration, and financial intermediation could support economic development to a higher degree. Thanks to innovations, financial services can be made available to a wider community of consumers and investors (*Nicoletti 2017*; *FSB 2017*; *EC 2017*; *Philippon 2016*). This may be especially important for consumer groups and regions, where relations with financial service providers or a more developed financial infrastructure are currently only available to a limited extent.

FinTech innovations could induce meaningful efficiency improvement in the financial system (*McKinsey 2016*; *FSB 2017*; *Nicoletti 2017*):

- *Rationalisation of back-office functions:* Incumbent institutions could adapt several new technologies into their operations which could reduce the complexity and costs of back-office activities. Thanks to automated and algorithm-driven financial planning, statutory compliance could also become more efficient and cheaper (RegTech).[2]

- *Optimisation of decision-making processes:* The adaptation of machine learning and artificial intelligence could place the models applied by institutions and investors in decision preparation on new bases.

- *Reduction of the branch network:* On-line access to the services of the institutions and online administration create the opportunity to use most financial services on-line. As a result of the need for workload-decreasing offline processing, the branch networks of the individual service providers can be streamlined, and this process can be accelerated by the market entry of innovative actors.

[2] For more details on the concept of RegTech and SupTech, see: *MNB* (*2017*).

- *Reduction of searching costs:* By the application of advanced Big Data-based methods of analysis and by comparative algorithms, it is possible to reduce searching costs, enabling more efficient decisions on capital allocation, both for institutions and consumers.

- *Faster completion of transactions:* Technological innovations could meaningfully accelerate the settlement times of transactions, which could reduce the interdependence of market actors. The risk-mitigating effect of more efficient settlement requires less tied-up capital and collateral, which enables more efficient capital allocation decisions to be made.

- *Appearance of RegTech solutions:* In order to ensure legal compliance, the institutions can apply innovative technological solutions. The regulatory encouragement of the application of technologies requires the management of new risks on the institutional side. However, the innovative tools of legal compliance are capable of substantially increasing the efficiency of the identification of risks and that of legal compliance itself.

- *Use of SupTech innovations:* Implementing digital, automated solutions to be applied in supervision can improve the efficiency of financial system's supervision. Aim of SupTech solutions, could be among others, is to strengthen the technological and IT angles of the audits, to establish granular data reporting and to develop automated supervisory mechanisms.

2.2. Possible risks of technological innovations related to financial intermediation

2.2.1. Micro-prudential risks

The rapid growth of FinTech actors could result in a significant increase in funding risks. In order to increase market share as soon as possible, the level of leverage may rise significantly for one actor – especially if its activity is unregulated – and the ratio of its disposable liquid assets could decrease. There is an increased risk of a substantial maturity mismatch developing between assets and liabilities, and in the case of lending activity, a significant interest rate risk may also arise. During a period of turbulence or as a result of temporary operating anomalies, these risks can materialise within a short time (*FSB 2017*; *BIS 2018*). The actors of the market could generate false initiatives for incumbent institutions. Because of the intensifying competitive situation, in an effort to maintain profitability, the risk appetite of these institutions could rise, thereby increasing the vulnerability of the financial system (*BIS – FSB 2017*).

Several operational risks could arise in relation to FinTech solutions. Naturally, operating risks could occur in the life of an enterprise: this could involve deficiencies of information systems, human errors as well as external interventions. However,

in the case of FinTech innovations, in addition to these, matters of data quality and data protection, as well as cyber risks are also significant, additional risk factors (*BIS 2018*; *FSB 2017*):

- *Data quality and data protection:* The operation of FinTech innovations is fundamentally characterised by a high volume of shared data and their wide utilisation and analysis. As a result of data processing deficiencies, problems or deterioration in data quality, the automated processes and analyses could lead to incorrect results, meaning that there is the danger of errors committed by or deception of the customers or the customers losing money, and even unauthorised data utilisation could occur.

- *Cyber risk:* As a result of technological progress, the operation of market actors is based on sophisticated IT systems and software. Overview of these information systems may be complex and time-consuming, and it is difficult to determine if they are vulnerable, which creates the possibility of the development of systems exposed to both internal and external threats. The outsourcing of certain activities to third party providers could further reduce the transparency of operation, and any malfunction in the operations of these service providers could further increase the vulnerability of the business models of FinTech solutions.

2.2.2. Macro-prudential risks

The emergence of novel institutions and activities with systemic importance could pose a systemic risk.[3] The market players which are the first adapters of a novel solution in financial intermediation may obtain a significant competitive advantage. This could result in the increase of concentration risks. If an actor which has become dominant in a narrower segment undergoes some kind of shock, substitutability could pose a problem because of the probably unique business model. With the spread of innovative technologies and solutions that determine and interconnect the operation of the individual actors, and not only institutions, even individual activities could become systematically important (*BIS – FSB 2017*).

The wide utilisation of FinTech innovations could also strengthen the procyclicality of the financial sector. The financial system, especially commercial bank lending is procyclical, since in the case of an economic upturn banks are prone to relax their lending conditions, while if there is a downturn in the economy, they may significantly restrain their lending activities, in an effort to stop the deterioration of profitability and of the capital position. As a result of the FinTech innovations, the procyclical operation of the financial sector could be strengthened: on the one hand, because of the automated decision-making of the market actors following similar

[3] It should be noted that as a result of the advent of FinTech innovators, the literature sees the possibility of both a decrease or an increase in the number of institutions with systemic importance.

patterns, on the other hand, by way of the intensifying market competition (*FSB 2017*). The increased spread of FinTech innovations could even result in a situation where the financial system reacts with higher sensitivity to specific industry news, changes, and therefore volatility could increase substantially at systemic level.

The channels of contagion between sectors of the economy may increase. In the new business models, a direct interaction may develop between demand and supply, which increases the number of connection points between market actors, and the retail sector and enterprises could appear both as funders and investors. Since the main purpose of innovation efforts is typically the establishment of automated operation based on artificial intelligence, human supervision of the processes is also reduced, which could lead to the realisation of unexpected risks (*FSB 2017*). In several markets, the high level of connectedness among the incumbent institutions could persist, which may be supplemented by the interconnectedness of information systems. The increase of the number of connection points, the standardisation of information systems and interfaces, as well as the incorporation of the actors of the real economy into intermediation could mean several risk points for the entire financial system, and through the transmission channels the potential risks could spill-over into the rest of the sectors of the economy (*Deutsche Bundesbank 2017*).

2.2.3. Impacts affecting customers

It could pose a risk both from the consumer protection and the data protection side that certain innovative solutions require the financial service providers to use specific information for their application. The inappropriate handling of personal data or even their unauthorised use could deceive or harm consumers and investors. Consumer protection issues may also be of key importance in the case of cross-border, foreign transactions and services (*BIS – FSB 2017*).

Table 1
Opportunities and threats of FinTech innovations

Area	Opportunity	Threat
Micro-prudential	Operational efficiency of the market, lower cost level	Excessive risk-taking at individual level (leverage, liquidity, maturity mismatch), appearance of unsustainable business models, mounting operating risks (data quality, cyber risks)
Macro-prudential	Diversification, decentralisation	Intensifying procyclicality (with effects that could even spill-over to other sectors), appearance of new institutions and services with systemic significance, intensifying opportunity of regulatory arbitrage
Impacts affecting customers (consumer protection, data protection)	Increasing level of financial integration, decreasing searching costs, new products, services	Challenges of customer protection, data protection risks

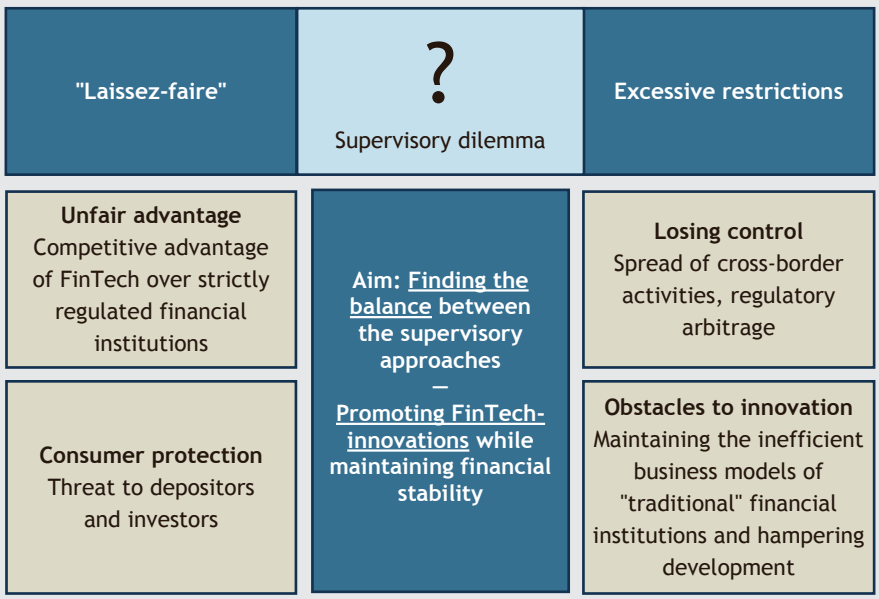
Source: Based on BIS (2018), FSB (2017) and MNB (2017)

3. Potential regulatory responses to challenges posed by FinTech

3.1. Regulatory dilemma concerning FinTech solutions

With regard to FinTech solutions, the regulatory dilemma basically lies in finding the balance between the "laissez-faire" approach and an entirely prohibitive regulatory approach (*Figure 1*). The establishment of the optimal framework is based on the assurance of equal competitive conditions. It is also important to encourage the actors to consider the systemic risks as well in their own operation, in addition to the individual risks (*He et al. 2017*). The restricted availability of the expertise necessary for the new technologies may make the development of the regulatory framework more difficult. In addition, the technological innovations that appeared in the FinTech industry are characterised by a high level of heterogeneity already, and in the future we should anticipate the emergence of an even more complex market (*MNB 2017*).

Figure 1
Regulatory dilemma concerning FinTech solutions



Source: MNB (2017)

An exceedingly permissive regulatory approach could – through the intensifying competition – reduce the price of services, but at the same time, from the aspect of consumer protection such an approach involves several risks. FinTech institutions would enjoy an unjustified competitive advantage compared to the severe regulatory requirements which apply to financial actors. The lack of rules

entails risks for all of the affected parties as well. For example, a solution that is not mature enough could cause unexpected losses both to consumers and funders. It could pose a further risk that financial intermediation could shift into a segment over which the regulatory authorities only have indirect control. As a result, new market actors with less experience would also not be able to develop an efficient risk management mechanism (*Zetzsche et al. 2017*; *MNB 2017*).

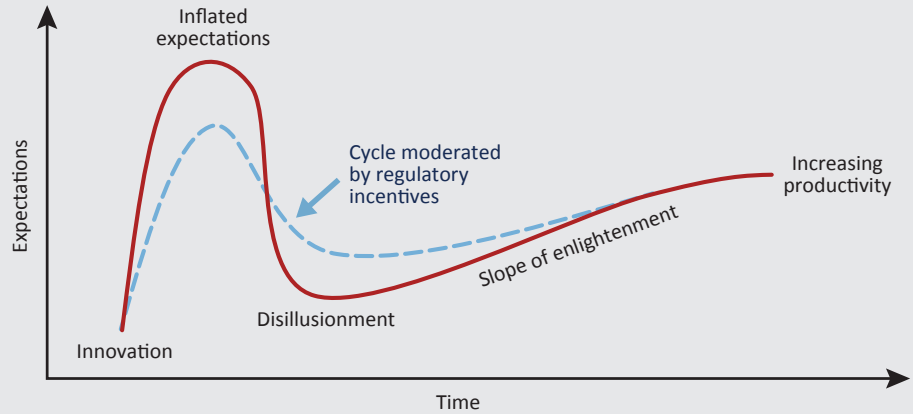
At the same time, the total prohibition of FinTech solutions could hinder innovations. In addition to hampering innovation, in an excessively stringent regulatory environment both innovations and customers could leave the domestic market. The exploitation of cross-border opportunities would probably further increase the costs of regular financial services, since the domestic actors would offset the departure of new consumers who prefer foreign opportunities by higher prices (*WEF 2016*). The lack of new entrants and the lack of competition has been a major problem of the domestic financial sector for the past decades, since financial services continue to be expensive in Hungary and so far the innovations have not delivered significant benefits for consumers (*Nagy – Vonnák 2014*).

As a response to the emerging financial innovations, the most important task of the regulatory authority may be to find a balance, which – in addition to ensuring the guarantees for consumer protection and required under competition law in respect of FinTech solutions – does not function as a hindrance to innovation. Overall, it may have a meaningful effect on the long-term performance and competitiveness of the economy, how a given regulatory system addresses the advent of FinTech innovations and how it can appropriately encourage their spread, while addressing the risks efficiently (*MNB 2017*). The application of the so-called Innovation Hub and Regulatory Sandbox regulatory concepts could provide a solution for finding that balance.[4]

Typically, new technologies have a significant potential in the long term in the individual sectors of the economy, but various phases can be identified in their evolution and wide spread. The so-called hype cycle provides an overview of how a new technology and its application evolve over time (*Gartner 2017*). Five phases can be identified in the cycle: the emergence of innovation, the peak of inflated market expectations caused by increasing market interests, the trough of disillusionment caused by the temporary loss of trust, the process of "enlightenment" laying the basis for sustainable development, and the actual emergence of value-creating processes arising from the innovative technology, i.e. the long-term improvement of productivity (see *Figure 2*).

[4] In the domestic literature, no widely accepted translation has been developed for these concepts as yet, and therefore in the study we basically use the English terms. The MNB uses the English terms as well as the Hungarian terms of "Pénzügyi Innovációs Platform" and "Pénzügyi Innovációs Tesztkörnyezet".

Figure 2
The hype cycle as a variable of time and expectations



Source: Based on Gartner (2017)

A supportive regulatory approach, for example, the application of an Innovation Hub or a Regulatory Sandbox, could exert a favourable impact by mitigating the swings caused by inflated expectations. On the one hand, it is possible to improve the sophistication of business models by the appropriate regulatory tools, and consequently products or services which will probably represent substantial added value could enter the market even at an early stage of development. On the other hand, in parallel, market failures can also be moderate, therefore the impact of the loss of trust through disillusionment could also be less powerful.

3.2. The Innovation Hub as a supporting regulatory tool

The Innovation Hub is a platform provided by the regulatory authority, where FinTech innovators can receive guidance from the authority. Within this framework, the experts of the regulatory authority answer the questions received from the representatives of FinTech innovations and provide assistance in interpreting the legal requirements; they also survey the needs for changes to legislation and forward such to the decisionmakers (thereby probably also making the general regulatory environment more favourable for innovations). This institution is available for both unregulated and currently regulated activities; furthermore, both the innovations of newly established enterprises and the new technological solutions of incumbents (e.g.: banks, insurers) could be covered by it.

The scope of activities of the Innovation Hub could cover a broad spectrum. In the default case, Innovation Hubs were established mainly for addressing FinTech-specific questions on banking services, but in response to increasing market demands, questions for guidance may typically involve additional segments of the system of financial intermediation, for example, by the involvement of the InsurTech

or RegTech areas. In addition to guidance in relation to direct queries, several hubs also provide an opportunity for the constant maintenance of connections, in which the authorities also provide assistance with obtaining licenses. The operators of the hub monitor and support newly established enterprises for a specific period of time, typically for 12 months following the date of obtaining the license.

It is an advantage of the Innovation Hub that the innovators can ask their specific questions on a dedicated channel, which enhances the speed of the process of responding. It is another feature that questions are subject to preliminary screening. The purpose of this criterion is to ensure that the innovators receive appropriate information before asking their questions on their opportunities and expected obligations. Usually, innovators need to assess the market availability of their idea based on some questions, as well as the novelty contents and expected impacts thereof on the potentially affected parties and on the economy of the given country (*MNB 2017*).

3.3. The concept of the Regulatory Sandbox

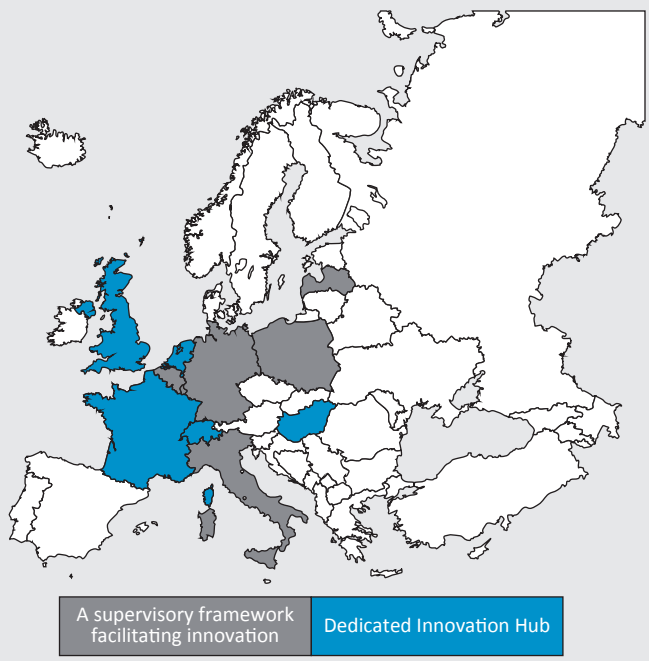
The Regulatory Sandbox enables innovators to assess the viability of their financial product, business model in a "test environment" controlled by the regulatory authority, while enjoying exemption from certain regulatory obligations for a specific period of time. The tests are carried out with the involvement of real consumers. It is a common feature of every Sandbox that they allow the testing of the innovation under real market circumstances for a specific time only – typically for 6 to 12 months – and only involving a predefined number of customers. During that time, the regulatory authority waives compliance with certain predefined regulatory requirements. Typically, it is an essential condition for getting into the test that the innovation should have a significant content of novelty for the consumers or the clients, and that the party applying the innovation should generally comply with the requirements of market entry. If the service proves to be viable in testing, then actual market entry can take place.

Depending on country providing the legislative environment for the implementation of the concept and on the conditions applied by that legislation to allow the operation of the concept, every Sandbox has a toolset that ensures legal application. In certain cases the supervisory authority may issue a statement of intent on the restriction of supervisory actions ("no enforcement action letters" – NAL), which remains valid as long as the time of compliance with the testing conditions and may also provide individual guidance to the tester, in order to ensure compliance with the legal environment. It is also possible to grant a restricted, temporary operating license to companies with no license from the supervisory authority. In such cases the application for the operating license may be assessed faster, and the obligations imposed by the regulatory authorities may also be more moderate in these initial phases (*MNB 2017*).

4. International initiatives

More and more countries recognise that the FinTech phenomenon requires an appropriate regulatory response. At the same time, the national supervisory practice supporting innovation is not consistent. Dedicated frameworks encouraging the spread of FinTech innovations have been established only in a few countries so far. The most typical situation is when the supervisory authority takes individual steps. With these steps, market actors can usually gain more detailed knowledge of the legislative framework applying in the given country – especially the obligations strictly attached to their product or service under development – in more detail and furthermore they can receive support in the form of consultation during the process of obtaining their activity license. So far, Innovation Hubs have only been established in a few countries, at present less than 20 such dedicated frameworks are operated globally[5] (*BIS 2018*). *Figure 3* summarises the European presence of such Hubs.

Figure 3
Innovation Hubs and other solutions of supervisory authority supporting innovation in Europe

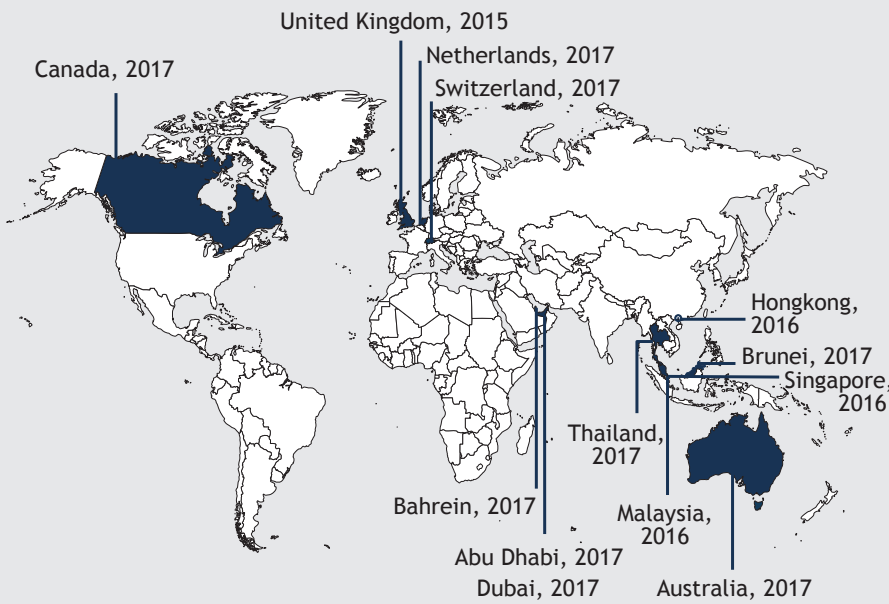


Source: Based on BIS (2018)

[5] We note that there are several institutions around the world called Innovation Hubs, but the study only allocates those to this category for which a thorough assessment of their functions and activities so far reveals that they provide comprehensive services to FinTech innovators.

At present, the framework of Regulatory Sandbox is not widely applied yet (see *Figure 4*). Since the first application in the United Kingdom, the number of actually operating Sandboxes is less than ten and they are typically applied in Asia. Other than the remarkable case of Great Britain, at present in Europe only the Netherlands and Switzerland are operating dedicated Regulatory Sandboxes. In the Netherlands, based on the publicly available information, no testing has been performed so far. In the case of Switzerland, the Sandbox primarily functions as a testing environment with limited application: it enables the collection of deposits without a banking license, in an amount not exceeding 1 million Swiss francs. Lithuania started an official consultation on the introduction of the Sandbox in the summer of 2017.

Figure 4
International examples for the Regulatory Sandbox and the year of introduction



Note: In the figure we have indicated the situation at the end of 2017.
Source: BIS (2018), MNB (2017)

At the European Union level, more initiatives are evolving for the development of coordinated responses to the FinTech phenomenon. In 2016, the European Commission set up a working group for the establishment of the relevant regulation. Its task is to review the existing rules to ensure that they meet the challenges of the digital age. The FinTech Action plan of the EU was published in 2018, based on this work (*EC 2018*). The European Banking Authority has also developed its schedule for the period of 2018/2019, in which the results of their 2017 market consultation were also taken into account (*EBA 2018*). On the one hand, the European Central Bank (ECB) has launched public consultation concerning the conditions of the

operation of banks applying the new type, FinTech business model, since they are receiving an increasing number of applications for operating licenses in parallel with the spread of FinTech solutions (*ECB 2017a*). In March 2017, ECB also issued a communication in which the establishment of a FinTech Hub covering the euro area is indicated as an objective. The purpose of the future platform uniformly available for the 19 countries would be to facilitate the exchange of information and the sharing of international good practices (*ECB 2017b*).

5. Seeking the optimal regulatory response: characteristics of the individual Regulatory Sandboxes

Considering the fact that Regulatory Sandbox frameworks are special legal schemes, it should be assessed what codification solutions are applied by the individual countries for running the testing environment. Accordingly, in the following section we will review the practices applied for the best-known Regulatory Sandboxes, detailing the solutions observed in the Asian, the Anglo-Saxon and the European Continental legislative systems. Given the fact that the general attributes of the sandbox-phenomenon were summarized as mentioned above in this chapter the specificities will be covered primarily.

5.1. The international practice of Regulatory Sandboxes

Although the individual frameworks serve the same purpose, in respect of actual implementation several peculiarities can be identified in the case of the individual countries:[6]

- *Singapore*: One characteristic feature of the framework developed by the Monetary Authority of Singapore (MAS) in 2016 is that the testing period can be extended if the tester proves that it needs additional time to ensure compliance with the entire legislative environment, or if during testing it has changed the originally tested service in the meantime because of consumer feedback (*MAS 2016*). In addition to time extension, the framework also enables the extension of the testing parameters. However, if testing can be expected to be unsuccessful, the testing period can be terminated.[7]

[6] As indicated earlier, in Switzerland, Canada and several other, typically Asian countries there are also Regulatory Sandboxes in operation, but for these countries at present no appropriate comparison can be made owing to the peculiarities of the legislative systems and the scarcity of available information.

[7] The guidance of the Singaporean authority provides a list of cases when decision is made on the closing of the testing period, these are the following:
a) MAS is not satisfied that the sandbox has achieved its intended purpose, based on the latest test scenarios;
b) the sandbox entity is unable to fully comply with the relevant legal and regulatory requirements at the end of the sandbox period;
c) a flaw has been discovered in the financial service under experimentation where the risks posed to customers or the financial system outweigh the benefits of the financial service under experimentation;
d) the sandbox entity breaches any condition imposed for the duration of the sandbox;
e) by the decision of the sandbox entity.

- *Malaysia:* The Malaysian system shows the image of a fully flexible approach. This can be considered, among others, from the fact that even such basic attributes as the limited number of consumers or the time dimension of the testing opportunities are treated flexibly, and exceptions can be made from these – at least in theory, at the level of the regulatory system (*BNM 2016*).

- *Australia:* One attribute of the system operated by the Australian securities regulatory authority (ASIC – Australian Securities & Investments Commission) since December 2016 is that it grants exemptions not only on the basis of the application of individual legal entities, but – if the Australian legal conditions apply – also concerning the performance of activities belonging to predefined activity classes, regardless of the person who performs the activity. It is a further characteristic feature of the system that if certain special conditions are met, in respect of the future consequences of non-compliance in the past, the authority provides the opportunity of giving a retroactive exemption as well.

- *United Kingdom*: The Financial Conduct Authority (FCA), which acts as the British financial supervisory authority, makes available a broad set of potentially applicable tools in the Sandbox, such as a dedicated supervisory statement that excludes legal enforcement, the procedure aimed at obtaining a limited license, and the exemption procedure (*FCA 2015a*). Of the items listed above, the procedure aimed at obtaining a limited license should be highlighted. As a result of the license, a flexible, dynamically changing regulatory framework mechanism will be established for the testing entity: in every stage of testing the testing entity only needs to comply with those expectations that are in proportion with the tested activity at the given moment in time, according to the constant assessment of FCA. They ensure the establishment of a system of equal conditions among the individual testers performing similar activities by group testing periods (cohorts). Accordingly, in contrast with the rest of the Sandboxes, the period of application for the testing environment is not continuous, it is only possible in certain specified time intervals. It should also be mentioned that only enterprises may enter the Sandbox for which FCA has checked individually whether the consumers have received appropriate information concerning the service, and whether they have received appropriate protection, and within that, the right of sufficient indemnification.

- *The Netherlands*: The Dutch concept does not cover the sphere of obligatory statutes, for reasons that include the application of Union regulations, most of which cannot be amended on national authority. In accordance with that, the Dutch framework focuses on the technological features of the innovative solution, and on ensuring that their favourable impact is felt concerning the stability and efficiency of the financial system and the security of consumers (*DNB 2016*). Therefore it can be primarily considered a facilitating framework, in which "*soft*" regulatory requirements play the main role.

5.2. Legal attributes of the Regulatory Sandboxes

Regulatory Sandboxes show dissimilarities in terms of legal implementation as well. The differences can be analysed in three areas. The first is to review the legislative changes necessitated by the introduction of the legal institution, or whether it is supported by a legislative base at all, or if it only involves the suspension of the toolset applying to their enforcement. The second criterion to be assessed is the subject of application, i.e. the obligations from which exemption can be granted in the framework of the Sandbox. Finally, the issue of the identity of the persons to whom the established concepts will apply should also be assessed (*Table 2*).

5.2.1. Legislative burden and scope of application in relation to the development of the concept

In respect of the legislative burden and the closely related scope of application, very significant differences can be observed regarding the concepts under examination. If we assess the Asian Sandboxes, based on the limited information we have available, we can conclude that the legal basis of the exemption (making testing available) is an act belonging to the legislative powers of the supervisory authority. The fact that in the framework of the Sandboxes exemptions can be granted only from certain legal and regulatory requirements imposed by the supervisory authority gives rise this conclusion. These requirements may include, in addition to the legislation issued by the authority *per definitionem,* waiving the application of the acts otherwise expected by them that have no legal binding effect (*soft law*), and the requirements enabled by the discretionary latitude guaranteed by statutes for the authority.

The Australian concept clearly goes beyond the scope presented above, since ASIC has a legally defined discretionary power to grant exemption[8] from the expectations of a set of individually defined regulations. In addition to the explicit exemption system, the Australian model includes a significant efficiency increasing tool on one more point. If any of the provisions contained in the statutes listed above is unclear or cannot be clearly interpreted as applying to a particular innovation, then within its own discretion ASIC may grant an exemption from compliance with these as well, subject to the procedural and other rules of the Sandbox concept[9] (*ASIC 2009*).

Despite a legislative system that is similar to that of Australia, FCA applied a fundamentally different codification solution when developing the concept. The law laying down the fundamental rules of the provision of financial services in Britain states that FCA may grant an activity license to any entity if it complies with the necessary conditions, unless FCA releases the entity from the need to comply with these requirements (*FCA 2015b*). Therefore, FCA may provide during the licensing procedure already that certain applicants that apply innovative solutions do not

[8] Corporations Act 2001 (Corporations Act); Superannuation Industry (Supervision) Act 1933 (SIS Act); National Consumer Credit Protection Act 2009 (National Credit Act); National Consumer Credit Protection (Transitional and Consequential Provisions) Act 2009 (Transitional Act).
[9] So-called comfort relief

have to comply with certain licensing criteria, or they are subject to more lenient conditions of compliance.

The Dutch system has not resulted in a legislative burden, but this also means that efficiency can apply within a relatively narrow scope. The authority may not extend the scope of application of the Sandbox beyond the "*soft law*" and its own discretionary powers defined in legislation. Although to a decreasing extent, the power of exemption may also apply to non-binding regulatory acts of European supervisory institutions (e.g.: EBA, ESMA) (*DNB 2017*).

5.2.2 The personal scope of the concepts

Personal scope means what are the legal entities which have a potential opportunity to test their services in a Sandbox framework in the given country. In many cases, the Sandbox concepts provide a wide scope of possibilities for the potential inclusion of undertakings with no activity license in the group of testers.

The Asian solutions under examination treat the scope of applicants flexibly. According to the concepts developed by MAS, in addition to obviously enabling the applications of entities licensed to provide financial services, enterprises can compete with them that do not hold an activity license at the moment, but are likely to obtain one. Malaysia also opted for a similar solution. On the one hand, the National Bank of Malaysia (Bank Negara Malaysia – BNM) enables entry into the Sandbox for financial entities holding an activity license issued by it. However, this rule can be loosely interpreted, inasmuch as other innovation providers are also allowed to apply for inclusion together with the financial entity. On the other hand, it is also possible for such undertakings to apply for participation that only plan to obtain the license for operating as a financial entity (*BNM 2016*).

The concepts operating in the Anglo-Saxon legal systems also support the above approach, but in certain cases entities without a license are subject to a preliminary screening with exhaustive conditions. ASIC will accept the application of non-licensed entities subject to compliance with each of a set of conditions (*ASIC 2017*). However, these conditions are not only attached to this capacity of the entity performing non-license-bound activities, but also cover the entire scope of eligibility criteria. The United Kingdom establishes three different categories, enabling the entities covered by these categories to apply. On the one hand, the Sandbox of FCA is naturally open to entities with an activity license, on the other hand, it is also open to those that launched the procedure for obtaining the activity license. Thirdly, regardless of the activity license, FCA allows entry for all undertakings whose activity can be related to some kind of technological innovation.

At present, the Union legislation does not allow the performance of financial activities without a license, and there are no exceptions. Accordingly, the Netherlands also represents the most conservative position concerning personal

scope, in that it only allows financial entities to apply for the Sandbox (*DNB 2016*). The procedure on the activity license of financial entities intending to settle in the member states of the banking union is conducted by the European Central Bank (ECB), subject to the rules on the standard supervisory mechanism, regardless of the size of the entity. In the procedure, the ECB is required to apply not only the relevant directly applicable Union statutes, but also the legislation of the member states that transposed the Union Directives. Since these are minimum harmonisation provisions, the legislation of the member states may also impose more stringent requirements. In this latter case, the ECB is also required – despite its quality as an institution of the Union – to apply the purely member state level legislation imposed for the licensing requirements. However, since the Union rules do not contain any exemption opportunities that may be granted in case of the application of financial innovations, the legislation of the member states also cannot impose any such measures. However, such an exemption is possible while observing the currently applicable Union rules, which would only allow departures in the framework of a Sandbox type legal entity from those requirements of the member states that are defined more strictly than the requirements of the Union.

Table 2
Comparative presentation of the Regulatory Sandboxes under examination according to three chosen criteria

Region	Country	Legislative burden/technique	Scope	Personal scope
Asia	Singapore	• Presumably an act within the legislative powers of MAS	• Legal and regulatory requirements imposed by MAS	• Financial institutions • Entities likely to obtain the license
	Malaysia	• Presumably an act within the legislative powers of BNM	• Legal and regulatory requirements imposed by BNM	• Financial institutions • Licensed entities and FinTech enterprises together
Anglo-Saxon countries	Australia	• Economic law • Supervisory law • Law on consumer credit	• Legal provisions in three relevant laws • In the case of rules that cannot be clearly interpreted, it is "comfort relief"	• Financial institutions • Entities meeting the conditions defined by ASIC and having no license
	United Kingdom	• The Financial Services and Markets Act	• Discretionary right of the FCA	• Financial institutions • Entities that officially applied for a license • Innovative unlicensed entities
Euro area	Netherlands	• No legislative burden has emerged	• National level and Union "soft law" • Discretionary powers of the authority defined by statute	• Financial institutions

6. Domestic initiatives concerning FinTech innovations

The establishment of an appropriate regulatory framework applying to the FinTech industry is of outstanding importance for the national economy and for the competitiveness of the financial system. With the exploitation of FinTech innovations, in the longer term cost efficiency improvement can be accomplished in the financial sector, and the customised regulatory responses contribute to the strengthening of stability and to the potential increase of the consumer surplus. Indirectly, how Hungary manages the appearance of FinTech innovations could also influence the long-term performance and competitiveness of the Hungarian economy. For the time being, the FinTech investment activity of the East-Central European region is low by international standards, which could be significantly improved by the establishment of a supporting regulatory framework.

In the Hungarian system of financial intermediation a significant need has been registered, both on the demand and the supply sides, for the secure application of innovative financial services. Considering the consumer side, there is already a significant group in the population in Hungary – comprising about 15 to 20 per cent, according to the Residential survey of the MNB – which is interested in the innovations provided by FinTech. Projected on the active population, this means that about 1 million consumers can already generate potential demand for novel solutions. The level of rejection is lower in the case of the younger generations, and therefore in the future the overall residential openness may continue to increase (MNB 2017). On the part of the domestic industry actors – the incumbent institutions and the newly established FinTech companies – there is also substantial interest in the application of FinTech innovations. Several institutions have relevant plans, and many of them are already using innovative solutions, primarily related to mobile and digital payment solutions, and payment initiation services (*MNB 2017*).

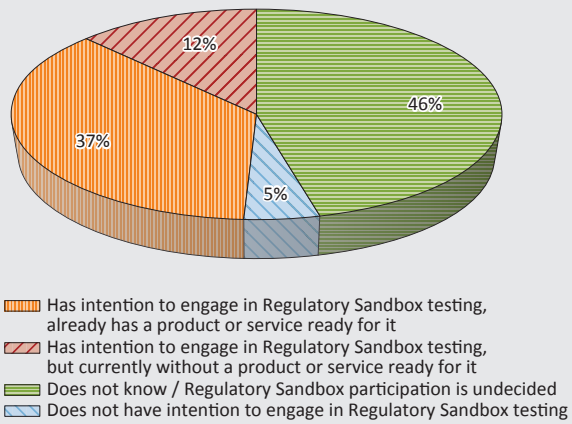
After mapping the international practice and surveying the opinions of Hungarian stakeholders, the MNB Innovation Hub (Financial Innovation Platform) started operating in March 2018, with the mission of supporting Hungarian financial innovations.[10] The first step taken by the MNB aimed at the encouragement of FinTech innovations within a secure framework was the establishment of an Innovation Hub. The MNB Innovation Hub applies four functions to enhance the feasibility of innovative ideas. The Information repository enables the initiators of innovations to obtain an appropriate volume of high-quality information in a systematic form concerning the applicable legislative expectations and obligations. The Regulatory supporting platform provides an opportunity for the clarification of legal issues raised concerning innovations by obtaining the guidance of the MNB. The Communication hub provides an information-sharing interface for the entire FinTech

[10] https://www.mnb.hu/en/innovation-hub

ecosystem. The Innovation Hub also functions as an international cooperation platform. This function serves the establishment of connections with foreign regulatory authorities that are in the vanguard in the support of FinTech innovations.

According to international experiences, the establishment of a Regulatory Sandbox framework is an important element in facilitating the sphere of financial innovation. The MNB is already studying the opportunity of the establishment of a Regulatory Sandbox, in coordination with the relevant domestic institutions and other stakeholders. Based on their feedback, a significant number of market actors would participate in a dedicated testing environment (*Figure 5*), and several potential applicants have already identified the service that they would like to test there.[11]

Figure 5
Opinions of the market actors (banks, insurers, funds, intermediaries and FinTech companies) on the establishment of a domestic Regulatory Sandbox



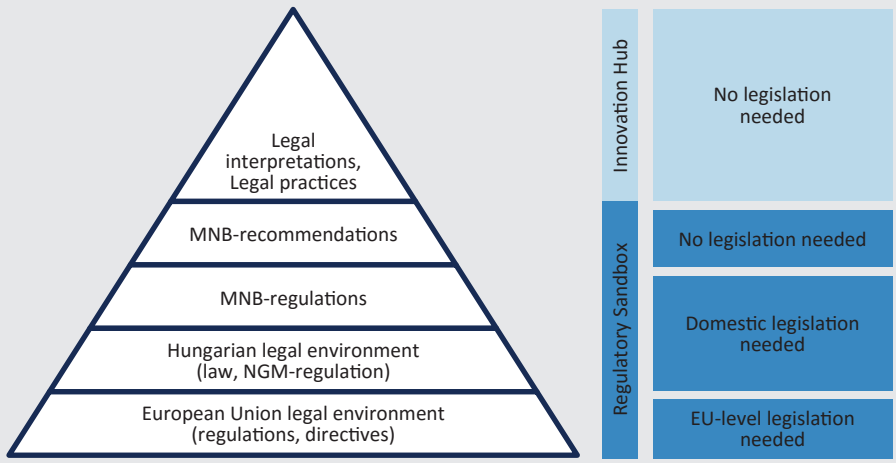
Note: Based on the responses of 83 market actors.
Source: MNB

Over the longer term, FinTech innovations could induce changes at each level of the legislative hierarchy (*Figure 6*), as solutions are being developed the legal background of which is often far from being settled at present. In other cases, the difficulties are caused by the legal framework or expectations of the law enforcing authority which are often unclear or are not easy to interpret for the novel solutions. According to the feedback of market actors, the Innovation Hub and the Regulatory Sandbox could provide a solution concerning most of the presently occurring legal problems for the clarification of the legal framework of innovative

[11] See the relevant Consultation document of the MNB on the methodology of the survey and on its further results: MNB 2017

solutions. However, issues may also arise that could only be fully settled through national or even EU-level legislation. The regulatory solutions created and intended to be introduced by the MNB could also support this legislative process by collecting and making available daily updated information and by constant communication with the affected actors.

Figure 6
Levels of the regulatory environment of FinTech innovations in Hungary



Note: NGM is the Ministry for National Economy in Hungary.
Source: MNB (2017)

7. Conclusion

The process of consulting with the significant actors in the domestic FinTech ecosystem and the consideration of international best practices both indicate that the most efficient tools of finding the optimal regulatory approach concerning FinTech innovations are probably the Innovation Hub and the Regulatory Sandbox (*MNB 2017*). These concepts are suitable for exploring which innovative idea carries what kind of market potential, without creating complicated regulations imposing a significant legislative burden "in advance". If an innovation proves to be durable and offer a significant customer benefit, then after the application of the concepts, the regulatory authority can start the implementation of the relevant legal framework in possession of the appropriate amount of information.

At the same time, an assessment of the international cases has also revealed that there is no generally effective, standardised solution that meets every geopolitical requirement: when the concepts are developed, the special features of the financial intermediary system of the given country, the level of financial culture and the specific solutions of the applicable legal framework must also be taken into account.

Therefore, the simple "imitation" of solutions that function efficiently abroad is not viable, and we can expect a mixture of international best practices and local characteristics to provide an efficient concept.

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Firm Dynamics and Aggregate Growth: The Case of Hungary*

Péter Bauer – Marianna Endrész

This paper reports some stylised facts on firm dynamics in Hungary for the period 2001–2015. We find that young firms tend to be small. They grow fast, but at the same time they are risky, have a high exit rate and their productivity is lower than that of older firms. Despite their small share in aggregate output, their contribution to aggregate growth is significant. Their dynamism comes from their young age rather than from their small size. Export performance is somewhat different, as older firms remain more active and make a significant contribution to aggregate growth. During the crisis, young firms still made a positive contribution to growth, but the deteriorating performance of older firms dominated the aggregate picture, because of their large share in production. The behaviour of firm groups by size and age varied during the crisis and the recovery. Interestingly, the recovery seems to be dominated by the lower-end of the distribution of firm population; destruction eased and fewer firms exited, but there was no recovery in gross creation. Firm entry kept falling even during the recovery period, which must have contributed to the sluggish, weak recovery.

Journal of Economic Literature (JEL) codes: D22, L25

Keywords: firm dynamics, firm life-cycle, crisis, economic growth, empirical analysis

1. Introduction

Analysis of the drivers and constraints of economic growth is at the heart of economic policy research. The literature is very rich, covering various aspects of growth such as institutions, competition, technological waves, innovation and international trade. In this study, we focus on firm dynamics and their relation to and impact on aggregate growth. What can firm-level analysis add to the understanding of aggregate growth? The behaviour of firms is heterogeneous, their dynamics vary by age and size, and entry and exit can become important drivers of the level and pace of aggregate growth. The analysis of firm dynamics and their evolution

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

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The English manuscript was received on 19 December 2017.

DOI: http://doi.org/10.25201/FER.17.2.6898

over time may provide insights on where growth comes from, on differences during phases of the business cycle or the existence of constraints. It allows us to investigate questions such as whether small or young firms grow quickly? Is the cost of entry high or is it more so growth that is constrained? How do firm dynamics change during a financial crisis? Answers to these questions can help to identify the sources of and constraints on growth and elaborate growth-enhancing economic policies. This paper takes a first step in this direction by reporting basic observations on firm dynamics.

The empirical literature on firm dynamics documents the following observations: (1) young firms tend to be small and their size distribution is skewed; (2) small firms are more likely to exit, but conditional on survival they grow faster than large firms; (3) age and size are positively correlated; (4) the reallocation of inputs from less productive firms to more productive incumbents or new entrants is a key source of productivity growth (see *Bartelsman et al. 2004*, *López-Garcia and Puente 2006*, *Békés et al. 2011*, *Andersson 2006*). Findings on the link between size and growth were later challenged by *Haltiwanger et al.* (*2013*) and *Criscuolo et al.* (*2014*), who show that the importance of small firms in employment creation comes more from their young age, rather than from their small size. The theoretical models which are best at predicting these empirical regularities are Schumpeterian growth theories, relying on the notion of creative destruction (see *Aghion et al. 2014*). Schumpeter regarded innovation as the driver of growth. As new technology replaces old ones, growth materialises through creative destruction. Creative destruction involves the entry of new firms, reallocation of inputs and is mostly consistent with the empirical observations of firm dynamics.

Related previous literature on Hungarian data focuses on the decomposition of aggregate productivity growth. *Békés et al.* (*2011*) analyse manufacturing for the period 1992–2006. They find that growth in aggregate productivity is mainly due to productivity growth at continuing firms, although the reallocation of inputs and creative destruction also had some positive impact. *Brown and Earle* (*2008*) analyse manufacturing firm data for some transition countries, including Hungary, documenting how reallocation changed following the transition.

We use firm-level data to investigate some features of firm dynamics in the Hungarian economy for the period 2001–2015 and to document the impact of the recent financial crisis. The analysis focuses on aggregate growth. We evaluate the growth performance of firms and its link to age. Following the works of *Haltiwanger et al.* (*2013*, *2016*), we also discuss whether firm size or age is important for growth. During the recent crisis the entry of firms fell to historically low levels in many countries, causing a persistent slowdown and weak recovery. Therefore, we investigate the role played by entry and exit in general and during the crisis-recovery period in particular. Our analysis also builds on the firm life cycle literature:

in addition to entry, exit and output growth, other aspects of firm performance – exports, productivity and bank borrowing – and their changes with the age of the firm are also analysed.

This paper is the first of its kind on Hungarian data. We cover almost the entire firm population. We deviate from the literature on firm dynamics, which focuses on employment creation as a measure of growth. Instead, we use real value added. Our dataset is novel in the sense that we fully control for all kinds of firm transformations, including mergers and acquisitions, or one-to-one transformations. Our paper does not cover the decomposition of productivity, which can be considered as a natural extension of our work on firm dynamics and is left for future research.

The next section introduces the datasets used and the methodology. The following sections each discuss one performance measure, covering its relation to age, behaviour during distinct time-periods and the age-size debate. We start with real value added, which is followed by productivity, exports and bank borrowing. Finally, we present our conclusions.

2. Data and methodology

We use three databases for our analyses: annual balance sheet and income data of double bookkeeping firms from the Hungarian tax authority (NAV), the registry of firms from the Hungarian Central Statistical Office (KSH), and bank lending data from the Central Credit Information System (KHR).

Balance sheet and income data are used to create the main firm-level variables. Thus, we conduct our analyses with annual frequency between 2001 and 2015. Value added is calculated from turnover and various cost items. Firms are classified into 2-digit sectors based on their 4-digit NACE numbers. We dropped the financial sector and the oil production sector due to data issues. Nominal variables are deflated by official, 2-digit sector level deflators to create real variables (the implicit value added deflator for value added and PPI for exports). We use employment and real value added to calculate labour productivity.

We also use total assets, turnover and employment from this database to classify firms into size classes: micro, small, medium and large. The definition is very similar to the official SME categories where the thresholds are the following: for employment: 10, 50, 250 persons; for sales: 2, 10, 50 million euros; for total assets: 2, 10, 43 million euros. We classify a firm into a higher category if any of the three variables exceeds the relevant threshold which is different from the official definition where employment or both sales and total assets must exceed

the threshold.[1] If employment is missing, we classify the firm based on the other two variables (there are no missing values for turnover or total assets).

We calculate two indicator variables for credit from KHR that show if a firm has a credit relationship with a financial institution. The first one is a flow variable defined as 1 if the firm takes out a new loan in the given period, otherwise it is zero. The second one is a stock variable defined as 1 if the firm has loan in the given period, otherwise it is zero. The data from KHR is available from 2005, and thus we analyse lending only for the period 2005–2015.

We use so-called mid-point growth rates for value added and exports proposed by *Davis, Haltiwanger and Schuh* (*1996*) and applied in several papers on firm dynamics (e.g. *Haltiwanger et al. 2016*). The growth rates are calculated as follows:

$$X_{it}^{gr} = \frac{X_{it} - X_{it-1}}{0.5 * \left(X_{it} + X_{it-1}\right)}$$

This has several advantages compared to the usual percentage changes or log difference, however it can be approximated by the latter. Its range is bounded between –2 and 2; it is symmetric in the sense that if we exchange X_{it} with X_{it-1} then the growth rate will be the same in absolute value with the opposite sign (true for log difference as well). From that it follows that if there is an increase and then a decrease back to the same value, then the sum of the growth rates is zero. A huge advantage is that zero values of X are not omitted:[2] so, entry and exit have a growth rate of 2 and –2, respectively (not true for log difference, and percentage change is only meaningful for exit, when it is –100 per cent).[3] Another advantage is that it can be easily aggregated: if we calculate the weighted average of mid-point growth rates with the mid-point weights (i.e. the average value of *t* and *t–1*) we arrive at the aggregated mid-point growth rate: $(X_t - X_{t-1})/(0.5 * (X_t + X_{t-1}))$, where $X_t = \Sigma_{i=1}^{n_t} X_{it}$, and n_t is the number of firms in *t*.

[1] We deviate from the official rule to correct for greenfield investments by multinationals when in the first couple of years the subsidiaries have only a handful of employees and no turnover, but total assets are large.
[2] Some firms have negative value added. As neither the mid-point nor the growth rate can be meaningfully estimated with negative values, negative Rva is always replaced with zero. As a result, the total real value added is raised by 3–4 per cent on average, but its dynamics hardly change. Another consequence of this assumption is that we are likely to slightly underestimate the fall/rise during the crisis/recovery, as changes between negative (and zero) values are ignored.
[3] For entry, we check whether there is an observation in the previous year. If not, we define the growth rate as 2. For exit, we create artificial observations in the next year, and the growth rate then will be defined as –2.

We usually interpret the mid-point growth rate figures in this paper as percentage changes, which is quite similar to the generally accepted interpretation of logarithmic differences. For example, if the mid-point growth rate is 0.05, then we say that the growth rate is 5 per cent. The bias of this kind of interpretation is small when the growth rates are low, e.g. in the former case the actual growth rate compared to the previous period is 5.1 per cent. But the bias can be quite large or even infinite in case of larger growth rates (in absolute value). For example, if the mid-point growth rate is 1, then the actual growth rate compared to the previous period is 200 per cent and not 100 per cent. If the mid-point growth rate is 2, then the actual growth rate is infinite as this can only be possible in case of zero value in the previous period. So, in the case of growth rates of 2 or –2, we will not interpret these as 200 or –200 per cent rates.

The registry of firms is used to calculate the age of firms based on their foundation year. The age is 1 in the foundation year by our definition (versus 0 in some other papers in the literature). For value added, we define entry in the year when the firm was founded (i.e. when its age is 1) or in the year when it first appears in the database. An exception is the year 2004, when all firms had to switch to double-entry bookkeeping and thus older, previously single-entry bookkeepers appear in our database. Firm transformations are also handled as an exception, as described in more detail in the following paragraph on mergers and acquisitions. Exit is defined as the last observation of a firm in the database. For exports, we use a different entry and exit definition, as the beginning and end of export activity is not directly linked to the foundation and liquidation of firms. Thus, entry in this case is the beginning of export activity and exit is the end of export activity. For exports, in contrast to the case of value added, we allow multiple entries or exits by a firm.

The registry of firms also contains information on mergers and acquisitions and other types of firm transformations (hereinafter: M&A).[4] We use this information to consider M&A in the calculation of age and the dynamics of value added and exports. Firms' age is always calculated based on the age of the oldest firm that was part of the M&A. For example, if A and B firm merge in year *t* and the new firm is C in year *t+1*, then the age of C will be the age of the older one of A and B, plus one, because of the year that passed. Moreover, we consider neither A nor B as exiting firms or C as an entering firm. We also correct the dynamics for M&A activity: growth rates of variables are calculated as if we consolidate firms that engage in M&A in the same year, weights (mid-point values) are set that the aggregate dynamics do not change. In the above example, if A and B firm merge in year *t* and the new firm is C in year *t+1*, the growth of the value added for C will be calculated as growth of the aggregate firm A+B to firm C. In the case of division of

[4] Other types of transformations include divestment of firms and simple one-to-one transformation.

firms, e.g. D to E and F, growth rates for E and F will be calculated as growth of D to the aggregate firm E+F, and will be the same for E and F. In this case, the weights will be set that they reflect the relative share of E and F in E+F and thus the aggregate growth rate does not change.

In the analysis, we almost always use weighted growth rates (or weighted levels in the case of productivity) or weighted regressions to draw conclusions about aggregate effects. Without weights, micro firms would dominate all the results. The weights are the mid-point values (average of t and t–1) in the case of value added and exports, and actual employment in the case of productivity. In the case of entry and exit, the mid-point values are calculated as expected: a missing value is considered as zero, and so the weight will be half of the value of the first (last) observation. In this way, the weighted average of dynamics is the same as the dynamics of the aggregated values (value added or exports).

When the regression is run, year fixed effects and 2-digit NACE sector fixed effects are always controlled for. Other explanatory variables (age and size dummies) are added depending on the specification.

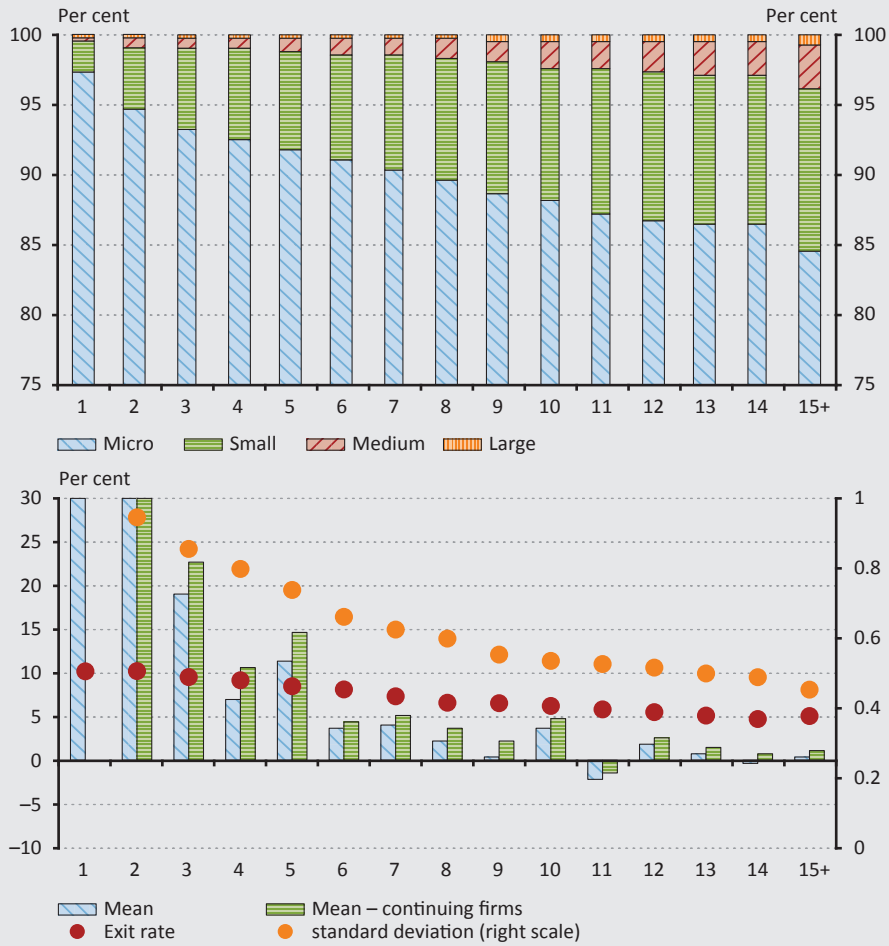
We study firm performance in the following dimensions: age, where we use the following categories: 1 to 14-year-old firms, and 15-year old or older firms (15+); size: we use the usual categories: micro, small, medium, large firms; time: we define 3 periods: before crisis (pre-crisis: 2001–2007), crisis (2008–2012) and recovery (2013–2015).

3. Firm size, dynamics and age – Real value added

First, we document the stylised features of Hungarian firms' dynamics relating to size, age, growth and volatility. To analyse the changing dynamics of firms along their life cycle we use real value added (Rva). Similar papers often concentrate on employment. Because of data unavailability, studies using other, output-type measures are still scant (one exception is *Haltiwanger et al. 2016*). Another reason for analysing Rva instead of employment is that the impact of age and size on employment creation is extensively studied by *Benk – Morvay – Telegdy* (*2018*).

New entrants tend to be small. *Figure 1* (upper panel) shows that there is a positive correlation between age and size. The correlation remains even if we run regression and control for time trends and sector fixed effects (regression results are not shown here).

Figure 1
Size distribution by age (upper panel) and weighted Rva growth rate by age (lower panel)



Note: The left axis of the lower panel is truncated at 30 per cent.

New entrants are not just small, they are extremely dynamic, exhibiting a very high growth rate during the first years of their existence (see lower panel of *Figure 1*). For example, 3-year-old firms[5] grow at a rate of around 20 per cent on average over 2001–2015. Following the 5th or 6th year (in life-cycle analysis that age is often found to be the time when firms become mature and start slowing down), the growth rates fall significantly, below 5 per cent, and above 10 years, firms hardly grow (max. 1–2 per cent).[6]

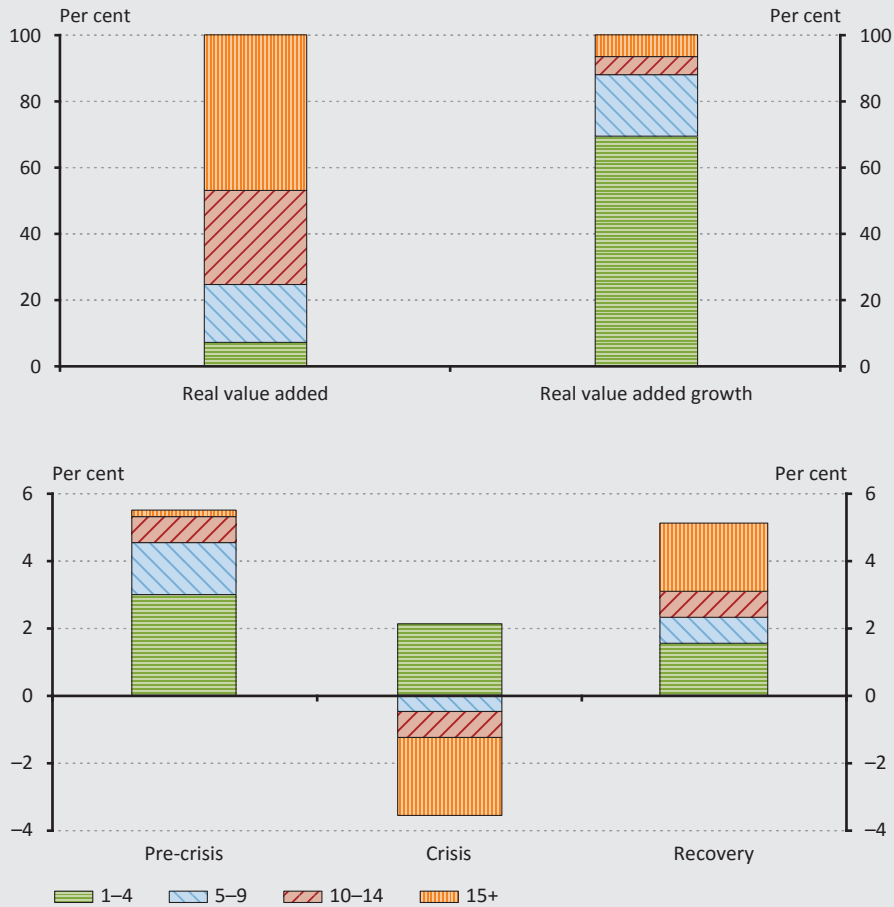
Although young firms tend to grow rapidly, their performance is dispersed – shown by the standard deviation of growth rate by age groups – and their exit rate is high (see lower panel of *Figure 1*). For example, firms up to the age of 3 years have at least a 10 per cent probability of exiting. Firms go through a selection process after entering, and only the viable firms survive. Exits have a non-negligible impact on the growth rate of each age group as well – this is captured by the difference between the two columns (*Figure 1*, lower panel), the one calculated for continuing and the other for the entire sample, including exiting firms. All of these measures – the exit rate, its impact on growth and the dispersion of the growth rate – decline with age.

To assess the aggregate significance of the observed dynamism of young firms, the aggregate growth rate of real value added is decomposed into four age groups (*Figure 2*, upper panel). We find that the contribution to aggregate growth declines with age. Most strikingly, despite the low weight of the youngest group (1–4 years), which produces only 7 per cent of total real value added, 70 per cent of growth is attributed to them. By contrast, firms 15 years or older produce more than half of total Rva, but their contribution to growth is negligible.

[5] The growth rate of 1-year-old firms equals 2 by definition. The growth rate of 2-year-old firms is above 1, which is not shown in the figure for two reasons. First, to make the rest of the figure more visible. Second, the calculation assumes that at each year firms operated for the entire year, which is surely not the case for entrants, who may enter any time during the year. As a result, the growth rates calculated for 2-year-old firms are biased upward, at the same time their weight (mid-point) is biased downward. After all, this affects how growth rates and/or weights are "allocated" between year 1 and year 2. Since most of the time we analyse the group of 1–4 year-old firms, this has minor impact on the results.

[6] This is different from the findings of analyses on job creation, where older firms have a negative net contribution to employment growth.

Figure 2
Contribution of age groups to Rva and Rva growth (upper panel) and growth decomposition by time periods (lower panel)



Note: The upper panel shows averages for 2001–2015.

At the same time, the contribution of certain age groups varies according to the business cycle (see lower panel of *Figure 2*). Young firms do grow even during the crisis – *Criscuolo et al.* (*2014*) have similar findings on employment creation. Less firms enter, and their growth rate is lower than during the boom, but they still make a positive contribution to growth. By contrast, the Rva of older firms declines sharply during the crisis, driving the aggregate growth rate well below zero, but then jumps higher during the recovery. Their impact on aggregate growth becomes important because of their large share in Rva, and not necessarily because of their

stronger cyclicality.[7] Interestingly, the performance of young firms did not recover in 2013–2015, which is related to the severe setback in firm creation – the entry rate was steeply declining in this period.

To see more details on what happened during the crisis and the recovery, the decomposition of Rva growth is enhanced (see *Figure 3*) by separating gross terms: creation (contribution of firms with positive growth rate) and destruction (contribution of firms with declining Rva) of incumbent firms, entry and exit. When the crisis hit, the decline in the Rva growth rate materialises through all channels. More firms exit, the contribution of entrants falls, and the performance of continuing firms declines as well: gross creation falls and destruction increases, resulting in an overall negative net impact for incumbents. Both entries and exits play an "accelerator" role: during the crisis they not only contribute to the overall slowdown, but their share in gross creation and destruction increases as well. The share of new entrants in gross creation falls from 6.6 per cent to 4.9 per cent during the crisis, while the share of exits in gross destruction on the other hand increases from 7 per cent to 7.9 per cent.

Figure 3
Decomposition of Rva growth rate to gross terms and entry/exit

Note: Share of exits for 2013–2015 is not shown because unobserved temporary exits in later years may significantly bias the figure.

[7] During the period investigated, a gradual aging of firms is observed, which accelerates because of the crisis. That ageing leads to an increasing weight of older firms in Rva. But the rebound in the older age groups during the recovery is only partially explained by their increasing weight. For simplicity we do not decompose Rva growth further.

The recovery period, instead of being a mirror image of the crisis, has some distinct features. The recovery is driven by less destruction rather than more creation – no improvement is observed in either firm creation or positive growth. Regarding incumbent firms, fewer firms shrink, or the magnitude of decline is smaller, but there is little improvement in terms of positive growth. Another distinct and alarming feature of the recovery is the further decline in the contribution of entries. The decline is observed both in terms of absolute contribution and in terms of share in gross creation – the latter drops to 3.3 per cent, standing at a mere half of the pre-crisis figure. This is in sharp contrast to the behaviour of exits: their contribution to overall growth – as one would expect – decreases during the recovery, while their relative role in gross destruction cannot be judged due to data problems.[8]

Overall, exits seem to behave countercyclically and their impact accelerates during downturn. The evaluation of countercyclical exits is not without ambiguity. On one hand, exits may make productive capacity disappear and the reallocation of production factors can be limited. On the other hand, recessions can induce a cleansing effect through exits by pushing the least productive firms out of the market. To what extent this cleansing effect worked during the Great Recession is an interesting question for future research.

As for entries, we expect this to be procyclical. Entrants do show sign of procyclicality during the recession, but their behaviour during the recovery is rather surprising. The contribution of entrants and more generally young firms has trended downward since the onset of the crisis. The fall in the entry rate was observed in many countries during the Great Recession, and its size and persistence are regarded as exceptional in several countries where long time series are available.[9] In Hungary, firm creation halted for a very long period, and the entry rate was declining even 8 years after the outbreak of the crisis. Low entry harms growth over the longer term, as falling entries in a given year lowers growth not just in that year, but also in the following ones, through the lower share of dynamic young firms. In this way, the decline in entries induces a persistent slowdown in output. The importance of entries (and exits) and their potential role in prolonging the recovery is recognised not just by empirical studies, but in theoretical model developments as well (*Clementi – Palazzo 2016* and *Clementi et al. 2017*).[10]

[8] Exit data for the recovery period is exaggerated. In general, there are many firms in the Hungarian economy, which exit temporarily, and some years later restart operation and reporting financial accounts. Towards the end of the sample the distinction between the two types of exits becomes impossible. Some of the exits categorised as final will turn out to be temporary, and therefore the impact of exits in the recovery period is exaggerated. Still, we find that the role of exits drops during the recovery, which would be even more pronounced, if we were able to measure exits correctly. Because of this issue we do not show the ratio of exits to destruction in the figure.

[9] For the US it is documented by *Gomis and Khatiwada* (*2015*), *Gourio et al.* (*2016*) or *Clementi et al.* (*2017*).

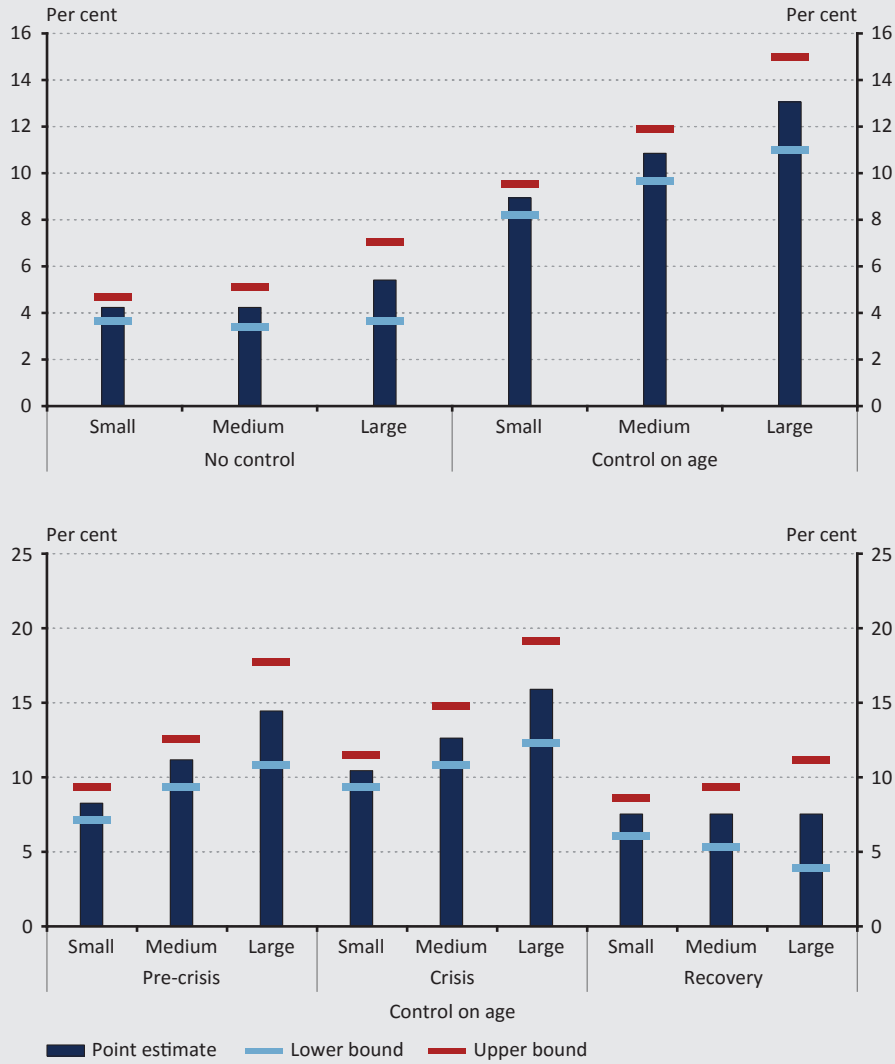
[10] The decline in entry rates and its consequences on corporate investments are documented in *Bauer and Endrész* (*2017*).

As young firms are shown to be dynamic and small, the question arises as to whether size or age is more important for growth. Using employment data, *Haltiwanger et al.* (*2006*) shows that small firms tend to make a larger contribution to employment creation, but if we control for age, this impact disappears. Apparently, the positive correlation between size and growth is due to the fact, that small firms tend to be younger. *Benk – Morvay – Telegdy* (*2018*) reach the same results with Hungarian data. We conduct a similar exercise, regressing Rva growth rates on firm size and age dummies, while controlling for year and sectoral fixed effects. Results partly differ from the findings on employment creation. Larger firms are found to grow faster, with the largest difference between micro firms and the rest (*Figure 4*). The differences observed between the small, medium and large groups are not significant. If we control for age, i.e. comparing firms of the same age, the average differences – as expected – become even larger (estimated parameters double), at the expense of smaller firms.

During the crisis (lower panel of *Figure 4*), micro firms' relative performance slightly deteriorates, but in the recovery period there is some reversal, especially for large and medium sized firms.

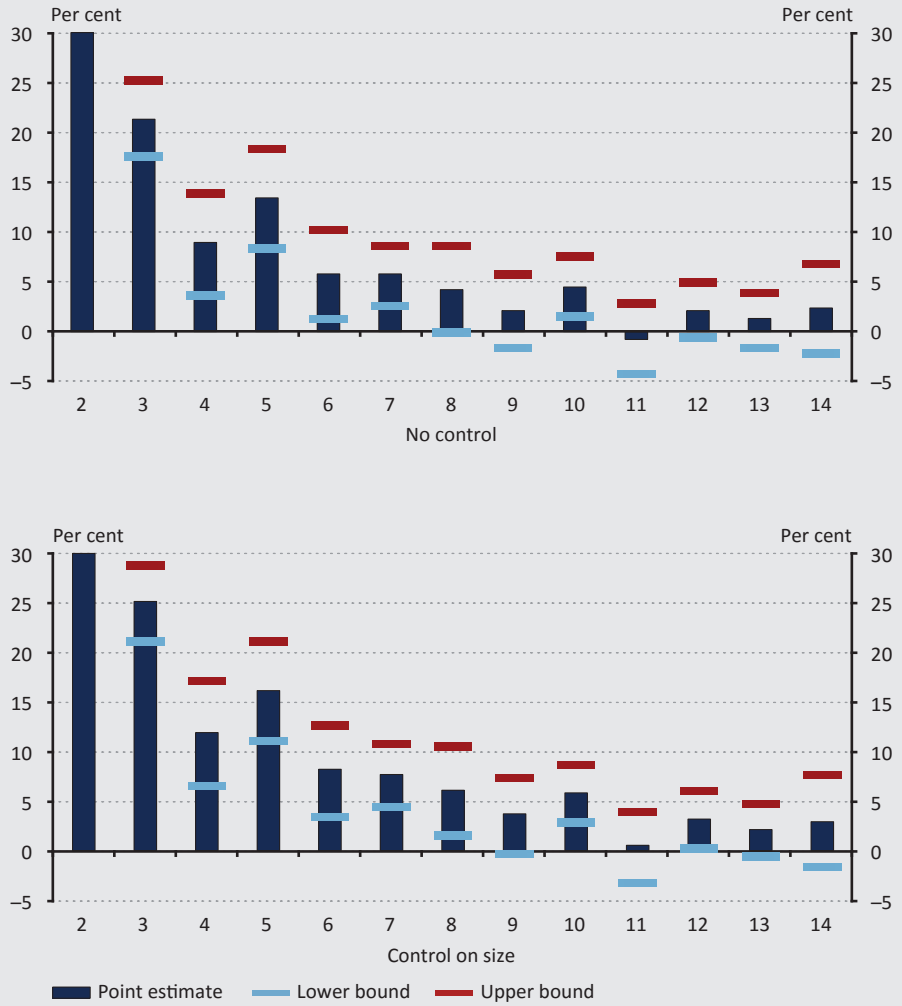
Estimation results on the impact of age reinforce the previous findings, as growth rates steeply decline with age (*Figure 5*). Controlling for size has a minor impact on the results. Altogether, age seems to be more influential than size. The comparison of partial R^2s of different models leads to the same conclusion (not shown).

Figure 4
Rva growth by size
(coefficients from a regression of Rva growth on size and on age, micro=0)



Note: Average (of t and t–1) Rva weighted linear regression coefficients, micro firms are the control group, with year and 2-digit sectors dummies. Lower and upper bounds are bounds of the 95 per cent confidence interval.

Figure 5
Rva growth by age, with and without control of size
(coefficients from a regression of Rva growth on size and on age, 15+=0)



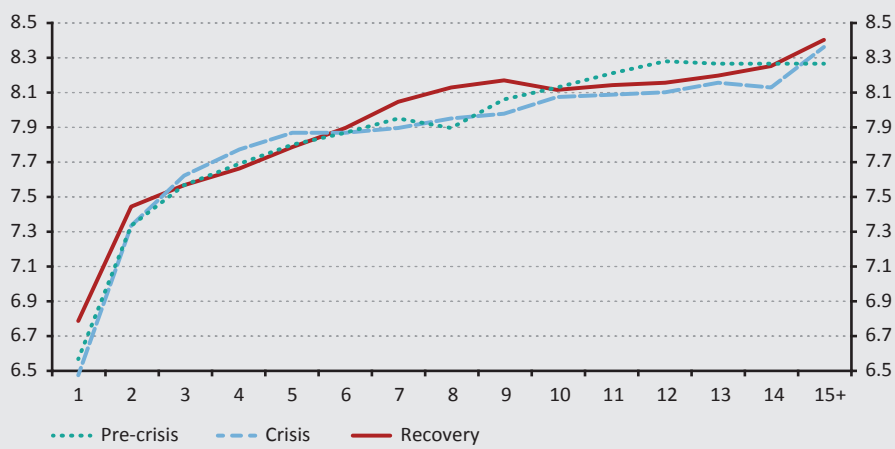
Note: Average Rva weighted linear regression coefficients, 15+ old firms are the control group, with year and 2-digit sectors dummies. Lower and upper bounds are bounds of the 95 per cent confidence interval. Left axis is truncated at 30 per cent.

4. Productivity and age

In this section, we investigate the relationship between productivity and age, and the effect of entry and exit on productivity. We measure productivity by the labour productivity of firms in logarithm, i.e. by the logarithm of real value added per persons employed.[11] Aggregate productivity is the employment weighted average of the firm-level (log) productivity. Thus, aggregate productivity can be considered as a geometric mean of firm-level productivity. Labour productivity has the advantage that it is observable opposed to total (or multi-) factor productivity which is an unobservable measure of productivity. The level of productivity is positively correlated with age (*Figure 6*). While entering (1-year-old) firms have markedly lower labour productivity than older firms, the increase in productivity slows down above about 10 years of age.

The crisis did not change significantly the relationship between age and productivity. We can observe that entering firms have higher productivity in the recovery period (2013–2015) than before. This may be related to self-selection because of the lower entry rate. This phenomenon may also be reflected in the somewhat larger size of entering firms (not shown here).

Figure 6
Mean of labour productivity by age
(employment weighted log labour productivity)



[11] Persons employed is defined in full-time equivalent thus correcting for potential changes in hours worked per person.

As we have seen, entering firms have lower productivity than existing older firms, and thus the immediate effect of entry on aggregate productivity is negative. This is not the case for exits (*Figure 7*, upper panel). Exiting firms (those which will exit in the next year) always have lower productivity than existing ones in the same age group. Thus, the effect of exits is always positive on productivity. But the productivity of exiting firms increases with age. Consequently, exiting firms that are 3 years or older (and usually, but not always 2-year-old firms) have higher productivity on average than entering firms. This suggests that the effect of net entries on productivity may be easily negative if the weight of 3-year or older exiting firms is large enough to offset the lower productivity of exiting firms with an age of 1 or 2 years.

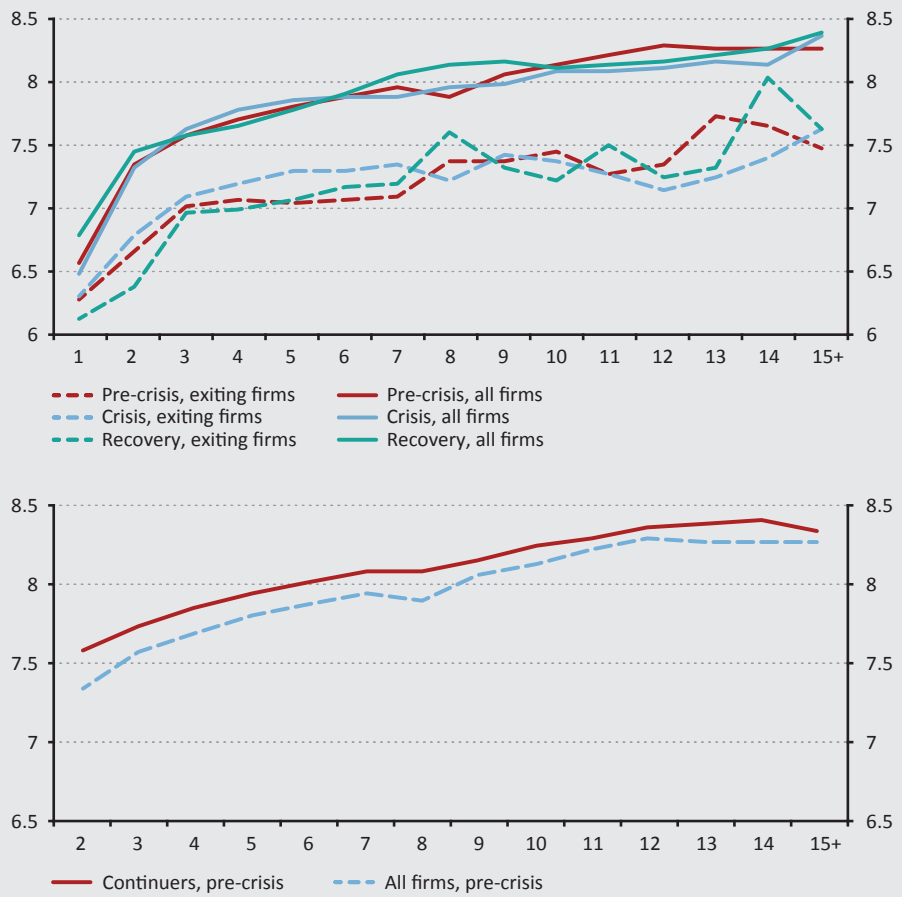
As exits can raise the productivity of all age groups, it is a natural question as to how much of the increase in the level of productivity by age is due to exiting. To this end, we calculated the average productivity only for continuers, i.e. firms that have labour productivity both in the previous and in the next year. Thus, entries and exits do not influence the age-productivity relationship in this case.[12] According to our findings, the increase in productivity by age is very similar to the case where we take all firms into account, only the curve is shifted upwards (*Figure 7*, lower panel). This means that increasing productivity by age is not the result of exits by lower productivity firms.[13]

We also examine productivity by size. We find that larger firms have higher productivity, which is in line with the results that were documented already in Hungary and in several countries (see e.g. *OECD 2017* for international results, and *MNB 2015* for Hungary). This is not surprising, as firms which become larger benefit more from economies of scale. As age and size have a positive correlation, we also run a regression where we control for age (and year and 2-digit sectors) to filter out the effect of age on productivity through size. According to our results, larger firms still have higher productivity (*Figure 8*, upper panel). This means that comparing two firms with equal age, the larger one has higher productivity. We note that controlling for age has smaller importance for productivity than for value added growth (the coefficients change by a smaller amount).

Using regression, we also checked whether the positive relationship between age and productivity remains if we control for size (and year and 2-digit sectors). According to the results, the controls change the coefficients only slightly, and thus productivity increases with age (*Figure 8*, lower panel).

[12] Entry in a broader sense is possible for firms older than 1 year, as log labour productivity can be missing because of zero employment or zero value added.
[13] A more detailed analysis of the source of productivity growth would require the study of the effect of reallocation on productivity which is beyond the scope of this paper.

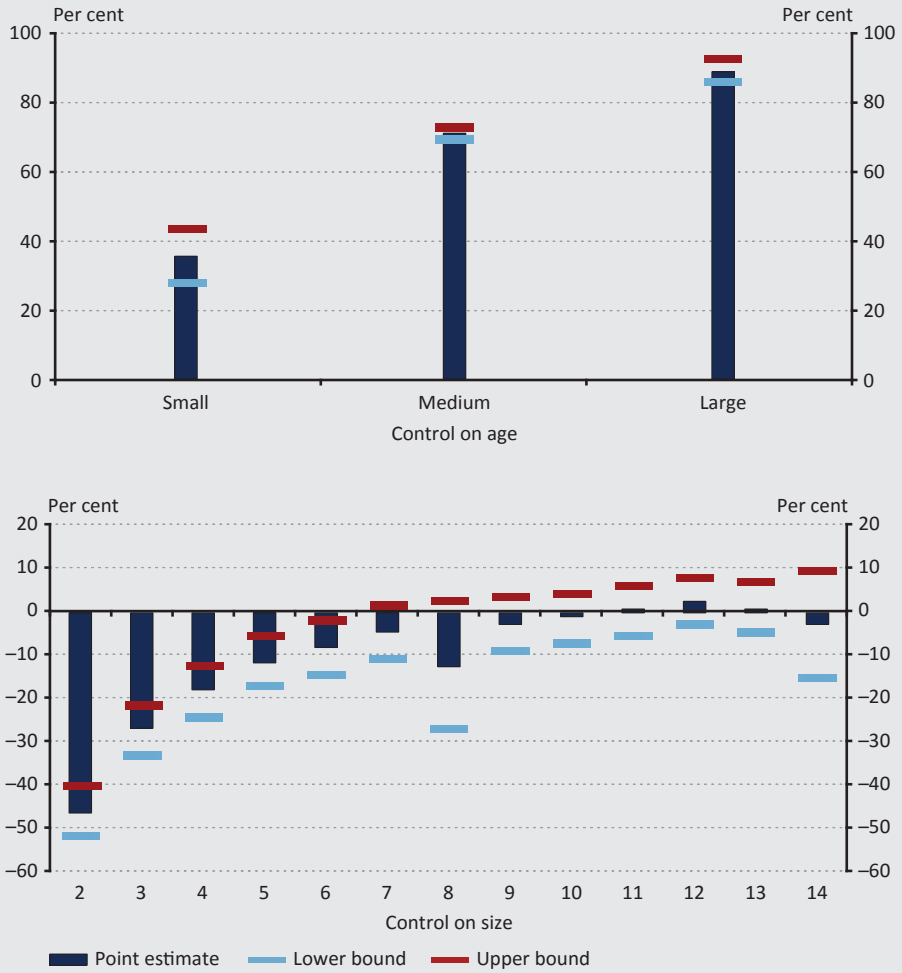
Figure 7
Labour productivity by age
(employment weighted log labour productivity)



Note: Continuers are firms that have log labour productivity in the previous and in the next year as well. This means that they cannot be entrants or exit in the next year.

We also investigated whether size or age better explains the variance of productivity. According to our results, (based on partial R^2s) the size of a firm is a much important determinant of productivity than the age.

Figure 8
Labour productivity by size (upper panel) and by age (lower panel)
(coefficients from a regression)



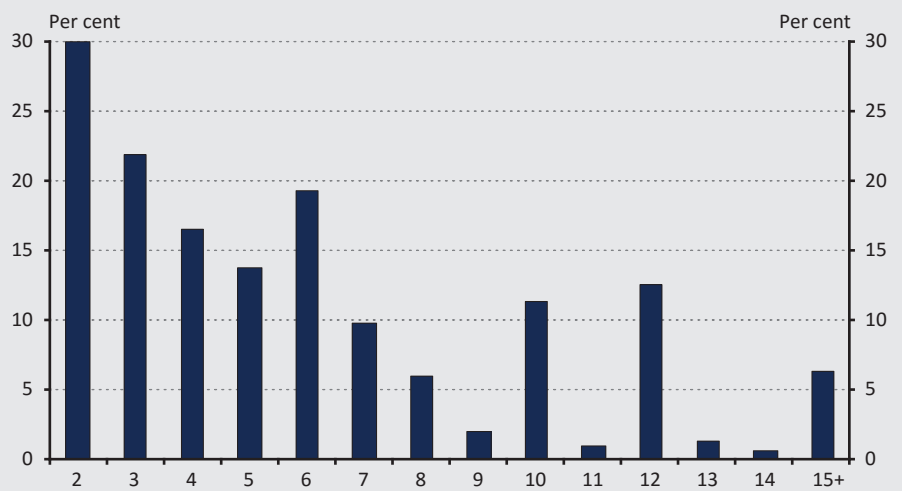
Note: Employment-weighted linear regression coefficients, micro firms are the control group for size, 15+ old firms are the control group for age, with year and 2-digit sectors dummies. Lower and upper bounds are bounds of the 95 per cent confidence interval.

5. Export growth and age

Exports are a fundamental indicator of firm performance: usually more productive firms engage in exports. Exports are also important from an aggregate point of view as Hungary is a very open economy, and exports are a dominant source of economic growth. In the following, we study the exporting activity of firms and its change with firm age. Firm-level export growth is defined the same way as in the case of value added, using the so-called mid-point growth. In this section, entry and exit is (re)defined in terms of entering to/exiting from export markets.

The relationship between age and export growth is very similar to value added growth (*Figure 9*). Young firms grow much faster than older firms, and the growth rate decreases at a slower pace at higher ages. The main difference is that in the case of export growth, old firms (older than 10) also show positive growth as opposed to value added growth, which is very close to zero. This can be explained by the fact that many firms are able to enter to export markets at a later age only, when they reach the necessary level of productivity and competitiveness. The sheer size and growth of export markets and the special properties of exporting activity may also force firms to remain innovative and dynamic even in the later part of their life.

Figure 9
Mean export growth by age, 2001–2015
(weighted mid-point growth rates)



Note: We do not show the growth rate for 1-year-old firms, as it takes the value of 2 by definition. Vertical axis is truncated at 30 per cent.

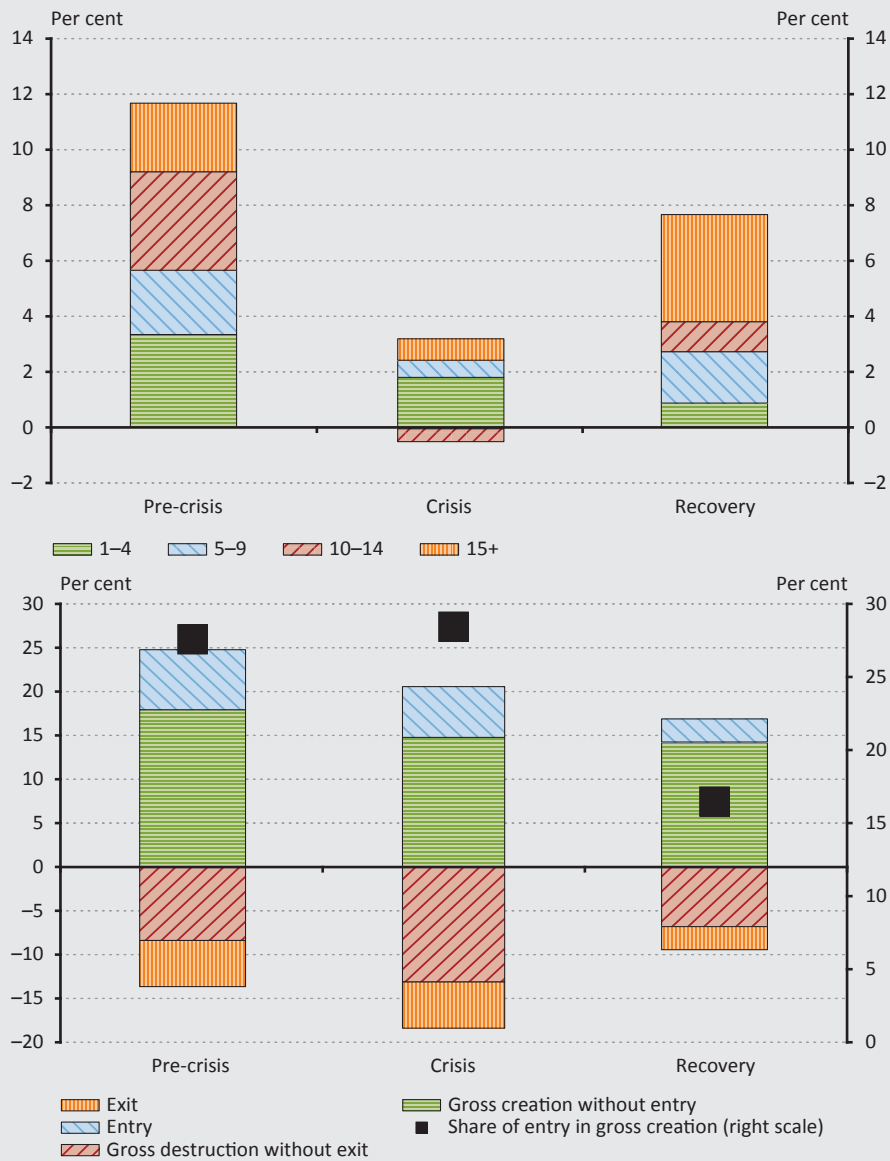
The importance of various age groups in export growth depends not only on their growth rates, but also on their weights in exports. Consequently, we decompose export growth to the contribution of age groups. According to our results, young firms play a significantly smaller role in export growth than in value added growth (*Figure 10*, upper panel). Older firms dominate even before the crisis when average age was significantly lower than later. During the crisis, not only the youngest firms show a positive contribution but even the oldest firms. After the crisis, the youngest firms' contribution can be considered marginal. The result that older firms are more important in export growth than in value added growth is closely related to the above shown fact that older firms show positive export growth. It is worth noting that this is not the consequence of disproportionately high weights of older firms as the weights are very similar to the ones for value added (not shown here).

Beyond the role of age, we would like to show the importance of the extensive margin, i.e. entry and exit on export growth. To this end, we decompose aggregate export growth into the contribution of four groups of firms. In the first group (called gross creation without entry), there are the firms that export in the previous year, so they are not entrants, and show positive growth. The second group (called gross destruction without exit) consists of firms that export in the current year (so they are not exiting) but show negative growth. The third and fourth groups are the entrants and exiting firms, respectively. *Figure 10* (lower panel) shows the decomposition and the share of contribution of entrants to gross creation.[14] The most important conclusion is that the contribution of entries decreased markedly after the crisis in absolute terms and compared to gross creation as well. Another observation is that the deceleration of export growth during the crisis period (2008–2012) is driven by smaller gross creation and larger gross destruction of continuing firms, while the changing contribution of entries or exits is less pronounced. Recovery is driven by smaller gross destruction including the decreasing contribution of exits. The shrinking importance of exits in the recovery period can be partly related to the lower entry rate as young firms have higher exit rates. In the recovery, similarly to value added growth, gross creation did not play a role, even if we disregard the falling entry rate.

We also examine export growth by size (for the analysis of exporting activity by firm size in Hungary, see e.g. *MNB 2017*, for the export growth and size relationship in France, see e.g. *Berthou and Vicard 2015*). Even if we control for age, larger firms have a higher export growth rate (*Figure 11*, upper panel). It is also worth noting that differences due to size (e.g. micro vs. small firms) are much larger than in the case of value added growth.

[14] It is important that we show the contribution of entries compared to gross creation and not the contribution of net entries to overall growth. Net entries and even overall growth can be negative, so the share is not meaningful. Gross creation and entries are always positive, and entries are part of gross creation, so the share in this case is meaningful.

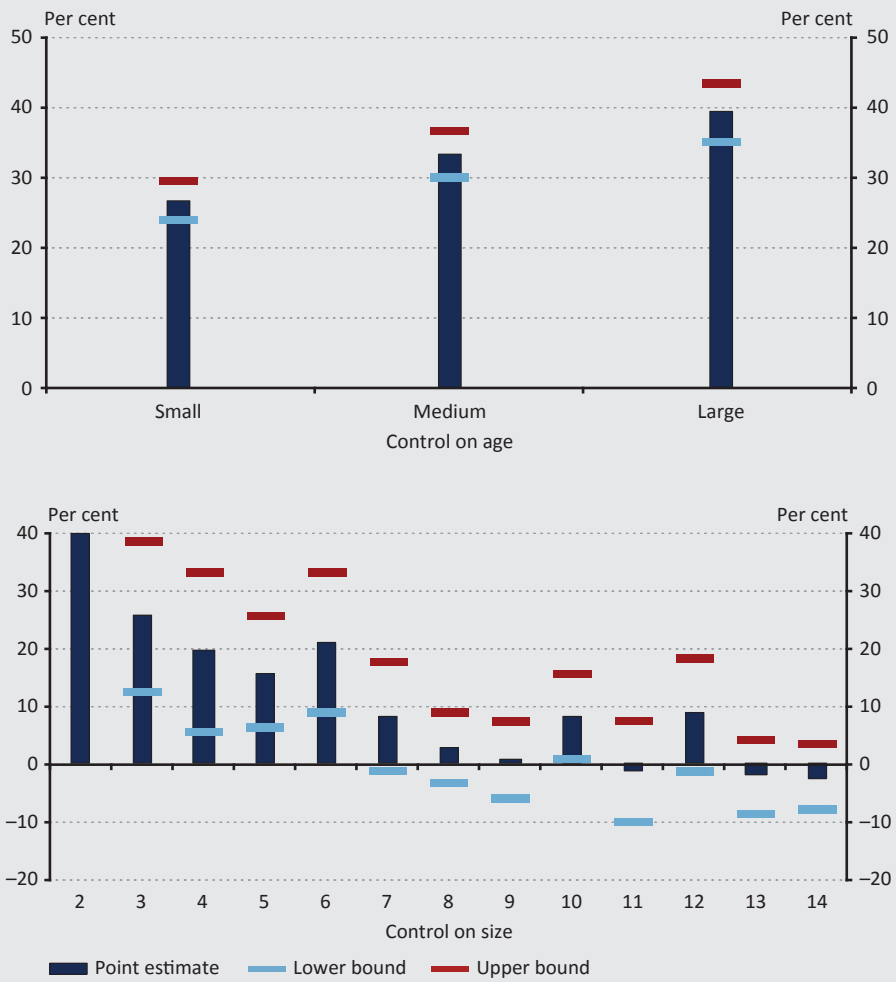
Figure 10
Decomposition of exports growth by age groups (upper panel) and to growing, shrinking, entering and exiting firms (lower panel)
(weighted growth rates)



Note: Entering (exiting) firms are defined as firms that start (cease) exporting in the current year.

We also checked using regression whether the relationship between age and export growth remains if we control for size. According to the results (*Figure 11*, lower panel) export dynamics decrease with age even after controlling for size. We also investigated whether age or size is more important in explaining export growth. We found (based on partial R^2s) that age is more important than size, but size is relatively more important in this case compared to value added growth.

Figure 11
Export growth by size (upper panel) and by age (lower panel)
(coefficients from a regression of exports growth on size and on age, micro=0 and 15+=0, respectively)



Note: Average (of t and t–1) exports weighted linear regression coefficients, micro firms are the control group in the case of size, and 15+ old firms are the control group for age, with year and 2-digit sectors dummies. Lower and upper bounds are bounds of the 95 per cent confidence interval.

6. Lending and age

Bank lending and age are expected to be intertwined because of the changes of supply and demand factors during a firm's life cycle phases.[15] Young firms tend to experience high growth and accordingly to have high funding needs. But as they are young and small, exposed to large risk (high failure rate) and often lack collateralisable assets, their creditworthiness is low, and the bank credit supply is thus limited. As they grow, become more profitable and less risky, banks become more willing to finance them. As they grow even older, their growth slows down, lowering their financing needs, while their ability to produce sufficient internal funds is elevated. In sum, we expect an inverted U-shaped relationship between age[16] and use of bank loans, where supply plays a role mainly on the upward sloping part.

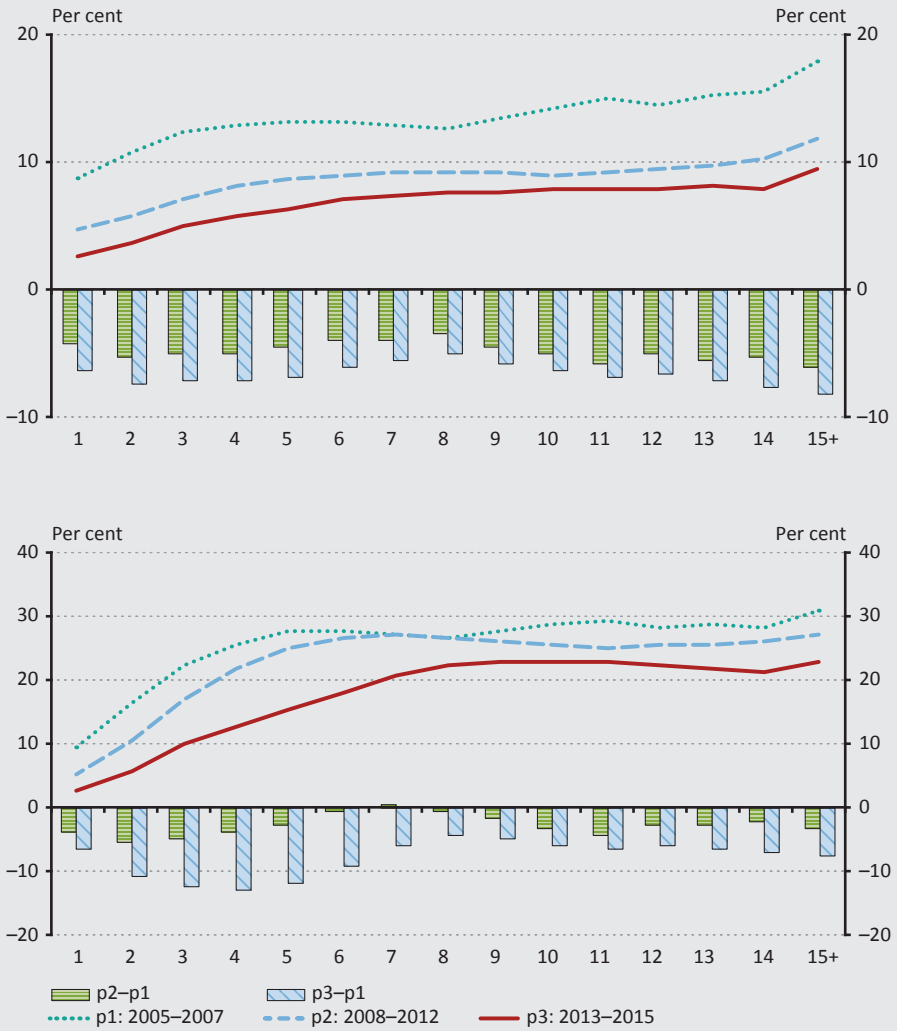
Changes in bank borrowing over time are also of interest, as the crisis triggered changes in bank supply, with a potentially large impact on aggregate growth.

The analysis of bank borrowing and the age of firm differs from the previous analyses. The available credit registry data constrains the analysis, as the outstanding value of loans is not available for most of the period under examination. Therefore, instead of loan amounts and the related growth rates we analyse the probability of firm-bank relationships, differentiating between the probability of taking out a new loan or having bank loan. Even in that case full coverage is ensured only from 2005, shortening the time period covered to 2005–2015. While we restrict the analysis to certain institutions (banks, foreign subsidies and leasing companies) and certain types of contracts (loans, credit lines, leasing, purchase of receivables), the qualitative results are the same if we add special financial institutions and cooperatives or other type of contracts (guarantees, etc.). Results for the latter are not reported.

Looking only at the probability of taking out or having a loan, we detect a positive correlation with age (*Figure 12*). The older a firm is, the more likely it has loan or takes out a new loan. There is a steady increase in probability up to the age of 5 or 6, which is likely to be driven by the changing supply. This is the age where growth starts slowing down, as seen in *Figure 1* (lower panel). Before the crisis, close to 30 per cent of mature and older firms (older than 5 years) had a bank loan, while about 15 per cent of them took out a new loan per year on average. Following the outbreak of the crisis, there is a huge drop in the use of bank loans. The probabilities decline even during the recovery. The youngest and oldest firms are more affected. Whether it is mainly due to supply or demand factors, needs further investigation.

[15] See e.g. *Castro et al.* (*2014*) and *Bulan and Yan* (*2010*) for discussion on the link between the life-cycle and the capital structure decisions of firms.
[16] Age is often used as a proxy of life-cycle phases.

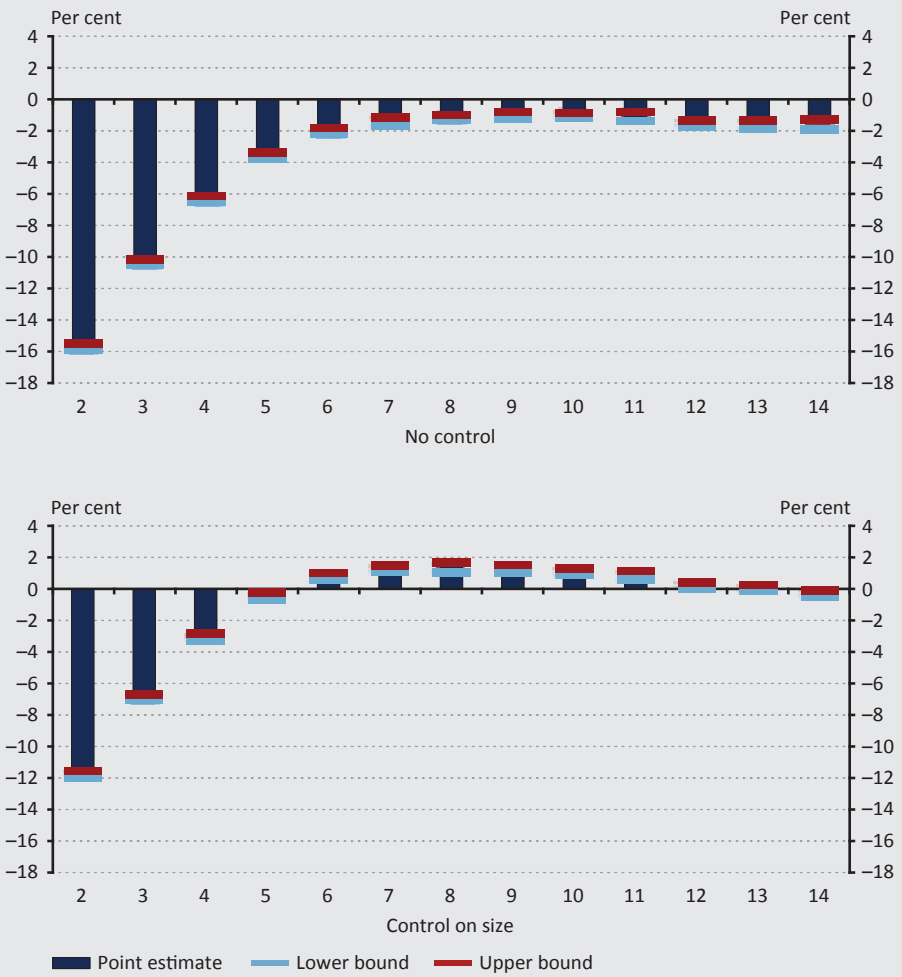
Figure 12
Probability of taking out a new loan (upper panel) and of having a loan (lower panel) by age and time periods



Note: Unweighted probabilities. p1, p2 and p3 denote the periods of 2005–2007, 2008–2012 and 2013–2015, respectively, while p2–p1, and p3–p1 denote the differences between time periods.

The age–bank borrowing correlation changes slightly when regression is conducted instead of calculating average probabilities, and follows the expected inverted U-shape (see *Figure 13*). This is even more so the case when we control for the size of the firm.

Figure 13
Impact of age on the use of bank loan without (upper panel) and with (lower panel) control on size
(Coefficients from a regression, 15+=0)

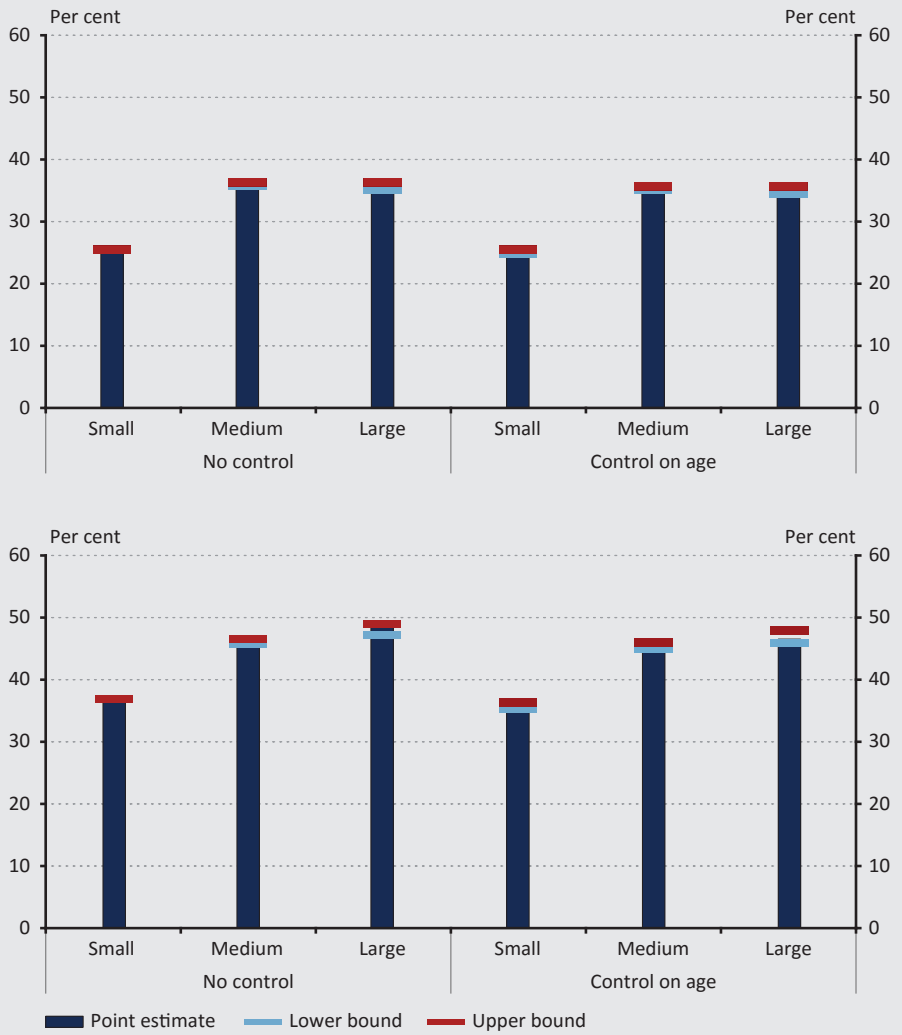


Note: Unweighted regression of a linear probability model of having a bank loan. Control group for age is 15+. Year and 2-digit sector dummies are included. Lower and upper bounds are bounds of the 95 per cent confidence interval.

The probability of using bank loans increases with the size of the firm as well. This correlation does not change much even if we compare firms of the same age (control for age as well). Apparently, size has a large impact on borrowing. Micro firms are the most disadvantaged: their probability of having a loan is 30–40 percentage point lower than that of larger firms. The medium and large group is almost identical regarding their bank loan use (*Figure 14*).

Considering the question whether age or size matter, we have seen that both do, but by comparing the partial R^2s we find that size had much greater explanatory power than age.

Figure 14
Impact of firm size on the probability of taking out a new loan (upper panel) and of having a loan (lower panel)
(Coefficients from a regression, micro=0)



Note: Unweighted regression of a linear probability model of having a bank loan. Control group for size is the group of micro firms. Year and 2-digit sector dummies are included. Lower and upper bounds are bounds of the 95 per cent confidence interval.

7. Conclusions

We documented several stylised facts in this paper concerning firm dynamics in the Hungarian economy, the debate on age versus size and the adjustments observed during the recent financial crisis.

We find that young firms tend to be small and that size and age are highly correlated. Young firms grow faster, but at the same time they frequently exit and their performance is dispersed. Age is more important than size in explaining the dynamics of firms.

The high growth of young firms (1–4 year) makes them important for aggregate growth as well: despite their overall small share in output, almost 70 per cent of aggregate growth is attributed to this group. The story is somewhat different for exports, where older firms remain more dynamic, and therefore their contribution to aggregate exports growth is much larger as well.

When we examine levels instead of growth rates, e.g. the level of productivity and the probability of having a bank loan, we find that these are mainly determined by the size instead of the age of the firm. As firms age they become more creditworthy and more productive, but size explain more of the cross-firm variation.

During the crisis the adjustment was heterogeneous along age and size. The fall in real value added growth during the crisis and the rise during recovery were dominated by the changing performance of older firms, while young firms' contribution to growth remained positive. The adjustment took place both on the extensive and intensive margin – fewer firms entered, more exited, creation weakened, and destruction increased. Heterogeneity is observed in the loan market as well: the decrease in lending affected younger and older firms more severely compared to middle-aged firms, which may have different reasons in terms of supply and demand at the two ends of the age distribution.

Interestingly, the recovery seems to be dominated by the lower-end of the distribution of firm population: destruction eased and fewer firms exited, but there was no recovery in gross creation. The contribution of firm entries kept falling even during the recovery period, which applies even to export markets. Given the importance of young firms in growth, this behaviour of entry must have contributed to the sluggish, weak recovery. Both the willingness or ability of firms to grow and to enter were weakened. Whether the reason is a general increase in uncertainty, changes in regulation (regarding entry) or the still-effective financing constraints presents an interesting question for future research.

This paper is descriptive in nature. Causal analysis and deeper exploration of some issues – e.g. the reasons of the prolonged fall in entry rates, the impact of bank supply shocks – are left for future research. Another important extension would be to update calculations on reallocation as well and to analyse creative destruction during the crisis.

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Appendix

Table 1
Regression results

Dependent variable	Rva growth					
VARIABLES	full sample	full sample	pre-crisis	crisis	recovery	full sample
age = 2 year		1.023***	1.022***	1.070***	0.987***	0.982***
		[0.0233]	[0.0368]	[0.0424]	[0.0304]	[0.0233]
age = 3 year		0.249***	0.295***	0.237***	0.177***	0.214***
		[0.0198]	[0.0256]	[0.0391]	[0.0273]	[0.0194]
age = 4 year		0.118***	0.190***	0.0865	0.0371	0.0876***
		[0.0274]	[0.0256]	[0.0588]	[0.0560]	[0.0259]
age = 5 year		0.160***	0.229***	0.0797**	0.183**	0.134***
		[0.0261]	[0.0431]	[0.0330]	[0.0721]	[0.0258]
age = 6 year		0.0805***	0.141***	0.0427*	0.0225	0.0574**
		[0.0234]	[0.0445]	[0.0237]	[0.0304]	[0.0228]
age = 7 year		0.0767***	0.114***	0.0474*	0.0645***	0.0559***
		[0.0162]	[0.0293]	[0.0248]	[0.0241]	[0.0157]
age = 8 year		0.0596***	0.108***	0.0681***	–0.0329	0.0421*
		[0.0225]	[0.0388]	[0.0216]	[0.0461]	[0.0221]
age = 9 year		0.0348*	0.0943***	–0.0422	0.0466**	0.0205
		[0.0193]	[0.0219]	[0.0566]	[0.0182]	[0.0188]
age = 10 year		0.0572***	0.0771***	0.103**	0.0404**	0.0447***
		[0.0154]	[0.0233]	[0.0402]	[0.0165]	[0.0154]
age = 11 year		0.003	0.0416	–0.0598*	0.0526**	–0.00827
		[0.0181]	[0.0269]	[0.0363]	[0.0208]	[0.0179]
age = 12 year		0.0313**	0.0504**	0.0408*	0.0393*	0.021
		[0.0145]	[0.0236]	[0.0227]	[0.0211]	[0.0144]
age = 13 year		0.0199	0.0392*	0.0268	0.00362	0.0115
		[0.0139]	[0.0234]	[0.0171]	[0.0239]	[0.0139]
age = 14 year		0.029	0.0568	0.00488	0.0164	0.0227
		[0.0235]	[0.0377]	[0.0212]	[0.0290]	[0.0235]
size = small	0.0418***	0.0887***	0.0830***	0.103***	0.0749***	
	[0.0028]	[0.0034]	[0.0051]	[0.0057]	[0.0066]	
size = medium	0.0421***	0.108***	0.110***	0.128***	0.0741***	
	[0.0045]	[0.0058]	[0.0089]	[0.0101]	[0.0106]	
size = large	0.0535***	0.130***	0.143***	0.158***	0.0747***	
	[0.0087]	[0.0103]	[0.0172]	[0.0173]	[0.0180]	
Observations	3,867,153	3,867,153	1,491,393	1,455,747	920,013	3,867,153
R-squared	0.018	0.061	0.061	0.075	0.053	0.057

*Note: Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1. 2-digit industry and year fixed effects are included. Control group for age is 15+, for size is micro firms.*

Table 1
Regression results – cont.

Dependent variable	Labour productivity	Export growth	Having a bank loan			Taking out a new bank loan	
VARIABLES	full sample	full sample	full sample	full sample	full sample	full sample	full sample
age = 2 year	–0.461***	1.035***	–0.158***	–0.118***			–0.0279***
	[0.0303]	[0.0527]	[0.0007]	[0.0006]			[0.0005]
age = 3 year	–0.274***	0.256***	–0.104***	–0.0688***			–0.0169***
	[0.0294]	[0.0666]	[0.0007]	[0.0007]			[0.0005]
age = 4 year	–0.185***	0.196***	–0.0637***	–0.0304***			–0.00999***
	[0.0287]	[0.0693]	[0.0008]	[0.0008]			[0.0006]
age = 5 year	–0.116***	0.160***	–0.0368***	–0.00586***			–0.00611***
	[0.0306]	[0.0496]	[0.0009]	[0.0009]			[0.0006]
age = 6 year	–0.0867***	0.211***	–0.0210***	0.00770***			–0.00483***
	[0.0321]	[0.0628]	[0.0009]	[0.0009]			[0.0006]
age = 7 year	–0.0489	0.0825*	–0.0147***	0.0118***			–0.00478***
	[0.0311]	[0.0483]	[0.00098]	[0.0009]			[0.0007]
age = 8 year	–0.125*	0.0299	–0.0117***	0.0132***			–0.00571***
	[0.0759]	[0.0323]	[0.0010]	[0.00098]			[0.0007]
age = 9 year	–0.0292	0.0116	–0.0104***	0.0124***			–0.00513***
	[0.0318]	[0.0351]	[0.0010]	[0.0010]			[0.0007]
age = 10 year	–0.016	0.0838**	–0.0102***	0.0110***			–0.00509***
	[0.0289]	[0.0365]	[0.00101]	[0.0010]			[0.0007]
age = 11 year	0.00224	–0.0101	–0.0115***	0.00794***			–0.00370***
	[0.0282]	[0.0451]	[0.0011]	[0.0010]			[0.0007]
age = 12 year	0.0189	0.0880*	–0.0159***	0.00227**			–0.00417***
	[0.0273]	[0.0502]	[0.0011]	[0.0010]			[0.0007]
age = 13 year	0.00891	–0.0189	–0.0162***	–0.00011			–0.00360***
	[0.0305]	[0.0330]	[0.0011]	[0.0010]			[0.0007]
age = 14 year	–0.0306	–0.0218	–0.0162***	–0.00285***			–0.00342***
	[0.0612]	[0.0295]	[0.0011]	[0.0011]			[0.0008]
size = small	0.360***	0.266***		0.362***	0.371***	0.254***	0.252***
	[0.0397]	[0.0148]		[0.0009]	[0.0009]	[0.0008]	[0.0008]
size = medium	0.707***	0.333***		0.454***	0.465***	0.358***	0.354***
	[0.00734]	[0.0168]		[0.0018]	[0.0018]	[0.0019]	[0.0019]
size = large	0.888***	0.392***		0.469***	0.482***	0.356***	0.352***
	[0.0151]	[0.0213]		[0.0038]	[0.0038]	[0.0041]	[0.0041]
Observations	3,152,913	507,326	4,183,013	4,183,013	4,183,013	4,183,013	4,183,013
R-squared	0.258	0.075	0.062	0.131	0.123	0.108	0.109

*Note: Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1. 2-digit industry and year fixed effects are included. Control group for age is 15+, for size is micro firms.*

Disaggregated Household Incomes in Hungary Based on the Comparative Analysis of the Reweighted Household Surveys of 2010 and 2015*

Mihály Szoboszlai

In the period 2010–2015, the Hungarian employment rate recorded an outstanding increase even by European standards. During this period, the Hungarian Central Statistical Office recorded a 9 per cent increase in the number of employees, coupled with a 15.5 per cent rise in net real wages. This study presents the evolution of these indicators broken down by income groups. In addition to number of employees and labour incomes, changes in the total compensation of pension and social benefit recipients are also discussed in the study. Calculations are based on the 2010 and 2015 data waves of the household budget statistics. One disadvantage of using these data, however, is that they are distorted along the income distribution due to the phenomenon that high earners are typically represented by a low number of observations. The study presents a two-step recalibration procedure with previously unused cohort formation that addresses the aforementioned coverage deficiency with adjustment to external data sources. The material well-being of different household income groups can be tracked in the database produced by the applied method, and the macroeconomic indicators can be supplemented by pieces of distribution information. According to the results defined as the difference between the two years' data under review, the employment growth in the interim period was determined by the employment of the two lower income quintiles. In the assessment of social benefits, with the limited information available, the chosen tool does not provide a comprehensive view of the changes in these income categories; therefore, the quantified differences between the reweighted sample years' data should be considered with caution. Broken down by income group, real wage indices exhibited considerable fluctuations.

Journal of Economic Literature (JEL) codes: D31, D33, J31

Keywords: Income, income distribution, wage distribution, well-being, household statistics, reweighting

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

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This article presents the author's views and does not necessarily reflect the official opinion of the Magyar Nemzeti Bank. The author owes a debt of gratitude to Balázs Kóczián and Balázs Sisak for their thorough reading of the manuscript and for valuable recommendations regarding the presentation of the study's results. Special thanks go to Izabella Kuncz for her helpful comments and clarifications, Ákos Pogány for his remarks on the income of foreign employees and Dóra Kerényi-Bräutigam for conscientiously monitoring the initial versions' structural adequacy and the accuracy of the list of references. Last, but not least, I would like to thank the proofreaders of the study for their constructive criticism.

The Hungarian manuscript was received on 25 September 2017.

DOI: http://doi.org/10.25201/FER.17.2.99123

1. Introduction

The current state of well-being has constantly been the focus of attention of political decision-making and social science. This is mostly monitored by measuring households' current incomes and consumption expenditures. Regularly published statistics denote national economy totals, based upon which one can make statements with respect to material well-being on the basis of averages. At the same time, family revenues and expenditures by both individuals and specific household segments may emerge erratically in an economy. A prerequisite for exploring the distribution characteristics of these is the availability of a micro database that provides reliable, sufficiently detailed information for such an in-depth analysis.

In Hungary, the Household Budget and Living Conditions Survey (HBLS) gathers detailed information on the consumption expenditures, living conditions and collected incomes of respondent households. The expenditure side of the HBLS is structured in accordance with the classification of individual consumption by purpose (COICOP-nomenclature[1]), which offers the most comprehensive statistics as far as the granularity of product breakdown is concerned and is applied uniformly across the European Union Member States. Similarly, revenue data are structured in numerous income categories; however, in terms of coverage, the data collection is typically deficient around the tails of the income distribution. In order to answer differentiated questions about the living standards of various social groups, this deficiency needs to be remedied. Consistency between the waves of the micro database that serves as the primary data source is a crucial prerequisite for the accuracy of quantitative analyses. In this study, I use a peculiarly applied tool to resolve the methodological problem and then, with the information of the pre-prepared database, changes in the welfare of the individual income quintiles are examined by comparing these cross-sectional surveys of 2010 and 2015.

Besides general interest, there is growing professional demand for the publication of distribution information on welfare (*Stiglitz – Sen – Fitoussi 2009*). With the availability of such information one can analyse the processes of social/income differentiation. When inequality is increasing in a society to a degree that exceeds the increase in per capita welfare indicators, a large proportion of individuals may find themselves in a weaker financial situation even though welfare is improving (on average). Besides the shift of centre of welfare gravity, monitoring the behavioural responses of groups at the bottom and at the top of the distributions may also provide useful outputs from a social and economic policy perspective.[2] The reform ideas of the Fitoussi report gave fresh impetus to the development of information

[1] For more details on the methodology of the classification, see: *UN* (*2000*).
[2] The new macroeconomic forecasting model of the Magyar Nemzeti Bank also places a particular emphasis on the heterogeneity of households, as shown in detail in the working paper by *Békési et al.* (*2016*).

systems and inspired innovative thinking about the data while encouraging more prudent data use.

According to the recommendation of the Stiglitz report, the most evident approach to measure material well-being in an alternative manner would be the addition of distribution information to total economy-level statistical data. However, it should be noted at this point that comparing the indicators included in the national accounts with data derived from the survey can be challenging.[3] On the one hand, a considerable portion of the earnings captured at the macro level may not actually appear at the level of households (see, for example, imputed rents at market price, or the interest spread between preferential and market rates); on the other hand, the corrections performed to ensure the comprehensiveness of the national accounts (estimates regarding the level of unreported and hidden incomes) may also increases the discrepancies between the two data sources. According to general experience, household surveys offer limited insight into income at the individual level. In addition to the respondent burden, income concealment and respondents' low willingness to reply to sensitive questions about their well-being, reliable data gathering is hampered by the fact that households are not aware of certain income types on an item-by-item basis. Finally, the comparison also runs into difficulties, as in many cases the published consumption and income indicators do not include breakdowns that can clearly be attributed to actual data aggregated from the survey (e.g. labour incomes from full-time employment, cost reimbursement(s) or the forms of pension received on own right).

2. Data

The primary data source of the analysis is the Household Budget and Living Conditions survey conducted by the Hungarian Central Statistical Office. The HBLS contains about 8,000 to 10,000 private households (15,000–20,000 individuals) representing the total Hungarian population. The database collects product-level data on the value of the goods and services purchased by households and provides detailed information on households' stock of durable goods. Besides consumption habits, the survey contains questions relating to households' relative financial situation and indebtedness. Since it takes account of more than 60 – person or household-related – income types annually, it provides an opportunity for a detailed analysis that offers substantial information on the well-being of households both from a consumption and income perspective. The benefit of using the household database as opposed to administrative data sources (e.g. the registry of personal income tax returns, pension register, other official registers) is that it collects information on diary-keeper respondents not only on an individual basis, but also

[3] Exploring the differences may be facilitated by the description of the methods and data sources applied in the Hungarian practice for the compilation of GNI (gross national income), see: *(HCSO 2009*).

at the household level: therefore, the types of households in which the persons participating in the survey can be identified.

The analyses were based on the HBLS conducted for 2010 and 2015 (*HCSO 2011; 2016*); the main difference between the data collections of these two years was the accounting of incomes. In the 2010 data wave, households[4] reported on the reviewed income categories in gross amounts, while from 2013 onward they made a statement on their material well-being in net terms. The reason for this accounting difference that in 2013, the HCSO adjusted the budget survey to the methodology of the international living conditions survey (European Union Income and Living Conditions Survey). As a result of the harmonisation, the list of the survey's income variables and the contents of the variables changed (somewhat), which were standardised during the analysis. Net categories were created from gross income data for 2010 based on own calculation in accordance with the prevailing tax tables and transfer rules.

One of the external (secondary) databases used for the purpose for improving the data quality of the HBLS is the full sample of the anonymous PIT returns for the years 2010 and 2015. Using information from the database, a substantial part of personal incomes has become available at the personal level by sex, age and county (see *sub-section 4.2*). Data on pension benefits, in turn, have been corrected in accordance with the number of recipients contained in the statistical yearbooks of the Central Administration of National Pension Insurance (in Hungary abbreviated as ONYF) (see *sub-section 4.1*). Other benefits were not revised during the imputing process as beneficiaries often receive non-pension type transfers with some main sources of income (labour and/or retirement income); therefore, any database correction on this basis would specifically modify, assumedly to an undesired degree and direction, key income items.

3. Methodology

3.1. Approaches in European countries: merging with administrative data

This section discusses the statistical-methodological issue of how typical the usage of administrative data is among countries compiling European living standard surveys. The main data source on income, poverty, social exclusion and living conditions in the European Union is the EU-SILC (European Union Statistics on Income and Living Conditions) survey. Most Member States have been increasingly moving towards the use of administrative information for statistical purposes. The obvious benefit of re-using data is the simultaneous reduction of data collection costs and the burden on respondents. In addition, a further advantage of the use

[4] For the purposes of the calculations I used the survey with its weights adjusted to the baseline figures of the 2011 census; consequently, in longitudinal section the sample weights of the chosen years are balanced.

of official data is the improvement of the quality of the self-assessment based responses provided in existing surveys, as well as the updating and rationalisation of survey questionnaires. Merging the individuals participating in the survey to a register containing the characteristics in question through a unique identifier is the most direct way of data use. In many cases, the linkage is established by providing the person's social security or the personal identification numbers or in some countries the combination of name, address, place and date of birth information.

At the European level, the extent of the practical utilisation of administrative data varies across countries and statistical institutions. Differences can be explained not only with legislative obstacles but, as will be shown later, certain cases raise some questions in terms of quality. In the latter case, two aspects should be carefully taken into consideration: timeliness and comparability. Timeliness issues arise because of the fact that the contents of the registers are released by data owners with a significant lag due to the time-consuming nature of the data processing practices that intends to ensure the internal consistency of the registers. In addition, the methodological changeover to the use of administrative data may affect comparability across time and definitions country by country, which should be carefully assessed by the national statistical offices envisaging an increased use of registers.

Countries compiling the EU-SILC survey can be divided into two groups: the groups of "register countries" and "survey countries". In the register countries, the use of external registers is more broad-based in designing and conducting the survey. Register countries typically comprise Scandinavian countries and Slovenia *(Table 1)*, where a single unique identifier is used to merge numerous registers. The countries using administrative data sources, however, exhibit differences based on the extent to which they draw upon such data sources. For instance, regarding income types, Denmark, Finland, Iceland, Ireland, the Netherlands, Norway, Slovenia, Sweden and Switzerland collect income data mostly from registers, while other countries can only utilise information on certain income components and/or certain sub-populations. For the most part, SILC countries rely on official data sources to substitute demographic and income variables. Typical registers also comprise data on education, labour market and housing market, but these are used in relatively few countries. Denmark, Slovenia, Iceland and Norway are the four countries where each type of register listed above is used to compile the SILC survey. Recently, the active implementation of income registers has been completed or is in progress in France, Latvia, Switzerland and Ireland, while Austria and Spain are in the implementation/assessment phase (*Di Meglio – Montaigne 2013*).

Table 1
Use of administrative data in Europe

Administrative data	Countries	Total (number)
Demographic/household data	BGR, BEL, DNK, EST, ESP, FIN, ITA, LVA, LTU, NLD, AUT, SWE, SVN, IZL, NOR	15
Education data	DNK, FIN, SVN, IZL, NOR	5
Labour data	BGR, DNK, NLD, SVN, IZL, NOR	6
Housing/dwelling data	DNK, AUT, GBR	3
Income data	BGR, BEL, CYP, DNK, EST, FIN, FRA, IRE, ITA, LTU, LVA, MLT, NLD, AUT, SWE, SVN, IZL, NOR, CHE	19
Electricity and water consumption	MLT	1
Not using administrative data	CZE, DEU, GRC, HUN, LUX, POL, POR, SVK	8

Note: The table uses the three-letter country codes (ISO alpha-3).
Source: Di Meglio – Montaigne (2013)

In the "survey countries", it is the legal environment that most often hinders the use of administrative data sources *(Table 2)*. In the EU-SILC context, legal infrastructures need to allow the linkage of register information to survey data, the dissemination of micro data to Eurostat,[5] as well as further dissemination to third parties (i.e. researchers). A precondition for using registers is the broad, public approval of their use, especially since respondents must be informed of the use of register contents during sample surveys. Confidentiality may be legislated, for example, through data protection laws or laws on the processing of personal data, which have a wider scope than the provisions governing statistics (*UN 2007*).

[5] As a Directorate General of the European Commission, Eurostat provides EU institutions with statistical data and harmonises statistical methodologies across the Members States and EFTA countries, as well as candidate countries. Its databases are available free of charge over the internet.

Table 2
Main reasons reported by countries for not using register data

Reason for not using register data	Countries	Total (number)
Registers are not available	CZE, DEU, POL, SVK	4
Legal issues that		
prevent access to these sources	DEU, HUN, POL	3
prevent linking of these sources	GRC, HUN, LUX, POL, PRT	5
prevent the dissemination of micro data from these sources	HUN, PRT	2
Quality and methodological issues	EST, GRC, LUX, PRT	4

Note: The table displays the three-letter country codes (ISO alpha-3).
Source: Di Meglio – Montaigne (2013)

In addition to legislative constraints, efficient data utilisation during the design or assessment of surveys is hampered by the lack or insufficient quality of registers. Countries facing qualitative and quantitative problems are Estonia, Greece, Luxembourg and Portugal. The most typical drawbacks are poor data quality and the substantial amount of missing information. Methodological differences in these countries are caused by the contents of the variables included in the surveys and in the registers and the difference between the observation units and the classification categories. Insufficient coverage also poses a challenge.

3.2. Methods applied in the Hungarian practice

In the second half of the 1990s, several studies were published on the validity of household statistics (*Révész 1995*; *Éltető – Havasi 1998*). The accuracy of the survey in terms of social/economic statistics was investigated compared to macroeconomic indicators in a wide range. Subsequently, due to the sampling procedure the survey provided a fairly accurate from a social perspective, but the bias of consumption and income representativeness remained an inherent feature of the survey. Numerous Hungarian studies have attempted to bridge the latter discrepancies.

Hosszú (*2011*) simultaneously uses the income and consumption data of the household survey in one (economic) framework. Although the author performed calculations on raw data without any correction, she notes that the quantile measures used to indicate income disparities (the ratio of the income of the ninetieth and tenth percentiles is [p90/p10]) were unreliable in the lowest and uppermost deciles due to the deficiencies of the survey, and for this reason, it is more prudent to compare the second and the ninth deciles in the longitudinal comparison, instead of the differences between the lowest and the uppermost income deciles.

Benczúr et. al (*2011*) and *Benczúr – Kátay – Kiss* (*2012*) attempt to ensure the representativity of the survey with respect to labour income by percentile matching. The essence of the method is to map, percentile by percentile, the wage incomes in the household budget survey to the individual tax returns data and then to adjust the wage incomes of the survey for the average wage of each percentile from PIT data. This approach produces similar results regarding the representativeness of the HBLS with respect to earnings as the multiple matching of survey information and individual tax return data. This procedure was also used on the dataset presented by *Benedek – Kiss* (*2011*).

Cserháti – Keresztély (*2010*) propose two kinds of imputation methods for achieving consistency between the data of household survey and macroeconomic statistics. In the case of compensation of employees, cost reimbursements and earnings from self-employment and agricultural production, using personal tax return data the authors creating cohorts according to three variables (income deciles, region and age), which are matched with the corresponding cohorts of the HBLS. The principle is similar as in the case with *Benczúr – Kátay – Kiss* (*2012*), with the difference that the applied cohort formation in their case covers more dimensions. Lastly, the authors adjust the number of employees and average income data of the corresponding groups in the HBLS to the group averages of the tax returns. The second imputation method proposed by the co-authors is reweighting (also referred to as recalibration). Using modified values included in the HBLS, they alter the original survey weights according to property income applying an iterative algorithm for a multivariable optimisation problem – for more detail on this method, see the studies by *Darroch – Ratcliff* (*1972*) and *Molnár* (*2005*). The advantage of this method is that HBLS data, which become available with a lag of one and half years, can be updated and forecasted with the method of reweighting. Because of timeliness, results included with the unchanged weighting may cause bias. As noted by Cserháti and Keresztély, the method can be combined with any other cohort formation criteria. The next section presents a data imputation based purely on such reweighting. The section also addresses the dilemmas arising during the reweighting procedure.

4. Reweighting the Household Budget Survey

The reweighting algorithm presented later in the study serves a dual purpose. On the one hand, it is desirable to have a detailed database that is representative from the view of income, in which consumption expenditures and incomes earned by households can be examined in conjunction. If only incomes are adjusted to the whole economy aggregates calculated from administrative data sources, consumption-income ratios will have a one-sided bias in the survey. At the same time, it is generally observed regarding household living condition surveys that

respondents tend to report more accurately on their expenditures and liabilities than on their incomes and material well-being. Being aware of these facts, the applied data cleansing methods are assumption-dependent. The other (parallel) objective of reweighting is the creation of a dataset that can be better utilised from the income side for labour market simulations and impact studies.

I reweighted the household budget survey in accordance with the number of persons in each cohort derived from external data sources. It is also possible to perform the reweighting according to total amount of compensation, but this approach has two disadvantages: on the one hand, the application of the selected method does not ensure the non-negativity of the new weights, and on the other hand, the number of persons in the groups created may differ significantly from what can be observed. In the case of recalibration according to the number of persons, the cohort averages will be close to the average values of the secondary data sources if the created groups split the database into sufficiently detailed subsamples. It is a disadvantage, however, that in the primary database few individuals can represent group(s) with a large sample size.

The design of the new weighting system is sequential. First, I reweight the number of recipients included in the HBLS with the group sizes created according to sex and age in the electronic annexes of the Central Administration of National Pension Insurance (*ONYF 2010*; *2015*) and then adjust the taxpayers participating in the survey to the group sizes of individual personal tax returns. Selecting timeliness is required because of the phenomenon of post-retirement employment, which is handled by the adjusted weights applied to the age groups of 60–65 and above.

One precondition for reproducing and disaggregating the macrodynamics is that the aggregates derived from the personal income tax return data be close to the published statistical data, or the sufficiently accurate representation of most inter-period changes by the sub-population included in the survey. In such cases, the temporal change computed from the difference between the two cross-sectional surveys is nearly equivalent to the change computed from the official macroeconomic indicators.

It is important to underline that reweighting is performed at the level of individuals; household-level weights are produced by averaging the weights. Meanwhile, it should also be noted that the reweighting algorithm affects only certain groups, which strongly depends on the groups that are formulated. For example, if the number of 35–45 year-old men earning (purely) a gross wage income of HUF 3–5 million per year in one of the reference years is identical in the survey and in the PIT database, they will be considered representative for the purposes of the analysis, and the original weights applied in the survey will remain unchanged. Obviously, the

weights will remain unchanged in the case of households composed of individuals who earn non-taxable income or non-pension type benefits.

4.1. Reweighting of recipients of pension on own right

In the case of recipients of pension benefits, the most promising external data source is the complete payment database of the National Directorate for Pension Disbursement (in Hungary: NYUFIG). However, information was unavailable for the years required for the analysis. The statistical yearbooks of the ONYF publish two-dimensional contingency tables only, and do not show at the individual level the number of different benefits paid for recipients. *Cserháti – Keresztély* (*2010*) simply assume that the marginal distributions of the frequency tables are independent, therefore the authors receive the joint distribution by the desired attributes as the product of the marginal distributions. They determine the joint distribution from the distribution of age groups of beneficiaries calculated from year of birth and of the average amounts of pensions by region. The control numbers of the reweighting presented in this study are from the tables of the number[6] of recipients in each sex and age group. Geographic matching is outside of the scope of this analysis. The list of variables in the HBLS typically includes benefits received on the recipient's own right (old-age pensions, disability annuities, survivors' or orphans' benefits). For this reason, from the annexes of the yearbooks I used the number of persons receiving full benefits[7] of the recipients entitled to pension on their own right.

4.2. Reweighting according to tax return data

The use of anonymous tax return data raises the need of harmonising the income variables of the two data sources. One disadvantage of using tax return data is that individual taxpayer income categories cannot be compared with incomes reported in the HBLS due to differences in definitions. The category of "other wage incomes" include several social insurance and social benefits (e.g. pregnancy and infant care benefit, child care benefit, jobseeker's benefit and health care allowances) that are treated as wage incomes in personal taxation but are unidentifiable. The identification of "other income from other than self-employment" in the HBLS (e.g. remuneration received by senior officers or elected office-holders, income paid for personal contribution) causes similar difficulties and inconsistencies, as it is unclear which income types are used by the respondents to report such items. The income types used for personal PIT data are therefore restricted to wage income, cost reimbursements, entrepreneur's withdrawals, representative taxpayers and income from agricultural production.

[6] Older age groups were defined uniformly both in PIT return data and in the statistics of the yearbooks (55–59, 60–64, 65–74 and 75+) in order to address the aforementioned phenomenon of post-retirement employment.

[7] In the case of pensions, instead of main benefits, I consider the column data of full benefits as the point of reference as recipients often are not aware of the supplementary benefits received; therefore, they are expected to report and include in their diaries the pension received in cash via postal delivery.

Compared to the group formation mentioned above, the classification described here is different both in terms of criteria and income collocation. To create a dataset that is best suited for the data requirement of a labour market microsimulation, I reweighted the household survey according to sex, age group, income group and number of taxable incomes using the information of personal tax returns. I formulated income groups in the datasets by income brackets rather than by commonly used quantiles (*Benczúr et al. 2011*; *Benczúr – Kátay – Kiss 2012*; *Cserháti – Keresztély 2010*).[8], [9] The advantage of this classification is that there is no need to reweight the entire household survey population according to income, as the right tail of the frequency distribution of tax return data is heavier than that of the income distribution deduced from the HBLS. Apart from these reasons, it is also important to consider the number of different income sources individuals might earn, because – due to the lack of this information – the reweighting would be biased since we would allocate such incomes to individual respondents that they did not actually receive.

4.3. Limitations of reweighting

The drawback of the reweighting exercise is that the baseline figures of the original, uncontrolled weights become biased. It should be stressed, however, that reweighting according to more criteria would be practically unfeasible, due to the sample size because the individuals participating in the survey are classified into more than 250 groups (around 8,000 households and 20,000 persons). The system of design weights, in line with the census data, is representative in terms of sex, age group, region, education, economic activity and number of children (*Éltető – Mihályffy 2002*; *Molnár 2005*). In the case of pensions, regional and demographic distributions are altered with a relatively minor error (10,000–20,000 recipients), due to the reweighting, and the number of persons comprising the retired population remains nearly unchanged after the imputation.

In the case of employees' earnings, the degree of the bias is substantial for two reasons. Firstly, this is because there are more taxpayers (weighted) in the household survey in each wave than the number of taxpayers registered in PIT return data. As a result, the application of the new weights reduces the number of taxpayers at the

[8] Annual income limits applied: HUF 0, 500,000, 1 million, 3 million, 5 million, 10 million, 15 million and 90 million. Personal tax return data reveal that there are few taxpayers with an annual income of more than HUF 90 million, and since we did not observe any in the household sample and since their behavioural responses may significantly differ from the responses given by other individuals, I did not modify the weights of the survey for this information.

[9] The implicit assumption of the resulting income classification is that the under-reporting of the survey's incomes is not general.

level of the whole economy,[10] and this result also affects the number of households in each income group. Nevertheless, the reweighting does not change the average number of households in the whole economy significantly. Another type of bias is caused by the phenomenon that not all (taxable) income categories are observed in the HBLS (for example, no individuals with more than three sources of taxable income are included in the survey, and thus these individuals are also left out of the aggregation). Furthermore, in the survey the initial weight remains unchanged for those individuals who did not have to submit a mandatory tax return in the given calendar year (mostly small agricultural producers, those who earn tax-free income or income(s) not subject to tax, as well as, wage earners with income from simplified employment below the tax return limit amount).[11]

5. Results

5.1. Income structure in individual quintiles (2015)

In the analysis, households were classified into groups based on their equivalent incomes (adjusted for household size). One reason for using (equivalent) incomes calculated on the basis of the equivalence scale is that some household-level expenditures increase in line with the number of household members (e.g. food consumption, clothing), whereas no such linearity can be observed in the case of other expenditures (e.g. housing). On the other hand, not only personal incomes determine personal well-being, which is affected by the income situation of the rest of the household members as they together constitute a single consumption unit. Instead of applying the traditional OECD equivalence scales (*OECD 1982*; *Hagenaars et al. 1994*), I used the square root of the number of household members – a practice that has become increasingly widespread in recent years.[12]

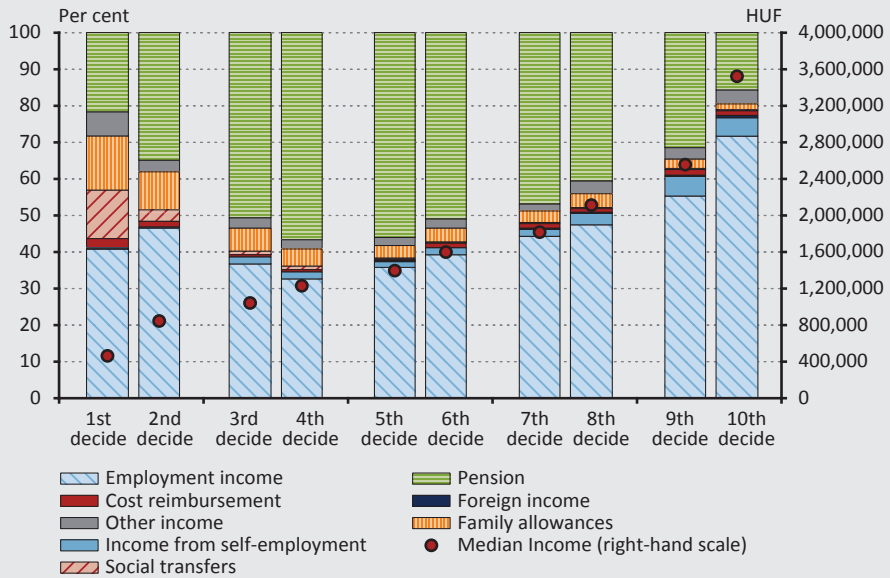
Income types comprising the bulk of the total income of the total population (labour incomes, pensions, social assistance and allowances) exhibit large differences in individual income quintiles *(Figure 1)*. In order to illustrate the marked differences observed at the tails of the income distribution, the income quintiles are decomposed into deciles in *Figure 1*. The income deciles clearly indicate that the income structure in the lowest and top two deciles differs significantly from that

[10] The 2015 survey identified nearly 1,150,000 more taxpayers than the external tax return data. In practical terms, it is a methodological issue as to whether the reweighting of the individuals in the lowest income categories (earning the minimum wage or less) is reasonable as the number of wage earners considerably exceeds the number of persons registered in the tax return data. During the procedure, no dedicated correction was applied in adjustment of PIT data. However, the technique is sufficiently flexible to accommodate such considerations. For example, *Benczúr – Kátay – Kiss* (*2012*: *9*) do not apply any wage correction steps in the three lowest income deciles.

[11] For the mathematical background of the reweighting and for the impact of the applied methodology on the weighting system and on income distribution, see sub-sections F.1 and F.2 of the Annex.

[12] For more detail on the scale thus defined, see, for example *OECD* (*2011*); *OECD* (*2008*), or the studies by *Cseres-Gergely et al.* (*2016*: *909*) on the HBLS dataset. The impact of the application of the scale is discussed in the study by *Éltető – Havasi* (*2002*).

Figure 1
Income structure in 2015 in households' equivalent income quintiles/deciles



Note: Other income includes: income from agricultural production, income from intellectual property, income from service contracts, tips, scholarships, payments from insurance transactions, balance of voluntary funds, interest received, dividend, capital gains, gift/consumption from own production, child support received, tax allowances, in-kind benefits, the total income of children under 16 and other income not identified or reported elsewhere. It is important to emphasise that a negligible number of respondents provide information on financial assets in the survey; consequently, this item is not discussed in the sub-sections presenting the results of the analysis.

Source: Calculated from data in the 2015 wave of the HBLS (HCSO 2016)

of the deciles representing the middle class (the finer the scale, e.g. it is divided into vigintiles [20 equivalent groups] or percentiles [100 equivalent groups], the greater the inequality between the bottom and the top of the distribution). Among households' current incomes, income from wealth is typically under-reported in the survey. This category includes profits/returns from property rents and from the holding of financial instruments. Since this information is not available from external micro databases and disaggregated statistical statements, these categories are not reviewed during the analysis even though they represent a sizable source of income within the revenues of Hungarian households.

In 2015, roughly half of the income earned by the lowest income group is labour income[13] and social benefits (pensions, social assistance and allowances). The share of pension-type benefits increases up until the third quintile (6th decile), with a decline in the rest of the income categories. This can be primarily attributed to

[13] Earnings from temporary work were also classified into the group of wage incomes.

household size: small-size pensioner households are classified into the middle quintiles (deciles) based on net income per consumption unit. Entrepreneur's income represents a larger share in the upper income quintiles. Labour income is the most dominant income category among households classified into the fifth quintile (including income from work and/or self-employment and the related cost reimbursement contributions), while non-pension type public transfers practically disappear from the income sources of the uppermost deciles. Typically, incomes from abroad are insufficiently observable in the survey because, on the one hand, these households cannot be reached at the place of domestic residence as they are located abroad at the time of the survey and, on the other hand, in many cases the persons reporting on the gross/net income of household members do not have comprehensive information due to the differences in taxation.

The right-hand axis of *Figure 1* presents the scaling of the median equivalent incomes of each quintile. The net disposable income of the lowest quintile is HUF 450,000 (per consumption unit), while households in the top decile earned HUF 3,550,000 per consumption unit in 2015. The median income of the middle quintiles amounted to HUF 1,490,000. Accordingly, incomes are distributed asymmetrically between the lowest quintile and the median earner (p50/p10: 3.05) and between the median earner and the top quintile (p90/p50: 2.53).

5.2. Decomposition of the difference between real incomes (2010–2015)

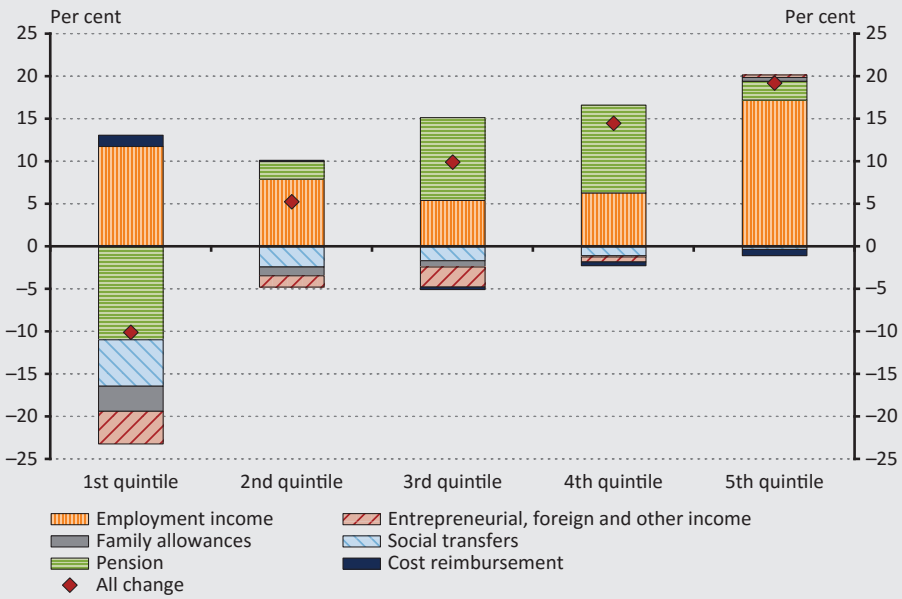
5.2.1. Perceived inflation – real earned income

In order to obtain the most accurate picture of the well-being of Hungarian households, the earnings of the income quintiles were deflated by the perceived inflation of the quintiles. The perceived inflation[14] of individual quintiles is defined as the price change weighted with households' own consumption structure. The distribution of perceived inflation by quintile exhibits a peculiar duality in 2015: while the lower income quintiles may have perceived a minor degree of inflation (+0; 0.1%) in the indicator calculated from the representative basket, the topmost income quintiles still perceived a similarly negligible decline in the price level (–0.4; –0.5%). In a low-inflation environment, the differences in the perceived inflation of individual income groups tend to decrease. Compared to the price levels observed in 2010, perceived inflation ranged between 9.3 and 10 per cent by income quintile in the period under review.[15]

[14] The annual price indices of products and services in the consumption basket are published in the information database of the Hungarian Central Statistical Office. See: http://statinfo.ksh.hu/Statinfo/haDetails.jsp?query=kshquery&lang=hu.

[15] The divergence observed in 2015 can be mainly attributed to the decline in fuel prices. Between 2010 and 2015, cumulated perceived information changed as follows in individual quintiles: 1st quintile: 9.5; 2nd quintile: 10; 3rd quintile: 9.8; 4th quintile: 9.5 and 5th quintile: 9.3 per cent, respectively.

Figure 2
Decomposition of real income differences into equivalent income quintiles between 2010 and 2015



Source: Calculated from HBLS data for 2010 and 2015 (HCSO 2011; 2016)

Figure 2 shows a decomposition of the real income differences of individual quintiles into six different categories. As for their low share, entrepreneur's income, income from abroad and other income constitute one category in the chart. With respect to *Figure 2*, note that the columns indicate the differences between total compensations; in other words, the chart illustrates the combined effects of the differences between the number of individuals and income levels. In addition, it should be emphasised that the income flows between the income groups cannot be observed over time since, due to the rotated panel[16] nature of the survey, respondents cannot be traced over this time horizon, which renders the interpretation of the results fairly cumbersome. Thus, for example, with respect to the disability pension of the bottom income quintile in 2010, pension income may change because the person in that group receives a lower amount of (rehabilitation) benefit, or he becomes an old-age pensioner during the six years of the examination period, which entitles him to a higher amount of benefit (old-age pension). Similarly, the number of persons in the group may decline if the person in question loses his

[16] The term indicates that one third of the respondents is replaced every year; therefore, two thirds of the diary-keeper households are the same from year to year. Another consequence of this rotation is the replacement of the total sample every three years.

benefit, or the number of retirees in the quintile may also decrease if the person is classified into a higher income bracket due to a change in his income position and/or household conditions (e.g. he forms a household with a higher-income individual). Changes in these numbers, therefore, affect average benefit levels. Overall, when comparing the results of equivalent household incomes from cross-sectional data (in 2010 and 2015) it is important to keep in mind that the absolute changes in structure, in flow, and within individual groups can occur simultaneously, and these cannot be separated from one another.

The equivalent household income of the lowest income quintile fell by 10 per cent in 2015 compared to the reference year 2010, while material well-being gradually improved in the rest of the quintiles in each group between 2010 and 2015. The drop in the income of the lowest quintile reflects a peculiar restructuring progress. The social benefits of this income group were reduced, while the compensation of employees gradually increased. The increment (positive difference) observed in labour incomes was more or less offset by the decline in pension-type benefits, while there was a concurrent decline in social benefits that are considered as a typical source of income in this quintile. From the second income quintile to the fifth quintile, in 2015 both pension benefits and salaries increased in real terms compared to the income situation observed in 2010 *(Figure 3)*. For easier interpretation, it is worth decomposing the differences further in accordance with changes in number[17] and wages *(Table 3)*.

Table 3
Decomposition of the cross-sectional differences between real labour incomes in 2010 and 2015 by income quintile

Income groups	Number of employees	Change in real wages	Change in the real wage bill
1st quintile	19%	19%	42%
2nd quintile	18%	9%	28%
3rd quintile	4%	11%	15%
4th quintile	–1%	15%	14%
5th quintile	5%	23%	29%
Aggregated change	8.9%	15.3%	25.4%

Note: The values of the table indicate absolute changes; in other words, they do not reflect contributions expressed in proportion to all changes (Cf. Figure 3: in 2010, the labour incomes of the lowest income quintile accounted for 28.6 per cent of the group's total household income. Thus, the 42 per cent increase in total real compensation indicated in the table contributed to the changes affecting households between 2010 and 2015 by 12 per cent (rounded value) on Figure 3.

Source: Calculated from HBLS data for 2010 and 2015 (HCSO 2011; 2016).

[17] There were numerous income tax related changes in legislation during the period that had a positive effect on (long-term) employment. The results are discussed in the occasional paper of *Szoboszlai et al.* (*2018*).

The comparison of cross-sectional data suggests a double-digit expansion in the number of employees in the period under review. The difference between employment in the lowest two quintiles amounted to almost 20 per cent in the review period, whereas the corresponding value is fairly small in the third and fifth quintiles. Based on the results of the two reweighted samples, the number of employees does not show any difference in the fourth quintile. The employment rates of the lowest quintiles can be attributed to a base effect and to the economic upswing in the period. During the recovery, a large number of employees returned to the domestic labour market in the lowest quintiles, and employment numbers were also boosted by the job protection action plan and the public work programme. The majority of employees in the middle and upper income group retained their jobs (the changes measured may have been also influenced by flows between the groups). Changes in net real wages show a significant degree of volatility in between the two examined years. Net wages were significantly influenced by the comprehensive personal income tax reform implemented during the period, but this paper is not intended to analyse the distribution and behavioural effects of the relevant tax law changes. The real wages of the lowest quintile are up 19 percentage points in the 2015 survey compared to the reference year, which is only surpassed by the wage difference observed in the top income quintile. From the second quintile to the fifth, real wages rose gradually in comparison to the wages of the groups formed in 2010. The increase in the number of employees aggregated in each quintile amounted to 8.9 per cent (with a 1 decimal place accuracy), while the average increase in net real wages was 15.3 per cent – these values deviate from the officially published national economy indicators by a few decimals (9% and 15.5%, respectively), which validates the efficiency of the reweighting algorithm.

5.2.2. Changes in real pensions

Before assessing the results, once again it should be stressed that we compare the group values of two cross-sectional samples, and also in view of the consequences discussed at the beginning of the section, we cannot draw longitudinal conclusions from this comparison (see above in the previous sub-section). In the case of pension-type benefits as well, reweighting is hampered by the absence of a micro database similar to the dataset of personal income tax returns at the time of the analysis; thus the two-dimensional reweighting practice (sex, age) does not offer a comprehensive solution to ensure the representativity of pensions from income perspective. It poses a special challenge that the pension system underwent large-scale changes during the period under review with numerous effects on the well-being of pension households regarding both direction and volume. Therefore, during the assessment we only formulate intuitions; drawing sound inference, however, would require panel data and simulation exercises.

The clustering of pension beneficiaries around median households observed in 2015 in each income groups relative to the reference year may stem from the

combination of the year-by-year group formation mentioned at the beginning of the sector and changes in legislation, as well. The difference in total pensions of the bottom quintile may reflect that the households concerned have moved into higher income quintile(s) as a result of the pension increases of the recent years, which reduced the number of pensioners in the lowest quintile (and/or the average benefit amount), while total pensions grew in the higher income categories compared to the pensions observed in the corresponding categories in 2010. On the other hand, the tightening of pension laws (reintegration of persons with a reduced capacity to work, increasing the retirement age) may have also triggered a decline in the lowest income quintile. Average real pensions are higher in the top income quintile calculated from the data of the 2015 survey than in the reference group of 2010, even though the number of pensioners was lower in the recalibrated survey of that year. This perception may be the combined result of several phenomena. Firstly, it may result from the aforementioned grouping, which may exert a crowding-out effect in case of the top quintile as labour incomes and entrepreneur's incomes may have increased at a faster pace than real pensions in this income class. The second effect may stem from the retirement attitudes of households with higher education, which may have been affected by the staggered retirement age and the early retirement of women (after 40 years at work). According to the survey data, nationwide average pensions were raised by 7 per cent in real terms in the period 2010–2015, while the number of retirees remained nearly unchanged. Note that the number of retirees remained constant while significant realignment was observed between the two years.

5.2.3. Changes in social benefits

Assistance-type benefits are not re-examined at the individual level. At the household level, however, if a household member received a taxable income or pension benefits and his personal weight was recalibrated due to the change in the household's weight by averaging the personal weights, these sources of income will be also affected by the reweighting process. The lower level values of social transfers in 2015 may mainly reflect the effects of legislative changes. In the period 2010–2015, the wage replacement allowance was eliminated, entitlement to the jobseeker's benefit was tightened, and the benefit amount and period of disbursement were both reduced.[18] The job search aid was phased out in 2011. In real terms, linking family allowances[19] to the minimum pension reduced the

[18] As regards the jobseeker's benefit, after the changes jobseekers are entitled to 1 aid day after 10 working days (previously this ratio was 5:1); the disbursement period was reduced to 30 days from 91 days, the benefit amount was capped at 100 per cent of the minimum wage compared to the previously applied 120 per cent, while the minimum amount of the benefit (which was previously 60 per cent of the minimum wage) was eliminated. The tightening of unemployment benefits also encouraged employment within these groups. For quantitative findings, see the study by *Benczúr et al.* (*2011*).

[19] The amount of the childcare and child bearing allowance is 100 per cent of the minimum pension. The base amount of the care allowance is 80–100–130 per cent of the minimum pension per category, whereas the maternity allowance amounts to 225 per cent of the minimum pension. The amount of the family allowance remained unchanged during the period.

purchasing value of these allowances. Changes in these income items mainly affected the well-being of the lower quintiles as such benefits represent a low share in the income structure of the middle and upper income groups.

6. Summary

In recent years, demand has increased for supplementing the macro aggregates capturing the well-being of households with distribution characteristics. Such detailed statistics cannot be compiled without the availability of individual-level data. However, since the available household survey cannot be considered unbiased in terms of income, conclusions drawn from the raw data of the survey may be incorrect. This study is intended to remedy this deficiency with an alternative solution (by recalibrating the weighting system of the survey), given that direct linkages to income tax data are prevented by legislative obstacles. The applied group formation and the two-step reweighting algorithm is unique to this survey data. The number of recipients used for the purposes of the calibration derives from personal income tax returns and from the pension tables, which renders the database representative in this regard. Moreover, with the grouping method which is employed income data are sufficiently close to the values observed in macroeconomic statistics. Household incomes can be traced with the assistance of the resulting unique dataset, and the reweighted dataset may form the initial database of labour market microsimulations. It is worth mentioning that additional disaggregated-level conclusions can be drawn along the lines of the variables used for setting up the new weighting system (age, sex, taxpayer and pension incomes) and along the lines of those characteristics that were used to design the weights of the original dataset and remained unbiased after the application of the procedure (e.g. regional distribution of pension incomes).

For the purposes of the analysis, households were taken into account according to equivalent income. Based on the calculations performed on the database, the employment increase recorded in the period 2010–2015 reflects a peculiar duality in individual income quintiles. The bulk of the aggregate increase resulted from a nearly 20 percentage point increase (difference) in the number of recipients in the two lowest quintiles. The number of employees was up 5 per cent on average in the third in fifth quintiles compared to the base year of 2010, whereas it remained nearly unchanged in the fourth quintile in comparison to the base year. The variability of wage dynamics across the income quintiles is similar to the changes in the number of employees, which may also be related to taxation, wage setting and other remuneration decisions. The greatest (approximately 20%) real wage increase was observed in the lowest and the top quintile; in the middle quintiles a real wage increment of 9–11–15 per cent was identified respectively from the second quintile to the fourth quintile. Similar statements cannot be made with respect to social benefits, as the representativeness of pensions is ensured in

terms of sex and age, and transfer incomes were not adjusted. Presumably, the decline observed in total pensions in the lowest income quintile compared to the corresponding group in the 2010 survey may be the combined result of numerous measures and other (composition, sampling, group formation) effects; however, more detailed data and a different analysis tool would be required for the relevant analysis. Jobseeker's benefits and family allowances showed a general decline – the former mainly because of legislative changes, the latter because of being linked to the minimum pension – measured at constant prices in the appropriate groups of the two survey years.

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Annex

F.1. Mathematical background of the reweighting

The individual characteristics of the survey contained by vector x_i with a weighting system of s_i. The programming task is to approximate the product amount thus received to the values of the actual (sub)-aggregates (*Deville – Särndal 1992*; *Creedy 2003*; *Pacifico 2014*). In our case, we approximate the weighted recipient number data of the individuals ($\hat{t}$)

$$\hat{t} = \sum_{i=1}^{N} s_i \cdot x_i \tag{1}$$

across the group-level cohorts to the recipient numbers (t) come from personal income tax returns and from the ONYF yearbooks.

$$t = \sum_{i=1}^{N} w_i \cdot x_i \tag{2}$$

The conditional optimisation problem: to minimise the differences (distance) between the newly calibrated weights (w_i) and the design weights of the survey with the condition that cohort sizes are as close to the control numbers derived from external data sources as possible (t_k).

$$\mathcal{L} = \sum_{i=1}^{N} G(s_i, w_i) + \sum_{k=1}^{K} \lambda_k \cdot \left[t_k - \sum_{i=1}^{N} w_i \cdot x_{ik} \right] \tag{3}$$

λ_k indicates the Lagrange multiplier in the primary conditions. For the differences ($G(s,w)$) I chose the chi-squared distance function, which defines the squared differences relative to the original weights. The advantage of the selected distance function is that it has an explicit[20] solution in the minimisation problem.

$$G(s_i, w_i) = \frac{1}{2} \cdot \sum_{i=1}^{N} \frac{(w_i - s_i)^2}{s_i} \tag{4}$$

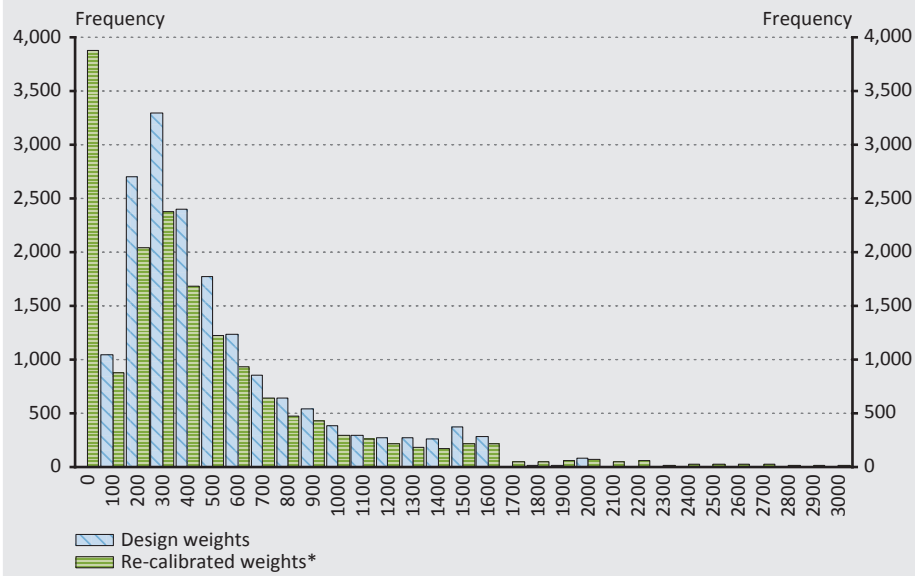
Since the optimisation procedure will be solved on the set of real numbers, depending on use, the final weights received during the calibration should be rounded up to whole numbers.

[20] During the programming task(s), most distance functions are received in an iterative way from this functional form. Explicit solutions, in conjunction with these function types, are convergence dependent (*Deville – Särndal 1992*; *Pacifico 2014*).

F.2. Effects of the reweighting

As shown on *Figure 3*, the initial weights are dispersed in a tighter range [180; 2,100] than the value set of the new weighting (0; 8,000]. Income groups that are over-represented in the HBLS take lower weight values, while groups with a low (weighted) number of observations represent a larger population with higher weights. Apart from weight values close to zero, it is clearly visible that the area[21] below the frequency distribution of the original weights is larger than the area marked by the distribution received after the application of the new weights. This is the consequence of the constraint mentioned in *sub-section 4.3.*, namely, that the aggregate number of employees decreases at the level of the national economy due to the reweighting. It is also striking that the occurrence of recalibrated weights above 5,000 is rare, representing employees that are captured with low number in the HBLS, but relatively frequent in tax returns.

Figure 3
Changes in the weighting system of the household survey as a result of the reweighting



**Note: Although the reweighting also produced weights above 3,000, these are not presented for interpretation reasons.*

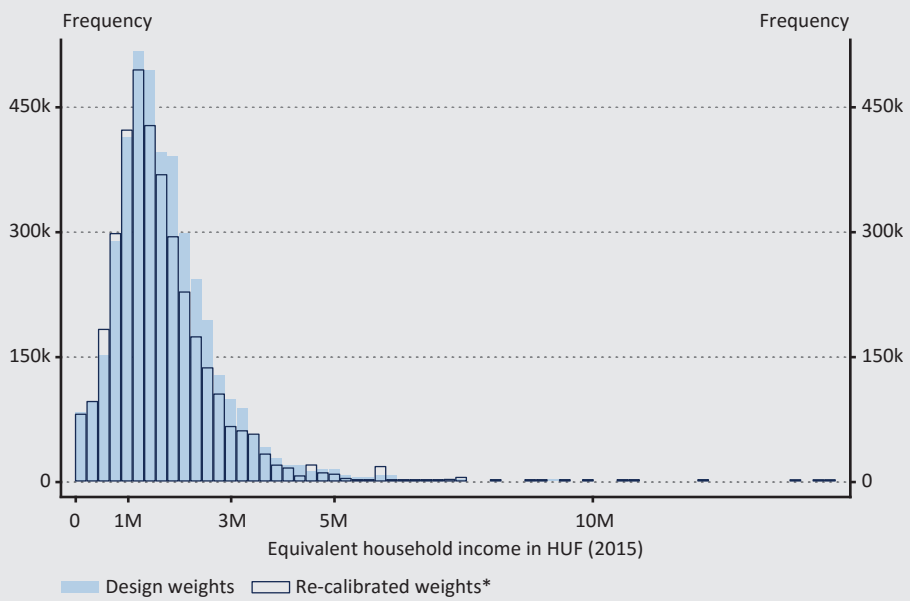
Source: Calculated from HBLS data for 2015 (HCSO 2016)

Figure 4 illustrates the effect of the reweighting exercise on the income distribution of households. It can be seen that the area below the curve of the frequency

[21] The area can be approximated fairly well with the size of the integrals below the kernel density function.

distribution decreases, owing to the fact that the HBLS includes more taxpayers in the HUF 1 million and HUF 3 million income brackets than registered in the data of personal income tax returns. Another notable difference is that taxpayer households are under-represented in the brackets above the HUF 5 million equivalent annual household incomes if household incomes are aggregated by using the original weights. Overall, the distribution is "compressed" due to the recalibration, which reduces the average and median values, as well as the standard deviation of the income groups.

Figure 4
Effect of the reweighting on the equivalent income of respondent households in 2015



Source: Calculated from data in the 2015 wave of the HBLS (HCSO 2016)

The Link between Corporate Social Responsibility and Financial Performance in the Hungarian Banking Sector in the Years Following the Global Crisis*

Nikolett Deutsch – Éva Pintér

The hectic economic changes in the past decade and the subsequent regulatory tightening have had a substantial negative impact on the operation of banking service providers. These providers have sought to arrest the decline in their profitability, to re-establish trust with their customers and to reinforce their competitive position with tools that presented banks as institutions which promote corporate social responsibility on the financial and capital markets, involving concepts such as responsible banking, green banking and ethical banking. However, the true extent of this rapid response focusing on corporate social responsibility and its effect on banks' long-term performance are difficult to measure. This study explores the assessment and measurement methodologies pertaining to the financial sector, and examines a sample of seven dominant market participants in the Hungarian banking sector to determine the relationship between banks' corporate social responsibility, its integration into operating activities and banks' financial performance in 2006–2013.

Journal of Economic Literature (JEL) codes: G00, G20, G21, G30

Keywords: corporate social performance (CSP), corporate financial performance (CFP), banking sector, Scholtens CSP

1. Motivating forces behind corporate social responsibility in the banking sector

The concept and practical implementation of corporate social responsibility (CSR) has been studied closely in recent decades, from both a theoretical and a practical perspective. The topic has also affected various areas and disciplines in economics.

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

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The paper was supported by the ÚNKP–17–4 New National Excellence Programme of the Ministry of Human Capacities.

The Hungarian manuscript was received on 6 February 2017.

DOI: http://doi.org/10.25201/FER.17.2.124145

One only need think of the discussion on the orientation of value creation within organisations, which is mainly linked to strategic management, the renaissance of the stakeholder theory (e.g. *Rappaport 2006*; *Porter – Kramer 2011*; *Ackermann – Eden 2011*), the focus on the "good management theory" (*Brammer – Pavelin 2006*), the approaches of sustainable development emphasising corporate social responsibility (*Deutsch 2011*), business ethics research on corporate social responsibility and accountability (*Joyner – Payne 2002*), social marketing (*Kotler – Lee 2004*), the business model innovation research increasingly popular in the innovation literature (*Schaltegger et al. 2012*) or the expanding toolset for assessing and managing organisations' CSR activities. When arguing for the promotion of CSR activities, the literature usually points to the strengthening of organisations' reputation and image (e.g. *Marom 2006*), rising customer loyalty and confidence (*Mohr et al. 2001*), the reduction of business risk and thus also the cost of capital (*Bassen et al. 2006*), the utilisation of the growth opportunities towards new products, services or markets (e.g. *Sen – Bhattacharya 2001*), and attracting and retaining skilled workers (*Greening – Turban 2000*). While CSR analyses and the research on the impact of corporate social performance (CSP) on corporate financial performance (CFP) usually focus on large production companies and service providers (*Orlitzky 2011*; *Lu et al. 2014*), the overwhelming majority of sector-specific studies concentrate on the banking and financial sectors. In Hungary, many papers have been written with a focus on international comparison (e.g. *Lentner et al. 2015*), examining the regulatory tightening in the wake of the financial crisis (*Borzán et al. 2011*) and the responsibility of regulators and auditors (*Lentner et al. 2010*).

This is because in recent decades the rising significance of corporate social responsibility reports (*Vigano – Nicolai 2009*), the provision of responsible banking products (*Scholtens 2008*), the spread of sponsorship and donation activities and CSR spending (*Truscott et al. 2009*), i.e. the overall increase in CSR activities was observed in the banking sector. This is primarily a part of the response to the tightening of the regulations on banks' operation and the loss of confidence in the financial and capital markets attributable to the 2008 crisis, as the financial crisis highlighted banks' operational and regulatory shortcomings. Another consequence of this is that the Basel Committee required European banks to introduce the Basel III principles and ratios step by step in 2012–2019 to manage systemic risks. The paper by *Härle et al.* (*2010*) assumed a 1.5–4-per cent drop in European banks' profitability in the long run as a consequence of the implementation of the Basel capital requirements (raising the capital adequacy ratio to 9 per cent). Furthermore, during the crisis, banks also had to face the lack of confidence in financial institutions. They had to show that they act responsibly towards their customers, even at the social level, while also keeping an eye on the safety of depositors. In order to reinforce confidence and retain customers, banks published CSR reports to supplement and substantiate the implementation of regulatory requirements.

Mcllroy (*2008*) argues that corporate social responsibility also protects banks from incorporating all risks into their financial products, and increases the transparency of the risks of financial products. The financial management of banks, just like other entities, aims to ensure profitability and profits. However, in the banking system this goal has to be achieved under special regulations on operating activities (*Basel standards, the Hungarian Act CCXXXVII of 2013 on Credit Institutions and Financial Enterprises*), while complying with three basic requirements, i.e. liquidity, solvency and prudent operation. This means that banks must generate returns while ensuring the safety of their customers in the long run, i.e. capital must provide adequate coverage for potential losses. Moreover, banks always have to hold enough funds to ensure smooth operation in the short run.

As regulation became increasingly rigorous, CSR has become a catchword among bankers, exerting a huge influence over society (*Scholtens 2008*). Its prominence was mainly motivated by the fact that from the perspective of banks' operating activities, risk and reputation are very important, which depend strongly on the perception by and relationship with customers (*McDonald-Lai 2011*). This relationship is built on trust, which must be strengthened (*Flavian et al. 2005*; *Pérez et al. 2013*). Improving stakeholder relations (*Chomvilailuk – Butcher 2013*) and perceptible environmental visibility can not only result in better reputation, but may also provide a competitive edge by reducing operating costs and risks (*Yeung 2011*), and it may also attract potential new investors and open up new markets (*Tschopp 2012*; *Tran 2014*). These motivating factors together imply that enhancing banks' social performance also exerts a positive effect on their financial results.

This paper examines the relationship between banks' financial and social performance. In order explore this, the study reviews the models used in the sector-independent and bank-specific literature for measuring social performance (CSP) and financial performance (CFP) and the assessment of the link between the two performance indicators as well as the models' main conclusions. Then it turns to presenting the results of the regression analysis performed on a sample of seven banks operating as limited companies and controlling a dominant share of the Hungarian market in 2006–2013.

2. Examination of the link between social and financial performance in the banking sector

The analysis of corporate social responsibility and financial performance has been the subject of several empirical and normative studies in recent decades. However, as shown by the meta-analysis studies summarising the results of individual papers (e.g. *Griffin – Mahon 1997*; *Orlitzky et al. 2003*; *Deckop et al. 2006*; *Beurden – Gössling 2008*; *Orlitzky 2011*; *Lu et al. 2014*), the relevant literature does

not provide a clear-cut answer regarding the nature of the relationship between social and financial performance, since there are examples of positive, negative and mixed links. In fact, some studies were unable to identify a significant connection between the two types of performance. *Ruf et al.* (*2001*), *Brammer – Millington* (*2008*) and *Lee et al.* (*2009*) argue that these conflicting results are attributable to both theoretical and methodological factors. The authors cite reasons such as the shortcomings of the theories on corporate social responsibility, the different considerations and methods of picking the factors determining social and financial performance, the lack of systematic, generally accepted methods for measuring social performance, the expectations regarding the CSP–CFP relationship based on different theories and methodological issues related to the examination of the CSP–CFP relationship.

Perhaps the greatest problem is that, as suggested by *Griffin* (*2000*), both CSP and CFP are so-called meta-constructs, and their definition is subject to a high degree of subjectivity, reflecting the different views of the individual authors and the theoretical approaches (stakeholder theory, institutional theory, neo-institutional theory) pursued by them. Despite the close attention devoted to CSR, there is still no generally accepted definition for it, or a consistent typology of the related activities and particulars. As a result, corporate social performance is measured using various methods. As the analysis of the studies on the CSP–CFP relationship reveals, *Orlitzky et al.* (*2003*), *Deckop et al.* (*2006*), *Beurden and Gössling* (*2008*), *Orlitzky* (*2011*) and *Lu et al.* (*2014*) all conclude that one of the most widely used methods for establishing social performance is based on the social and ethical ratings and reputation indices of the organisations under review. In the overwhelming majority of the papers, the CSP variable is calculated for the organisations under review based on the Dow Jones Sustainability Index, the FTSE4Good Index, the Ethibel Sustainability Index, the KLD,[1] the CRA,[2] the CSRHub[3] or the Asset4esg[4] indices. In a separate group of studies, CSP is determined based on the individual assessment or rating of the annual CSR or sustainability reports published by the organisations under review, where the CSP value is established using the distribution of economic value, CSR expenditure, environmental spending or sponsorship and donation outlays, or using a survey composed of unique factors. However, the use of the methodologies taking into account these different stakeholder groups, factors and indicators not only makes it difficult to compare the results and conclusions of the individual studies, but also entails the risk that the social performance of the organisations may be reflected in different, and even conflicting, values. In a similar but less complicated manner, corporate financial performance can be

[1] CSR index developed by KLD Research & Analytics
[2] CSR index developed in line with the Community Reinvestment Act
[3] CSR rating developed by ACSRHub.com
[4] CSR index developed by Thomson Reuters

measured using a variety of variables. There are approaches using market measures taking into consideration the effect exerted on companies' performance by market assumptions arising from CSR activities (e.g. Tobin's q, stock prices) and accounting indicators reflecting actual performance (e.g. ROA, ROE, EPS). In some studies, CFP is determined based on the results of the surveys conducted among the members of an organisation (*Orlitzky et al. 2003*; *Deckop et al. 2006*; *Beurden – Gössling 2008*; *Orlitzky 2011*; *Lu et al. 2014*).

Most authors examine the relationship between social and financial performance with a linear regression model, which can be geared towards the analysis of the effect of CSP on CFP or vice versa, but there are also regression systems taking into account the issue of a two-way impact (*Deckop et al. 2006*; *Beurden – Gössling 2008*; *Orlitzky 2011*; *Lu et al. 2014*). Yet ordinary linear regression models (OLS) are often criticised, on theoretical and practical claims that the CSP–CFP relationship is described much better by a curve than by a straight line (*Barnett – Salomon 2006*), and that the issue of endogeneity must be taken into account in examining the link between CSP and CFP, due to the so-called good management theory and the so-called resource slack theory (*Waddock – Graves 1997*; *Schreck 2011*). In the literature, the endogeneity attributable to simultaneity and the omitted variables are usually managed by two-step linear regression models and the Granger causality test (*Schreck 2011*; *Lu et al. 2014*). Of course, most regression models examining the CSP–CFP relationship also incorporate control variables. Based on the studies conducting meta-analysis (*Orlitzky et al. 2003; Deckop et al. 2006*; *Beurden – Gössling 2008*; *Orlitzky 2011*; *Lu et al. 2014*), such control variables include firm size, the sector and its special features, the ownership structure, the capital structure, leverage, risk, R&D intensity and advertising spending. Meanwhile, in the papers with an international comparison, control variables reflecting the local external environmental and macroeconomic factors, such as GDP growth, inflation or population size, are also used. The literature also cautions that when taking into account the special features of industries, companies, and national economies, CSP, CFP and the effects behind the relationship between them may appear through impact mechanisms and to extents that vary across sectors, companies and countries.

The assumptions and results of the examination of the link between corporate social responsibility and financial performance within the banking and the financial sector are also diverse. For measuring banks' CFP, the vast majority of the literature uses accounting indicators, such as return on equity (e.g. *Soana 2011*; *Mozghovyi – Ratnykova 2011*; *Islam 2012*; *Marcia et al. 2013*; *Ofori et al. 2014*), return on assets (e.g. *Soana 2011*; *Mozghovyi – Ratnykova 2011*; *Ahmed et al. 2012*; *Islam 2012*; *Marcia et al. 2013*; *Jo et al. 2014*; *Ofori et al. 2014*), net profits (e.g. *Mozghovyi – Ratnykova 2011*; *Okwemba et al. 2014*; *Malik – Nadeem 2014*), net interest income (*Wu – Shen 2013*) or the NPL ratio (*Wu – Shen 2013*;

Simpson – Kohers 2002), and there are also examples for using market indicators (*Saxena – Kohli 2012*; *Carnevale – Mazzuca 2014*; *Ahmed et al. 2012*). Major differences can be seen with respect to measuring banks' social performance. As it has already been suggested in connection with the general CSP–CFP research, even in the case of these sector-specific assessments, one frequent method of gauging social performance is to use the CSR or ethical indices published by rating agencies (e.g. KLD, CRA, ESI,[5] EIRIS,[6] Asset4esg) (*Simpson – Kohers 2002*; *Soana 2011*; *Saxena – Kohli 2012*). Nevertheless, many studies attempt to develop their own CSP indicators (*Pérez et al. 2013*; *Wu – Shen 2013*; *Mallin et al. 2014*), examine CSR reports (*Rogošić 2014*; *Okwemba et al. 2014*), measure environmental and CSR spending (*Mozghovyi – Ratnykova 2011*; *Okwemba et al. 2014*; *Omoro et al. 2014*; *Jo et al. 2014*), or determine the performance based on a survey conducted among customers or an organisation's members (*Islam 2012*; *Ahmed et al. 2012*; *Raihan et al. 2015*; *Malik – Nadeem 2014*; *Ofori et al. 2014*; *Fatma et al. 2014*). Among the CSP measurement practices, the framework that deserves special mention was developed by *Scholtens* (*2008*) in order to eliminate the shortcomings of ethical and CSR indices and surveys and the lack of consistency among them (attributable to the use of different factors, stakeholder groups and indicators), specifically geared towards measuring banks' social performance in a transparent manner. The use of Scholtens's framework can be increasingly observed in studies (see *Relano – Paulet 2012*; *Laidroo – Sokolova 2015*), mainly because this method enables the uniform comparison of the social performance of banks that are not included in CSR or ethical rating databases, since in such cases CSP is determined based on publicly available bank data. As shown in *Table 1*, Scholtens's CSP indicator consists of 5 criteria and 32 indicators in total, taking into account the international recommendations and principles pertaining to the assessment of banks' and financial organisations' CSR activities. However, one of its drawbacks is that its assessment criteria are difficult to reconcile with the social, environmental, employee, community, governance or economic categories of CSR indices and ratings. Moreover, the evaluation of the indicators with 0 or 1 is unable to capture the slight differences between banks' performance, or extra performance within the individual categories.

[5] Environmental Sustainability Index
[6] The CSR index developed by EIRIS (Ethical Investment Research Services)

Table 1
Scholtens's framework for measuring banks' social performance

Main indicators	Sub-criteria	Description
I. Business ethics, sustainability reports	1. Sustainability report	0: Does not have a CSR report, 1: Has a CSR report
	2. Supporting ICC Business Charter for Sustainable Development	0: Not an ICC signatory, 1: ICC signatory
	3. UNEP FI	0: Not adopted, 1: Adopted
	4. Equator Principles	0: Not adopted, 1: Adopted
	5. Global Compact	0: Not adopted, 1: Adopted
	6. "Who Cares Wins"	0: Did not participate in the programme, 1: Participated in the programme
II. Environmental management	7. Environmental management system (EMAS)	0: No, 1: Yes
	8. Environmental management system (ISO14001)	0: No, 1: Yes
	9. Environmental policy	0: No, 1: Yes
	10. Taking into account the supply chain	0: No, 1: Yes
	11. Quantification of environmental targets	0: No quantified targets are defined 1: Quantified targets are defined
	12. Transparency of environmental targets	0: No transparent targets, 1: Transparent targets
	13. Taking into account environmental risks when lending	0: No, 1: Yes
	14. Exclusion of special sectors	0: No, 1: Yes
	15. Taking into account World Bank guidelines on managing environmental risks	0: No, 1: Yes
	16. Taking into account OESO guidelines on managing environmental risks	0: No, 1: Yes
III. Responsible financial products	17. Socially responsible investments	0: No, 1: Yes
	18. Socially responsible savings	0: No, 1: Yes
	19. Sustainable financing	0: No, 1: Yes
	20. Microcredit	0: No, 1: Yes
	21. Environmental advice services	0: No, 1: Yes
	22. Climate products	0: No, 1: Yes
	23. Other sustainability products	0: No, 1: Yes
IV. Social conduct	24. Sponsorship	0: No, 1: Yes
	25. Community involvement	0: No, 1: Yes
	26. Training and education	0: No, 1: Yes
	27. Diversity and opportunities	0: No, 1: Yes
	28. Feedback from employees	0: No, 1: Yes
	29. Business ethics	0: No, 1: Yes
V. Benchmarking	30. Dow Jones Sustainability Index	0: Not in it, 1: In it
	31. FTSE4Good	0: Not in it, 1: In it
	32. Domini Social Index	0: Not in it, 1: In it
	33. ESI Europe	0: Not in it, 1: In it

Source: Based on Scholtens (2008: 165)

With respect to the methodology used in the sources focusing on the banking sector, it can be seen that –similar to non-sector-specific analyses – the CFP–CSP relationship is usually evaluated using correlation analysis or linear regression analysis. Only a handful of papers (*Wu – Schen 2013; Mallin et al. 2014; Jo et al. 2014*) strive to take into account the issue of endogeneity. In the case of bank CSP–CFP analyses, the most frequent control variables in regression models are firm size, the time elapsed since the establishment of the organisation and the ownership structure indicators, however, there are also examples for CAMELS-based capital adequacy, asset quality, coverage and liquidity indicators taking into account banks' special performance characteristics (*Simpson – Kohers 2002*; *Wu – Schen 2013*; *Mallin et al. 2014*; *Jo et al. 2014*). The capital adequacy ratio reflects the basic requirement for solvent and efficient banking operation, i.e. the efficient management of capital, since in the long run, equity guarantees a bank's solvency and the correction of potential adverse events. Asset quality shows the recovery risk of receivables, i.e. outstanding amounts, against customers, credit institutions and other external parties, which make up the largest share of a bank's assets. Management efficiency, i.e. the indicator derived from the quotient of administrative expenses and total assets, takes into account the activities related to management, i.e. the resolution of internal conflicts of interest, the visibility and accountability of the organisation, the bank's increasing efficiency and the reduction of operational risks, while liquid banks are able to meet all claims against them at any time with an adequate amount of liquid assets.

With regard to the impact of banks' CSP on CFP, all in all it can be stated that while some studies (*Bolton 2012*; *Simpson – Kohers 2002*; *Mallin et al. 2014*; *Wu – Shen 2013*; *Islam 2012*; *Marcia et al. 2013*) have uncovered a positive effect or were unable to identify a clear-cut link between the two (e.g. *Das et al. 2015*; *Soana 2011*; *Mozghovyi – Ratnykova 2011*; *Ahmed et al. 2012*; *Raihan et al. 2015*; *Malik – Nadeem 2014*), no paper on banks under review has confirmed a negative relationship between banks' social and financial performance. Therefore, overall it can be asserted that bank-specific CSP–CFP assessments rely heavily on non-sector-specific analyses with respect to determining the performance indicators, the methodology used and the variables taken into account during the analysis, and they also seek to incorporate the sector's special features.

3. Relationship between social and financial performance based on a sample of seven Hungarian banks

In view of the findings of the previous chapter, the present analysis attempts to establish the relationship between social and financial performance in the case of seven banks[7] with a dominant market share in the Hungarian banking sector

[7] Budapest Bank, CIB Bank, Erste Bank, Kereskedelmi és Hitelbank, MKB Bank, OTP Bank and Raiffeisen Bank

between 2006 and 2013 and operating in the form of a limited company according to the classification of the Magyar Nemzeti Bank acting in the capacity of supervisor. In addition to the same form of operation, the choice of these seven banks is also justified by the fact that they were present with a dominant market share on the Hungarian market during the whole period under review, and public information is available on their past CSR activities. In total, there were 56 bank years during the period under review. The relationship between banks' social and financial performance was examined using regression analysis and a two-step linear regression analysis for the whole sample, with the help of the SPSS 22.0 statistical analysis software. Based on the literature describing the link between banks' social and financial performance, the main elements of the regression models describing the relationship between financial and social performance are summarised in *Table 2*.

Table 2
Variables of the regression model and the two-step linear regression model

Variable name	Measurement of the variable	Data source
Dependent variable(s)		
NI	Net profits	Annual report
AROE	After-tax income/Average equity	Annual report
AROA	After-tax income/Average assets	Annual report
Independent variables		
CSP1	Scholtens bank social performance indicator	CSR reports, banks' websites
CSP2	Modified Scholtens bank social performance indicator	CSR reports, banks' websites
Control variables		
Capital adequacy (CA)	Equity/Total assets	Annual report
Asset quality (AQ)	Risk provision and impairment/Equity	Annual report
Management efficiency (ME)	Overhead expenses/Total assets	Annual report
Liquidity coverage (LC)	Debt/(Deposits + Short-term self-issued funds)	Annual report
Liquidity (LI)	(Cash + Monetary funds)/Total assets	Annual report
Size (FS)	Natural logarithm of total assets	Annual report

It can be seen from *Table 2* that in this paper's regression models financial performance interpreted as a dependent variable was expressed with accounting indicators, more specifically the average return on equity (AROE) and the average return on assets (AROA). Using net income as a dependent variable was considered important because as *Barnett and Salomon* (*2012: 1309*) caution, the use of

dependent variables expressed as ratios may lead to distorted results or more complicated relationships, since in this case the independent variables may affect the numerator, the denominator or both.

In the absence of the CSR indices determined by rating agencies, banks' social performance was measured relying on *Scholtens*'s (*2008*) framework in two ways. First, based on *Laidroo and Sokolova* (*2015*), banks' average annual performance was determined using 29 indicators from Scholtens's framework (CSP1). Then the social performance of each bank was determined again, based on modified criteria of Scholtens's model (CSP2). In the modified Scholtens model (*Table 3*), the main and sub-criteria of the baseline model were modified to resolve earlier shortcomings (related to applying employee concerns, the examination of the strategic and organisational incorporation of CSR and the separation of direct and indirect social engagement), and we also sought to omit the variables that were in the original model but were less relevant from the perspective of Hungarian banks, or that could not be taken into account due to a lack of data. Both social performance indicators were calculated based on information in the annual accounts of the banks, or, in certain cases, their parent companies, their own CSR or sustainability reports or websites, for all the years in the period under review, by calculating the average (*Table 4*).

Table 3
Components of the modified Scholtens indicator

Scholtens framework		Modified Scholtens framework	
Business ethics, CSR reports	Sustainability report Supporting ICC Business Charter for Sustainable Development UNEP FI Equator Principles UN Global Compact "Who Cares Wins"	Incorporation of CSR in the organisation	Independent sustainability/CSR report CSR strategic objectives defined Independent CSR committee or organisational unit Environmental and governance systems Adherence to GRI Standards Equator Principles UN Global Compact Compliance Own code of conduct
Product policy	Socially responsible investments Socially responsible savings Sustainable financing Microcredit Environmental advice services Climate products Other sustainability products	Product policy	Socially responsible investments Socially responsible savings Sustainable financing Microcredit Climate products Other sustainability products
Environmental management	Environmental management system (EMAS) Environmental management system (ISO14001) Environmental policy Taking into account the supply chain Quantitative environmental targets Transparency of environmental targets Examination of environmental risks in lending Exclusion of special sectors Taking into account World Bank guidelines on environmental risks Taking into account OESO guidelines on environmental risks	Environmental protection	Environmental policy Taking into account the supply chain Environmental targets Transparency of environmental performance Exclusion of special sectors
Social conduct	Sponsorship Community involvement Training and education Diversity and equal opportunities Feedback from employees Business ethics	Direct social impact	Economic value to the state Economic value to the employees Economic value to those providing capital Economic value to the suppliers Ratio of donation and sponsorship
		Indirect social impact	Community engagement, volunteering Organised education, trainings Social communication Own foundation
		Employees	Development and training of employees Diversity and equal opportunities Feedback from employees Motivational programmes

Based on the sector-specific studies, the control variables of the regression models were chosen from the elements of the CAMELS model used for analysing credit institutions' performance, while the impact of firm size was measured with the firm size (FS) indicator expressed as the natural logarithm of total assets. The values of the financial performance indicators and the control variables were determined based on banks' annual accounts and the MNB's Golden Books.

Table 4
CSP1 and CSP2 values for the banks under review – 2006–2013
(%)

	CSP1								CSP2							
	2006	2007	2008	2009	2010	2011	2012	2013	2006	2007	2008	2009	2010	2011	2012	2013
1	16.67	20.24	23.81	23.81	27.98	32.14	32.14	27.98	14.64	21.38	24.91	24.19	37.15	41.39	41.63	32.58
2	31.67	31.67	50.48	59.64	62.14	62.14	62.14	62.14	45.71	47.17	63.89	67.62	67.74	69.36	69.43	69.44
3	25.00	25.00	25.00	20.83	28.57	28.57	36.07	36.07	9.95	18.09	19.61	21.95	28.99	28.99	38.99	39.01
4	47.98	47.98	55.48	55.48	64.64	68.21	68.21	68.21	45.88	50.76	63.43	61.67	73.73	75.56	75.95	75.86
5	8.33	8.33	43.81	43.81	46.31	46.31	32.14	32.14	18.47	13.86	56.66	59.09	62.86	62.87	40.42	40.34
6	47.38	47.38	49.88	53.45	53.45	53.45	53.45	53.45	38.99	62.43	66.91	67.98	68.31	68.28	68.29	68.47
7	16.67	16.67	32.50	32.50	32.50	32.50	31.07	31.07	9.83	13.84	38.49	36.82	36.99	28.98	28.96	32.38

Based on the regression tests performed for the data under review, the relationship between the dependent and the independent variables can be best described using a linear regression equation, which takes the following general form based on the variables under examination (see *Table 2*):

$$CFP_i = \beta_1 CSP_i + \beta_2 CA_i + \beta_3 AQ_i + \beta_4 ME_i + \beta_5 LC_i + \beta_6 LI_i + \beta_7 FS_i + \varepsilon$$

Table 5 summarises the results of the robust linear regression analyses with respect to net income, average return on equity and average return on assets for the individual social performance indicators. During the regressions, White's robust standard errors were applied. It can be seen from the table that when using the Scholtens social performance indicator (CSP1), the values of the multiple correlation coefficient (r_{NI}=0.803, r_{AROE}=0.732, r_{AROA}=0.748) show that there is a moderate or strong linear correlation between the dependent and independent variables. Based on the values of the multiple determination coefficients (R^2), 64.5 per cent of the dispersion of net income can be explained by the changes in independent variables, and the same holds true for 58.7 per cent of the average return on equity and 60.8 per cent of the average return on assets. Similar values can be seen when applying the modified Scholtens social performance indicator (CSP2), however, it must be borne in mind that in these models, the strength of the linear correlation between the dependent and the independent variables increases, and

the explanatory power of independent variables is also greater. Nonetheless, it also should be mentioned that the changes in all dependent variables are influenced by other factors not included in this analysis, and the examination should also be conducted for a longer time interval.

Table 5
Summary table of linear regression models – With dependent variables of NI, AROE and AROA, and independent variables of CSP1 and CSP2

	With CSP1			With CSP2		
	NI	AROE	AROA	NI	AROE	AROA
R	0.803	0.732	0.748	0.813	0.751	0.762
R^2	0.645	0.587	0.608	0.660	0.589	0.617
Adjusted R Square	0.593	0.526	0.551	0.611	0.529	0.561

Examining the impact of the regression coefficients on financial performance (*Table 6*) shows that the negative effect of social performance (CSP1 and CSP2), asset quality (AQ) and liquidity coverage (LC) on net income has been confirmed, and so has the positive effect of firm size (FS) on it, while the effect of management efficiency (ME) and liquidity (LI) cannot be validated. In the case of the modified Scholtens indicator, capital adequacy (CA) has a slight positive effect on net income. With respect to the average return on equity (AROE), asset quality was confirmed to have a significantly negative impact in both linear regression models, while liquidity coverage had a moderate impact. The negative effect of social performance on ROE can only be proven in the regression model containing the modified Scholtens indicator (CSP2). When using the average return on assets, the negative effect of asset quality as a control variable was validated. Nevertheless, while the negative impact of social performance could not be shown with using the Scholtens indicator (CSP1), when the modified Scholtens indicator (CSP2) was applied, it was proven that social performance reduces the return on assets.

Table 6
Coefficients taking into account the Scholtens CSP1 and the modified Scholtens CSP2 – With all factors

Independent variables	Dependent variables		
	Net profits	AROE	AROA
With the Scholtens social performance			
Constant (Std. Error)	**–484,603** (192,894)**	2.73451 (1.99880)	0.0717541 (0.0971166)
CSP1	**–86,006.1* (45,397.8)**	–0.1016 (0.326682)	–0.0288578 (0.0206855)
CA	265,948 (184,011)	–1.47886 (0.962617)	0.00942178 (0.0690040)
AQ	**–38,128.5*** (7,622.84)**	**–0.417082*** (0.0641854)**	**–0.0218310*** (0.00305243)**
ME	399,423 (435,347)	0.467713 (2.05843)	0.0462294 (0.149819)
LC	**–48,543.3** (20,416)**	**–0.393224* (0.211651)**	**–0.0240745** (0.0105019)**
LI	8,355 (8,485.57)	0.0501049 (0.0587081)	0.00362491 (0.00349325)
FS	**39,421.1*** (12,581.7)**	–0.123892 (0.121207)	–0.00107046 (0.00610950)
With the modified Scholtens social performance			
Constant (Std. Error)	**–536,127**** (**202,106**)	2.55206 (2.10045)	0.0564608 (0.101774)
CSP2	**–89,941.2** (42,230.7)**	**–0.159699* (0.311049)**	**–0.0293010* (0.0184572)**
CA	**357,614* (203,101)**	–1.30930 (1.12531)	0.0391734 (0.0775070)
AQ	**–36,623.2*** (7,695.08)**	**–0.414654*** (0.0666511)**	**–0.0214430*** (0.00313394)**
ME	296,506 (417,520)	0.30629 (1.88541)	0.0123526 (0.146053)
LC	**–48,394.7** (20,706.5)**	**–0.395319* (0.213633)**	**–0.0239875** (0.015357)**
LI	7,425.28 (7,800.60)	–0.0485320 (0.0565713)	0.00332075 (0.00328560)
FS	**43,192.2*** (13,174.2)**	–0.109529 (0.128009)	3.23360e–05 (0.00640038)

*Note: *p<0.1; **p<0.05; ***p<0.01*

Table 7
Coefficients taking into account the Scholtens CSP1 and the modified Scholtens CSP2 – With significant factors

Independent variables	Dependent variables		
	Net profits	AROE	AROA
With the Scholtens social performance			
Constant (Std. Error)	**–352,759** ** **(168,385)**	**0.558785*** **(0.179271)**	**0.0436536*** **(0.00932544)**
CSP1	**–81,116.1*** **(43,428.7)**		
AQ	**–43,821.6*** **(6,101.28)**	**–0.377446*** **(0.0542081)**	**–0.0217175*** **(0.00250649)**
LC	**–72,160.0*** **(19,279.7)**	**–0.237039*** **(0.141556)**	**–0.0202774*** **(0.00731349)**
FS	**35,589.8*** **(11,864.8)**		
With the modified Scholtens social performance			
Constant (Std. Error)	**–509,119** ** (**190,964**)	**0.558785*** **(0.179271)**	**0.0436536*** **(0.00932544)**
CSP2	**–91,766.0** ** **(41,635.2)**	**–0.11977425*** **(0.23926846)**	**–0.02197575*** **(0.0184572)**
CA	**425,051** ** **(161,974)**		
AQ	**–35,919.3*** **(7,181.52)**	**–0.377446*** **(0.0542081)**	**–0.0217175*** **(0.00250649)**
LC	**–51,052.0*** **(18,155.9)**	**–0.237039*** **(0.141556)**	**–0.0202774*** **(0.00731349)**
FS	**42,288.4*** **(12,850.9)**		

*Note: *p<0.1; **p<0.05; ***p<0.01*

Since there appeared to be no significant link to most of the explanatory variables in the original regression results (*Table 6*), when running another round of robust regression analysis, only significant factors were applied as explanatory variables (*Table 7*). As there is no relevant difference in terms of magnitude between the results of the original regression and the one with the omitted variables with respect to the impact of independent variables, it can be stated that there is no substantial correlation (multicollinearity) between the significant variables and the parameters left out of the second regression, therefore our estimate is not distorted (*Rádóczy 2017*).

With respect to net income, the analyses with both social indicators confirmed the results of the linear regression analyses performed with all the factors. With the Scholtens indicator, the negative impact of liquidity coverage on net income became

stronger, while in the case of the modified Scholtens indicator, the positive effect of capital adequacy and the negative effect of liquidity coverage on net income could be confirmed. With respect to the average return on equity, a negative relationship could be shown even in a robust regression analysis with significant factors between financial performance interpreted as the average return on equity and asset quality as well as liquidity coverage. Moreover, it was proven that social performance as expressed in CSP2 influences AROE negatively. With regard to the average return on assets, the negative relationship between corporate social responsibility as expressed in CSP2 and ROA was confirmed, just like the significantly negative impact of asset quality and liquidity coverage taken into account as control variables.

4. Main conclusions

In the past decade, economic and sectoral changes and new impact mechanisms led to new competition and realignment in the Hungarian banking sector. As the most important consequence, policies and ratios aimed at safe capital adequacy and defined by the Basel Committee (and Hungarian accounting rules) have appeared that have applied to Hungarian banks since January 2008. In the Basel III regulation, the concept of leverage was modified, the countercyclical capital buffer was introduced and capital calculation became stricter (Tier 1 capital ratio[8]). As a result of the introduction of the capital buffer, the required level of the capital adequacy ratio will be raised in the long run. The European Banking Authority expects systemically important financial institutions to have a capital adequacy ratio of 9 per cent since June 2012. The risk management methods and policies are supplemented by the provision for the liabilities linked to lending. This provision and the credit coverage capacity of equity play a significant practical role because the MNB's Funding for Growth Scheme launched in 2013 boosted banks' credit. Thus asset quality indicates the recovery risk of receivables, because the NPL ratio has increased considerably in the banking sector since the onset of the financial crisis, and only a moderate fall in its value can be observed.

Although our study does not cover the whole Hungarian banking sector and contradicts the results of papers on international banking, it clearly proves that on the part of the major players in the Hungarian banking system, the subsidised loans and microcredit that appeared in their product policies and their sponsorship and educational engagement as well as a wide range of corporate social responsibility activities in foundations were responses to the consequences of the global financial crisis of the past decade and the loss of market share. This had a negative impact on income, return on equity and return on asset indicators, while banks focused on retaining customers and complying with stringent regulatory limits. Although

[8] Tier 1 capital ratio = Equity capital / Risk-weighted assets
Capital adequacy ratio = Own funds / Risk-weighted assets

these factors resulted in negative returns in the present short-term analysis, they may provide returns in the long run, since it was confirmed that capital adequacy is positively correlated with net income. Granted, this implies that capital adequacy can be maintained in the long run, while the banking system achieves greater profitability in the context of a growing and higher-quality loan portfolio and better risk management. In the short run, the return on equity is clearly negatively influenced by the higher provisions required by regulatory limits, the reclassification or restructuring and better risk management of the loan portfolio resulting in improved asset quality as well as the effectiveness of the Funding for Growth Scheme that improved liquidity coverage. Unfortunately, the latter seems to be even more effective on account of lower deposit taking due to the rise in alternative investment products (e.g. unit linked products). The two last factors also exert a negative impact on the return on assets, and although social responsibility and performance also influence the ROA negatively in the short run, they help restore the trust that disappeared from the bank–customer relationship during the crisis. In the long run, the customer base, resting on a safer and better risk management footing, will be the factor that facilitates banks' survival, competitiveness on the market and increasing profitability.

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Misbehaving – The Making of Behavioral Economics*

Nikolett Kiss

Richard H. Thaler:
Misbehaving: The Making of Behavioral Economics
W. W. Norton, New York, 2015, 415 pp.
ISBN: 9780393080940

Richard H. Thaler, a professor of the Chicago Booth School of Business since 1995, focuses his research activities on behavioural economics, an interdisciplinary field between economics and psychology. His studies are based on the assumption that the participants in economic life are humans, in contrast to the premise in classical economics that every actor in the economy is rational. Thaler claims that his role models and mentors were Amos Tversky and Daniel Kahneman, psychologists, the creators of prospect theory. He was awarded the Nobel Memorial Prize in Economic Sciences in 2017.

In the author's own words, the book is not the sort one might expect an economics professor to write. The book wishes to give a comprehensive overview about the findings in behavioural economics of Thaler and his colleagues over the years. These findings are illustrated with stories from everyday life, practical examples and experiments.

Behavioural economics originated from the idea that classical economics cannot accurately predict economic events, as it replaces homo sapiens with a fictional character, homo economicus. One of the basic doctrines of economics is that people optimise, make rational decisions, and thus choose the best among goods and services they can afford. Decisions are distorted by nothing, they are only influenced by rational expectations. In economics, this is combined with a theory of equilibrium, according to which on competitive markets, supply equals demand. Behavioural economics examines the elements of these doctrines with a critical, empirical approach. It states that the assumptions in classical economics are flawed, as the optimisation problems faced by average humans are often difficult, or even

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

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impossible, to solve. Moreover, the assumptions on which decisions are based are biased, and therefore the optimisation model disregards several other factors (supposedly irrelevant factors – SIFs).

Thaler devoted himself to behavioural economics in the 1970s. On the so-called "List", he collected instances of human behaviour that he believed to be incompatible with the economic model of rationalisation. To take one example: the author and his friend, Jeffrey, got free tickets to a basketball game a 1.5-hour drive away. As a blizzard struck on the day of the game, they decided to stay home. Jeffrey contended that if the tickets had cost money, they would have set out anyway. Jeffrey ignored the basic economic principle that sunk costs have to be disregarded. The author first came across the works of Kahneman and Tversky around this time, and used the two kinds of theories and the value function described in their paper, "Prospect Theory," to further analyse the behaviours on the List. The two kinds of theories mean the existence of normative theory and descriptive theory. Normative theory stipulates the right way of thinking about a given problem. Economists usually use one theory to achieve both normative and descriptive goals. One good example for this is the economic theory of the firm, according to which companies seek to maximise profits or increase their value, setting prices so that marginal cost equals marginal revenue. Prospect theory breaks with the widespread idea that any theory on human behaviour can be normative and descriptive at the same time. It maintains that one should concentrate on the changes in wealth rather than the levels of wealth, since people experience life through changes. This is because if they get accustomed to their environment, they are prone to disregarding it. Changes can occur with respect to the status quo or the expected situation, and changes can make people happy or sad. As the value function shows, both gains and losses exhibit diminishing sensitivity. People are risk-averse for gains and risk-seeking for avoiding losses. It can be seen from the function that losses hurt twice as much as gains give pleasure. The greatest weapon of behavioural economics is derived from this finding.

Thaler started working at Cornell University in August 1978, and examined how people think about money, a process Kahneman and Tversky called mental accounting. The research into this defined the subsequent career of the author. According to economics, consumers take into account opportunity costs, i.e. the given time and the alternative uses of money. By contrast, behavioural economics contends that it is unrealistic to assume the above decision-making process in consumers, since this thinking is too complex for them. In connection with this, the author has developed a formula with two types of utility. Acquisition utility describes the surplus gained when the opportunity cost of the choice forfeited is deducted from the utility of the acquired object. It is large if the consumer values the given good more than the market. Transaction utility is the difference between

the actual price and the reference price. If the actual price is above the reference price, transaction utility is negative and the transaction is considered a rip-off. If the actual price is below the reference price, transaction utility is positive and the transaction is a bargain. Transaction utility may prevent transactions that enhance welfare and support those that are rip-offs. Therefore, sellers can make certain transactions seem like bargains by manipulating the expected reference price, i.e. displaying a high recommended retail price and offering their goods in constant sales.

Thaler added further examples to the List in 1975–1988. One common problem in these examples was the lack of self-control, which, according to economics, is non-existent, as there is no need to differentiate between what we want and what we choose, since our choices are our stated preferences. The author has developed a tentative model based on the premise that self-control is about conflicts, requiring two parties, therefore the self can be divided into two: a forward-looking planner who is concerned about the future and a negligent doer who lives for the present alone. The author based this on the principal–agent model from the theory of organisations, where the principal is the boss and the agent is someone to whom authority is delegated. In the intrapersonal framework, agents are doers living for 24 hours, who would like to enjoy life and are not concerned about future doers. By contrast, planners regard doers as being paramount, and wish they would be collectively as happy as possible. Planners have two tools to influence doers: rewards and penalties, and the imposition of rules limiting options. If planners do not have the latter tool, they arouse the bad conscience of doers for not being concerned about the welfare of those coming after them. However, guilt makes life less pleasant, and therefore the use of rules provides more pleasure.

In 1983–2003, Thaler turned towards analysing finance, as he was convinced that behavioural economics could get a boost from the confirmation that behavioural biases also counted on financial markets. In the 1980s, financial markets were dominated by Eugene Fama's efficient market hypothesis (EMH). One component of the EMH is illustrated by the author with the phrase *"the price is right,"* according to which assets will always sell at their true intrinsic value. Thaler describes the other element of the EMH with the expression *"no free lunch,"* i.e. that one cannot beat the market, as all publicly available information is reflected in stock prices, therefore it is impossible to predict the future and thus gain an advantage. The author searched for proof of breaches of the EMH during his research, and found, among others, the following. The real forerunner to behavioural finance was John Maynard Keynes, who pointed out in the mid-1930s that stock prices of ice companies were higher in the summer months, when their sales were stronger. However, in the EMH, on an efficient market, stock prices show a firm's long-run value, i.e. one that does not reflect the summer heat and the winter cold, therefore

such predictable fluctuations in stock prices are strictly forbidden. The analysis of closed-end funds' share prices show that market prices are often different from net asset value, typically indicating a discount of 10–20 per cent as compared to the latter. This runs counter to the EMH theory that states that the market price of closed-end fund shares equals net asset value. The author argues that despite the anomalies, the EMH is still the best place to start, and 90 per cent of all markets are efficient, however, the price is often wrong, and in the case of a major difference from the real value, resources may be misallocated to a considerable degree.

In the mid-1990s, one of the objectives of behavioural economists was to use behavioural economics to make the world a better place. Classical economics is not concerned with the planning of retirement savings plans, as it claims that people save exactly as much as they need to. Economists have only one policy tool: the after-tax rate of return on savings. By contrast, behavioural economics takes into account more factors. The author collected the obstacles why people fail to save enough, which are the following: 1) inertia, i.e. that most retirement savings plan participants believe they should save more but procrastinate and do not take actual action; 2) loss aversion, i.e. that people do not like to lose, especially in the form of deductions from their wage; 3) people have more self-control with respect to the future than the present, therefore they are present-biased. Thaler's basic idea is that people have to be convinced to increase their savings rate when they get their next pay rise. To this end, people have to be kept in savings programmes until they opt out or their savings rate reaches a specific level. If increases in the savings rate are tied to pay rises, the problem of loss aversion can be avoided. If a decision has to be made that will take effect in the future, the present bias poses no issue either, and if the programme works until people opt out, inertia also supports savings.

Behavioural economics exerted the greatest influence in finance, because the latter had mature theoretical doctrines, and a rich dataset was available to test the theories. The author also expects behavioural approaches to become widely used in macroeconomics, as better understanding people and firms and the examination of their behaviour are crucial for selecting the appropriate economic policy and public policy measures. One impediment to this is that macroeconomics does not make easily rebuttable predictions and does not have such a wealth of data as finance. One issue requiring behavioural analysis is the development of tax cut policies providing an economic stimulus, since consumer behaviour has to be analysed from a behavioural perspective to establish whether the measure increases spending and to determine the way it has to be implemented (in a lump sum or spread out over a year). Another area that may require behavioural analysis is how to encourage starting new businesses. According to behavioural economics, reducing the price of failure may provide a better incentive than the tax cuts, targeted subsidies and better access to credit recommended by economists.

With respect to the future of economics and behavioural economics, Thaler believes that if economists put aside their prejudices and took into account variables deemed irrelevant by the rational economic model, behavioural economics as a separate discipline would disappear, as all branches of economics would become behavioural to just the necessary extent.

Fragile by Design: The Political Origins of Banking Crises*

János Szakács

Charles. W. Calomiris – Stephen H. Haber:
Fragile by Design: The Political Origins of Banking Crises
Princeton University Press, 2014, 584 pp.
ISBN: 978-0691155241

The stability of banking systems has received particular attention since the global economic crisis. Dysfunctional banking systems can cause substantial macroeconomic damage. Overly passive banking systems lead to suboptimal economic growth, while unstable banking systems result in more frequent bank crises, which in turn exacerbate the negative effects of economic crises and also directly increase taxpayers' burden, due to the costs of bank bailouts. *Fragile by Design: The Political Origins of Banking Crises and Scarce Credit* examines the underlying causes of the differences among nations in the occurrence of systemic banking crises. Starting from the case studies of five countries (United Kingdom, United States, Canada, Mexico and Brazil) the authors reached the conclusion that the occurrence of a systemic crisis is not random, but instead, it is a phenomenon entailed by the political establishment of each country.

There are significant differences by country in terms of the frequency of banking crises. According to the country list compiled based on the database of the World Bank and the IMF, of the 117 analysed countries, only 34 did not suffer any banking crisis, there was one crisis in 62 countries, two crises in 19 countries and three and four crises in 2 countries between 1970 and 2010. From these, the list of the countries that had two crises is of interest for us. In addition to Kenya, Nigeria, Brazil and Mexico, the list also features Spain, Sweden and the United States. By contrast, there was no crisis during that period of time in Canada, which is at the same level of development as these latter countries. So, the question is: how come developed economies are on the list of states that often suffer crises? How is it that certain countries suffer the burdens entailed by the instability of the banking system more than some others?

The authors claim that the answer can be deducted from the problem that is hiding in the book's title: banking systems are fragile by design. Governments everywhere have

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

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to face three main inherent conflicts of interest, and every government handles this differently, depending on its political institutions. On the one hand, governments are in charge of authorising and supervising banks while they also consider them as the key resource of their own funding. On the other hand, the government facilitates the enforcement of banks' claims vis-à-vis debtors, while it relies on the same debtors to support its political position. And thirdly, the government decides on how to allocate the losses among creditors and depositors in times of bankruptcies, while it strongly relies on the political support of the depositors. Consequently, it is an unavoidable conclusion that the factors fundamentally influencing the banks' operation are created not as the result of market processes, but to meet political interests, as part of some political game (the Game of Bank Bargains).

The political establishment and the development of the institutional system fundamentally define the outcome of the game. For example, an autocratic political leadership is unable to credibly bargain with the different interest groups, and in democratic countries the groups representing significant power through votes are also not able to interfere in governance by changing the political power. It is important to stress that a change in political structure only leads to the modification of bank bargains with considerable delay: the habits of the autocratic system only break down slowly in legal institutions. And finally, it is important to see that the organisation of the banking system is also essential in addition to the political structure: unstable systems can be created even in democracies, while even autocratic structures can lead to a stable banking system at least on a local level, through the functioning of the formation of different coalitions.

Table 1
Banking systems and state structures in different governmental establishments

Political establishment	Government	Relationship between government and banks	Banking system	State
Chaos	None	None	None	No state
Autocratic establishment	Absolute power	None	None	The "Poverty Trap"
	Centralized power	Profit distribution	Underfinancing, local stability	Strong state
	Weakly centralised	Distribution of inflation tax	Unsecured money market	State with moderate strength
	Local oligarchs	Few licensed banks	Small, fragmented	Weak state
Democracy	Liberalism	Competing, taxed banks	Broad financing, stable	Strong state
	Populism	There is no political pressure on the banks thanks to the welfare state	Limited role	Strong state
		Politically driven financing	Broad financing, stable	Strong state

Source: Figure 2.1 of the book

To come to the above conclusions, the authors use as case studies the historic development of the state establishments and the banking systems of some countries where the political establishment was formed through clearly distinct ways, which may also explain the different ways in which banking systems have evolved.

- **United Kingdom:** Over the past two centuries, the United Kingdom saw the alternation of constitutional monarchy, a narrow circle of citizens entitled to vote, a monopolised and unstable banking system resulting from the measures taken to establish a welfare state following the two world wars, and a competing and globally competitive banking system. The changing position of the banking system is well exemplified by the fact that in the 1960s the loans disbursed by banks represented only 20 percent of GDP, as opposed to the average value of 40 to 50 percent in Western countries and the 140 percent observed in the United Kingdom between 1990 and 2010. The city of London's role as a financial centre and the country's developed financial system are considered a novel phenomenon in a historical perspective, which changed in parallel with the political establishment.

- **United States:** The current form of the American banking system emerged only over the past 30 to 40 years. Until the 1970s the American banking system was composed of several tens of thousands of individual small banks. Due to state legislation, large banks were unable to open branches in other states, and in many states even the number of locally operated bank branches was limited. So the many individual banks led to a clearly risky, unstable, expensive banking system that, as a consequence, did not provide adequate financing, as economies of scale were left unexploited. Starting from the 1970s, urbanisation, more efficient ways to obtain information on credit worthiness thanks to technological developments, the spread of ATMs and the emergence of non-bank intermediaries as well as legislative reforms led to consolidation of the banking system. But the question inevitably arises: how did an efficiently functioning, highly competitive banking system lead to the recent financial crisis? The authors trace back both the formation of the so-called "too big to fail" banks and the spread of excessive risk appetite to the bargains between the banks and certain community groups and the ever-weaker lending conditions of refinancing mortgage loans of organisations enjoying governmental support, influenced by various political powers.

- **Canada:** Canada has similar historical and cultural origins to the USA, but there are major differences between the two countries in the historical evolution of their political establishments. One key difference which prevented the emergence of the small banks' system in Canada is that Canadian bank regulatory issues are decided on nation state level, and the political institutions established there were designed from the very start to counteract the influence benefitting certain interest groups. Consequently, only large banks with extended branch networks were created in Canada from the very start, the owners of which were

not motivated to create interest groupings with certain groups. According to the authors, these circumstances explain why not a single systemic bank crisis has emerged in Canada since the 1920s.

- **Mexico:** Mexico's example is used to compare democratic systems with autocratic establishments. In a country which practically operated without real electoral rights until the 1990s, Mexican governments usually strictly controlled access to the banking market, which ensured sufficiently high profits that could compensate the shareholders for the risk of expropriation. This arrangement led to suboptimal outcomes. Depending on the development of the specific political situation, either total chaos characterised the market (e.g. during civil wars) or only few banks were present that only financed those who belonged to the political elite. Although starting from 1997 most of the limitations were lifted as a result of which the proportion of the previously non-existing foreign owned banks spiked to 70 to 80 percent, and the banking system became stable, the access of households to financing has not improved at all compared to the early 1990s. The reason underlying this situation is that the legal instruments required for using and enforcing mortgage collateral needed in addition to the change in the shareholding structure have not yet been created.

- **Brazil:** Brazil is the model example of the alteration of the game of bank bargains, reflecting the changes that took place within the political institutions. During autocratic eras, the banking system was merely one of the instruments for collecting inflation tax. At the end of the 1980s inflation approached 2,500 per cent, while the banks and the government were able to split among them the inflation tax equivalent to 8 per cent of GDP. Banks were practically not lending, but instead, they pocketed the profit from the unpaid deposit interest earned during the time needed for financial transfers. But with the advent of free elections, this situation changed: by the mid-1990s inflation dropped to the level of the USA, and Brazilian banks started to lend. But even the current political structure has its downsides. The two largest banks are controlled by the government and according to the authors, they can influence the election results by granting sufficient financing to the business partners of certain candidates so that, in turn, they can increase employment at the companies within their spheres of influence.

Although the case studies are not fully representative, they can nonetheless provide a good basis for deducting certain trends. On the one part, in democracies, all other things being equal, more people have access to bank loans than in autocratic forms of state, but even democracies need some political institutions that render interest groupings among banks and certain groups more difficult. Considering the loan-to-GDP ratio as the indicator for measuring the volume of necessary lending and the number of banking system crises to be the measure of banking system stability, the authors conclude that the presence of democratic institutions increases

lending activity, a core component of which is the strength of ownership. By contrast, excessively restrictive bank regulations usually characterising autocracies significantly reduce the loan offering and lead to underfinancing and systemic instability. Finally, excessive public safety nets may render the banking systems unstable, which are often created not out of economic necessity, but through some political arrangement.

These findings may shed new light on the current economic argumentation in connection with systemic banking crises. Although the well-known problems — such as excessive maturity mismatch at the systemic level, excessive concentration, the formation of networks, pro-cyclical decision-making, etc. — do indeed provide the foundation for the occurrence of systemic crises, the extent to which these problems exist depends on the decisions of the banks and the regulators, and these decisions, in turn, are shaped in line with the political establishment. If nothing prevents banks from assuming excessive risk by creating interest groupings with certain groups, or if banks are even encouraged to do so because of excessive public safety nets, these problems are much more likely to occur. And the different systemic shocks of political nature (wars, military takeovers, systemic changes, etc.) are also factors to be considered. Hence, in order to obtain a comprehensive picture, the existing theories must be supplemented with the components of political economy when making decisions.

The final lesson of the book is that despite the numerous negative effects of the game of bank bargains and the above described difficulties, historical examples also show that positive changes can also be achieved within the framework of the game. For this, however, it is necessary to understand the above described political processes and incentives, and to assess and understand the political institutions and historical context of the given country. Moreover, new options must constantly be contemplated, as it is far from certain that the previous political establishment tried to improve the situation of the banking system in every possible way.

Report on the Budapest Renminbi Initiative 2018 Conference*

Tünde Mészáros

On 11 April 2018, the Magyar Nemzeti Bank (MNB, the central bank of Hungary) hosted its annual conference in the framework of the Budapest Renminbi Initiative for the fourth time. The *Budapest Renminbi Initiative 2018* conference featured lectures given by prominent market leaders and experts.

The conference was opened by *Dániel Palotai*, Chief Economist and Executive Director of the MNB. The success of the annual conferences is demonstrated by the continued interest in the event, which also reflects the importance of the internationalisation of the renminbi (RMB). According to experts, the 21st century will be Asia's Century, and thus it is appropriate to address the issue of China's economic performance and the spread of the international use of the renminbi. Dániel Palotai highlighted that the MNB had awarded the 2018's Lámfalussy Prize to Zhou Xiaochuan, Governor of the People's Bank of China, who is one of the key actors in the internationalisation process of the renminbi. China is gradually opening up its economic and financial markets, providing further opportunities for Hungary, in addition to the already close and increasingly strong relationships with China. In November 2017, Budapest hosted the 16+1 Summit, where leaders from China and Central and Eastern Europe had a discussion. Moreover, the 16+1 Central Bank Governors' Meeting will also be held in Hungary in the autumn of 2018. The recent conference is part of this series of high-level events. In his keynote lecture, Dániel Palotai talked about the MNB's role in Chinese-Hungarian financial market development and RMB internationalisation. He presented the correlations between the Chinese and the Hungarian initiatives, and highlighted the achievements of the Budapest Renminbi Programme in the fields of FX reserve portfolio, clearing, financial stability and regulatory issues, and research and academic cooperation. He outlined that the morning panel debate at Lámfalussy Lectures Conference 2018 had approached the main issues of the ongoing global economic transformation from an Eastern perspective. Among the global trends, the increasing prominence of Eastern economies and the emergence of a multipolar global economy are major issues that requires special attention. China is the largest investor worldwide and takes the lead in the field of technological innovations, dedicating the largest amounts

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of resources for such research projects, while working toward direct and indirect value creation. He emphasised that the MNB had already embarked on the New Silk Road, and that the central bank's initiatives were in conformity with the goals of the financial integration pillar of the One Belt, One Road Initiative.

In her lecture on the Chinese-Hungarian financial relations, *Ágnes Hornung*, Minister of State for Financial Policy Affairs at the Ministry for National Economy emphasised that there were already numerous examples of cooperation between China and the Hungarian financial sector as well. Hungary has been a member of the Asian Infrastructure Investment Bank since 2017, and is an investor in the SINO-CEE Fund through Eximbank. In 2015, an agreement on the construction of the Budapest-Belgrade railway line was signed. Furthermore, Hungary can also boast successful bond issuances (panda and dim sum bonds) in the Chinese market.

Florence Lee of HSBS Securities Services gave a lecture on entering the next phase of market liberalisation in China and on the country's integration into the world economy. Following a short overview of China's capital market, she discussed current and future trends and milestones in market development. Describing the possibilities of accessing the securities markets (stock and bond markets) in mainland China (onshore) and outside of China (offshore), she highlighted that regarding the quotas allocated under the Renminbi Qualified Foreign Institutional Investors scheme until the end of 2017, Hungary had the same position as Australia, Canada, Ireland or Switzerland in terms of quota allocations, but out of the 18 countries involved, Hungary was one of the 5 states that had not used from the existing quotas for investments to be made by institutional investors in China's onshore securities market yet.

Viktor Eszterhai, China analyst at Pallas Athene Innovation and Geopolitical Foundation, presented the relationship between Hungary and the One Belt, One Road Initiative from two perspectives: on the one hand as a pool of opportunities, and on the other hand as a serious challenge. He explained the criteria for Hungary to be a bridge or a gateway between the EU and China, and he also reported on the Made in China 2025 programme which may threaten the industry driven countries like South Korea, Germany, Ireland, the Czech Republic and Hungary. He emphasised that Hungary should not only focus on its own goals when considering the opportunities China provides, but it is necessary to both parties to formulate plans and realistic targets.

Presenting a lecture on behalf of Bank of China Head Office, *Yan Bo* highlighted that the renminbi is the second most frequently used currency for China's cross-border transactions, the fifth most frequently used currency in global payments, the seventh largest in foreign exchange reserves, and the eighth most actively used currency on the international FX trading market. China has signed currency

swap agreements with a total of 36 countries or regions, and the renminbi had accessed in almost 200 countries. Trade settlements, direct investments, lending and borrowing, liquidity management and other sources of financing are available in renminbi. Yan Bo presented the features of the Cross-Border RMB Index and the Overseas RMB Index, and then highlighted some interesting facts from the White Paper of the Bank of China on RMB internationalisation.

On behalf of SWIFT, a presentation was given by *Morgane Donck*. SWIFT continuously monitors the internationalisation of the RMB, and based on this, she discussed how the share of the renminbi in domestic and international payments changed between 2012 and 2018. The share of commercial payments in RMB, sent from China to Belt and Road countries increased significantly, especially in renminbi hubs, e.g. the growth in Hungary was 100 per cent between 2014 and 2017. She presented the development of the ratio of transactions made between Hungary and China in renminbi and in other currencies from 2015 in monthly breakdown, and she analysed, in a global context, the RMB's share in usage for payments ending in China.

The second part of the conference was opened with a lecture by *Sándor Pataki*, Director at OTP Bank Nyrt. He emphasised that the growth of the financial sector in China indicated challenges and opportunities as well, pointing out that several specific measures can be expected in China from 2018–2019. In July 2017, OTP Bank opened a representative office in Beijing. The observer status for a two-year period is a great opportunity to study local conditions, to obtain information and to identify potential business partners. The bank would like to seize the opportunities offered by China, but this requires a perfect knowledge of the legal environment. He highlighted that growth in China is now taking place according to new priorities and that the weight of internal consumption is increasing significantly. At the same time, the financial intermediary system is facing new challenges; for a foreign bank it is important to be aware of the specific business opportunities.

The issue of RMB global clearing services was presented by *Shan Yao*, on behalf of Bank of China Head Office. Following an overview of the renminbi global clearing system, he presented the Bank of China's RMB clearing services, which are available for the retail and corporate sectors, as well as for financial institutions and stock exchanges. Discussing the strengths of the bank, he highlighted its leading international role in RMB clearing services, its unified international payment platform and its global risk management system.

On behalf of the Budapest Stock Exchange, *Dániel Körmöczi*, Deputy CEO, gave a lecture on Chinese-Hungarian capital market opportunities. He underlined that one of the main features of the Chinese stock exchanges was the dominance of retail investors: they account for more than 80 per cent of trading volumes. By contrast,

the proportion of retail investors on the Budapest Stock Exchange is only 25 per cent, but the dominance of foreign institutional investors is very strong. China's stock exchanges have expanded considerably in the past few years; they have stakes, among others, in the Pakistan, Philippines and Kazakhstan Stock Exchanges, but also cooperate for example with the German Stock Exchange. Regarding the issuance of shares, Asia and China have been leading at international level in initial public offering since 2014, with the Shenzhen, Shanghai and Hong Kong Stock Exchanges on the three steps of the rostrum in 2017.

Ren Zhe, Deputy Representative at the London Representative Office of the People's Bank of China (PBOC), gave a presentation on the recent developments of FinTech regulation in China. The scope of the regulatory framework in China extends to payments, online lending, investment and insurance services, but there is no single regulatory authority and regulatory approach. Industry self-discipline is concentrated in the hands of a finance association that forms a bridge between industry and regulators. Innovation is increasingly gaining ground through self-regulation, enhancing at the same time the understanding of FinTech activities and contributing to creating a healthy operating environment, a common goal for market players, which results in considerable risk mitigation and an improvement of efficiency as well. Characteristics of the non-bank payments regulation include stricter Know Your Customer requirements, tiered regulatory regime where payment institutions with a better rating are subject to fewer regulatory scrutiny, and an emphasis on small-amount transactions. The representative of the PBOC also talked about central bank digital currencies. In connection with a central bank-issued digital currency (CBDC), the speaker pointed to the fact that, since commercial banks are also subject to the obligation, exchanging end-of-life banknotes requires considerable resources in China. A CBDC can be tracked more easily, making transactions more transparent. Furthermore, commercial banks are allowed to conclude contracts exclusively with the retail sector with coverage of 100 per cent.

The central bank's view on FinTech was presented by *Lajos Bartha*, Executive Director of the MNB. He highlighted some experiences and lessons could be learned from the Chinese FinTech-story for the MNB as well, including comprehensive services extending beyond the payments, innovative marketing methods, discounts at merchants, and a relatively loose regulatory approach in the initial period, based on more personalized marketing and strong consumer relationship based on the utilization of customer-data. The Magyar Nemzeti Bank effectively supports FinTech innovations, in the context of which it had launched two initiatives: an Innovation Hub and a regulatory service platform (Regulatory Sandbox). With the implementation of the new European regulatory framework, third-party payment providers will appear as new payment service providers, wedging in between consumers and their current payment service providers, and it will be easier for

FinTech companies to enter the payments market. The MNB has initiated and coordinated the implementation of the instant payment system which will provide new opportunities for further innovation, besides its numerous positive impacts, from the aspect of both the market players and the central infrastructure.

On behalf of the Hungarian Chamber of Commerce and Industry, *Mária Tényiné Stark* gave a lecture on Hungarian companies on the New Silk Road. She said that the One Belt, One Road Initiative, which Hungary was the first to join, had opened up new perspectives, and that the country could host the highest amount of Chinese direct investments within the CEE region. The biggest challenge for Hungarian firms was posed by the enormous size of projects, the lack of capital and financial means, the lack of market information, the project partners, and language knowledge. Several institutions provide information and help to find partners; one of them is the Hungarian-Chinese Committee of the Hungarian Chamber of Commerce and Industry, which helps to protect the general interests of 125 Hungarian companies, and assists them in becoming more internationalised in the Chinese market.

Report on the 8th Annual Financial Market Liquidity Conference*

Endre Morvay – Zsolt Lakatos – Dávid Andor Rácz

Hungary's major international conference on finance, which has featured prominent speakers also from abroad for many years, was held for the eighth time at the Corvinus University of Budapest. The Annual Financial Market Liquidity Conference was organised by the Financial Research Centre of the Department of Finance at the Corvinus Business School, and the Game Theory Research Group of the Centre for Economic and Regional Studies of the Hungarian Academy of Sciences. The conference, which took place on 17–18 November 2017, was financed by the Foundation of the Department Finance, and key supporters of the event included the Budapest Stock Exchange, KELER CCP, OTP Bank, the Institute for Training and Consulting in Banking, CFA Society Hungary as well as international companies and associations, such as Morgan Stanley, MSCI and the European Federation of Financial Analysts Societies (EFFAS). The programme of the two-day event included lectures by five renowned foreign and three domestic invited experts, and the agenda was supplemented by a series of papers and posters submitted to the conference. The attendants could listen to a total of 35 lectures, and the results of 10 further research studies were presented in poster form. The speakers came from 15 countries – ranging from the USA to Australia and including Brazil and Japan – representing 29 foreign and 6 domestic universities or research institutes. Some 180 participants registered for the event, and the audience included university teachers, analysts, researchers and PhD students from more than 20 countries representing 34 foreign and 21 domestic universities and institutes.

The conference was opened by *Mrs. Zita Zoltay-Paprika*, Dean of the Corvinus Business School. She greeted the participants, speakers and attendants, and thereafter highlighted that – reflecting the successes and improvement in the standards and international reputation of the conference – even more journals than last year (including Studies in Economics and Finance, Finance Research Letters, Journal of International Financial Markets, Institutions & Money, Journal of Multinational Financial Management, Risk Management) had notified their wish to receive the papers of the participants.

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The keynote speaker of the conference was *Andrew Karolyi*, who is of Hungarian origin, Harold Bierman Jr. Distinguished Professor at the SC Johnson College of Business, Cornell University, and who also serves as Executive Editor of the Review of Financial Studies, one of the top-tier journals in finance. Karolyi gave a highly professional lecture on the so-called "home bias" phenomenon, i.e. the bias in investor behaviour towards domestic financial products. Defining this distortion as the discrepancy between the share of domestic products in a portfolio and the weight of the country in the global market, he pointed out using Hungarian and international data that this phenomenon can be considered to be global. According to figures from an IMF survey of 2010, the level of home bias in Hungary is 60 per cent. This means Hungarians overinvest in domestic assets to the same extent as the Swiss or the French. He pointed out, however, that this phenomenon hinders investment efficiency. Providing an overview of the root causes of this phenomenon, he also presented the findings of his own repeated survey among researchers in the field. Respondents ranked informational disadvantages as one of the key factors, followed by mismeasurement of benefits and behavioural-based explanations. At the end of his lecture, Karolyi mentioned that models assuming a difference between domestic and foreign investors in interpreting information could describe and explain the phenomenon. He also mentioned that the latest research among international investment fund managers corroborated the key role of informational advantages/disadvantages in overweighting domestic products.

In the plenary section after the keynote lecture, *Jonathan A. Batten*, professor at the Australian Monash University and Managing Editor of several journals (Emerging Markets Review, Journal of International Financial Markets Institutions & Money, and Finance Research Letters) gave his lecture on the co-movement between oil and stock markets, and on how oil transactions help to hedge against stock market risks. A shift towards the use of green energy sources and the fight against global warming through the reduction of greenhouse gases has put pressure on the oil market. These developments affect investors' portfolios that include energy shares. In the context of the above, the speaker summarised the findings of a research studying the Asian markets between 1990 and 2017. The empirical results show that after the global financial crisis, the close co-movement between stock market indices and oil prices cannot be generalised, and the degree of correlation between oil and stock markets changes over time. As a result of this, in a significant part of the period analysed, the two markets – under regular market conditions – could be regarded as "segmented", which allowed investors to hedge risks resulting from one market by using the other market. The benefits of diversification by holding oil and stock portfolios could be realised, enabling investors to make positive risk-adjusted returns. Batten highlighted that new technologies, such as horizontal drilling and hydraulic fracking, present challenges for investors through the predictability of

prices, and systemic risks induced by decarbonisation would be high in periods when energy markets closely follow the trends observed in other markets.

The second lecture of the plenary section was given by *Thorsten Hens*, professor at the University of Zurich and adjunct professor at NHH – Norwegian School of Economics. Hens examined the role of high-frequency trading embedded in an evolutionary model in which trading strategies adapt to each other. He presented two evolutionary models; one of them included high-frequency traders, whereas the other did not. Based on the findings, as a result of the presence of high-frequency traders, active speculators suffer serious losses, while the impact on passive investors following a buy-and-hold strategy is negligible. On the whole, this encourages investment in the market portfolio and considerably reduces overall turnover. However, the development of other market measures shows that all this has no significant impact on the quality and efficiency of the market.

In the closing lecture of the plenary section, *András Bohák*, Vice President in MSCI's Risk and Regulation Research Team presented the application of MSCI's Liquidity Metrics model that the company developed in the US municipal bond market. The attendants heard a lecture on the special features of a market which usually collects contributions to finance community projects, and where there are a lot of bonds, but most of them are never traded, and buy or sell bids are never placed for them. This latter anomaly poses a real challenge in the modelling of risks, and this is what MSCI's Liquidity Metrics model offers a solution for. In the market examined, 349 groups of municipal bonds can be identified with this methodology. Floating-rate instruments of 30-year maturity with interest rates adjusted daily or weekly (puttable VRDO instruments) represent a major group. In addition, four main groups of the issuing states can be distinguished, with one of them being the group that consists of the states of California and New York. Some other group formation features: taxation of bonds (burdened with tax or not), interest rates (fixed, floating), aim of the issuance and finance. A further characteristic is that the distinguished groups (the ratings of bonds) are not sufficiently homogenous. On the whole, Bohák emphasised that although data are important, it is even more important to understand the market and interpret the data correctly.

Following this, lectures in parallel sections were held. The lectures classified in eight sections were focused on the aspects of behavioural economics, bank runs, issues relating to taxation on securitisation and transactions, commonality in liquidity, the spilling over and the effects of predictability and liquidity, lending and interbank market, risks of investments, and theories and experiments relating to liquidity. Two invited researchers gave lectures in the parallel sections.

The section concerned with the aspects of behavioural economics included the presentation by invited speaker, *Niklas Wagner*, professor at the Finance and

Financial Control Research Group of the University of Passau and Editor-in-Chief of the journal Studies in Economics and Finance. The intertemporal risk-return relationship is not clear-cut in the literature: there are examples of positive, negative and insignificant relationships. Wagner presented the findings of the study on the relationship between these two financial concepts. An important feature of the presented analysis is the consideration of the effect of trading breaks, since it has been pointed out in the literature that investors expect premium over non-trading periods due to a lack of opportunity for trading. The lecture was supported by data on yields on exchange-traded investment funds, with market premium broken down to premium over trading and non-trading periods, so we could observe that the pricing of risk premium is significantly different for trading and non-trading periods. In these latter cases, risk premium is positive and significant, even if the effect of the control variables is taken into account.

In the section concerned with lending and interbank market, *Gábor Vígh*, Head of the Counterparty Exposure Modelling Group at Morgan Stanley gave a lecture on the change in the difference between LIBOR and Overnight Indexed Swap (OIS) rates. This difference used to be negligible until 2007, but then the global crisis increased it due to the significant credit and risk premiums priced into LIBOR rates. As a new development, the prices of instruments linked to LIBOR rates started to take stochastic differences. Such a divergence in the two rates demanded a review by the market of its modelling assumptions, pricing, and hedging strategies. The speaker presented the findings of his research work on the effects of the stochastic LIBOR-OIS spread, including the difference of the distribution of future client exposures that the model with a stochastic spread shows, compared to the deterministic spread prevalent in markets.

The conference was closed with a plenary section. The first lecture of the section was given by *Christoph Kaserer*, professor at the Technical University of Munich. Kaserer discussed how open-end investment funds and exchange traded funds (ETFs) – the prices of which always follow the price trends of a product (stock exchange price index of a country, raw material, etc.) – affect stock market liquidity. The presented analysis examined the relationship observed in the German market between 1 July 2002 and the end of 2014. In a sample of more than 3,000 trading days, an improvement in market liquidity was observed. Based on liquidity-motivated trading of portfolio managers managing open-end investment funds, the study revealed that trading such funds had a positive effect on market liquidity in Germany. Furthermore, open-end investment funds' contribution to market liquidity has become stronger since the financial crisis in 2008–2009. In addition, it was also observed that the positive effect was mainly driven by highly skilled/highly effective mutual fund managers through their information processing ability. At the same time, ETFs did not affect (or negatively affected) market liquidity, which

leads back to the mechanism of ETF's creation and redemption process as well as the involvement of market makers.

The conference's closing lecture was given by *Imre Kondor*, member of the Parmenides Foundation, Pullach/Munich and London Mathematical Laboratory and the Complexity Science Hub Vienna, Honorary Professor at the Corvinus University of Budapest on the theme of portfolio optimisation. The typical task of portfolio optimisation is to maximise the expected yield of the portfolio using fundamental indicators (covariance matrix and the vector of expected yields), while minimising the variance. The speaker focused on the type of variance optimisation which is based on the sum of the absolute values of the weights of financial instruments. A limitation of the optimisation is that compared to the number of assets in the portfolio, data are usually insufficient to assess the input parameters of the optimisation. In order to address this mathematical problem (the singularity of the covariance matrix), standard softwares (R, Matlab) use regularisation techniques. However, unfortunately, not only university student users, but also risk and asset managers are usually unfamiliar with the details of these problem-solving algorithms built into the programmes, as well as with the risks and scope for errors arising from their use. In the course of the optimisation process, *the ratio (r) of the number of assets in the portfolio to the length of the time series (the size of the sample)* is an important control parameter. The key conclusion of the lecture is that the interval of ratio *r* where the optimisation of the portfolio is feasible can be extended with a limit based on absolute values, however, results are still not favourable. If the number of assets in the portfolio is significantly lower than the sample size, the value of *r* is small, and the regularisation has no role to play. However, if the value of the ratio *r* is adequately large (exceeds the critical r=2 value), the estimation error is so large that optimisation becomes senseless.

At the end of the conference, *Barbara Dömötör*, chair of the organising committee expressed her hope that the 2017 conference had contributed to further increasing the professional reputation of the event and had covered themes and launched debates that would be worth addressing again at the next year's conference. She thanked the speakers for their work, and the attendants for their participation. She also announced that the next, 9th Annual Financial Market Liquidity Conference to be held on 15–16 November 2018 was open for applications (http://www.uni-corvinus.hu/index.php?id=liquidity_conference), and was looking forward to welcoming everyone back.

INSTRUCTION FOR AUTHORS

Manuscripts should be submitted in accordance with the following rules.

- The length of the manuscripts should be limited to 40,000 characters (including spaces) but a ± 50 per cent deviation is accepted. Manuscripts should be written in Hungarian and/or English.
- Papers always begin with an abstract which should not exceed 800–1,000 characters. In the abstract a brief summary is to be given in which the main hypotheses and points are highlighted.
- At the bottom of the title page a footnote is to be given. The footnote contains every necessary information related to the paper (acknowledgement, relevant information etc.). This is followed by the name of the institution and position the author works at, e-mail address in Hungarian and English.
- Journal of Economic Literature (JEL) classification numbers should be given (three at least).
- Manuscripts should be written in clear, concise and grammatically correct Hungarian and/or English. Chapters and subchapters should be bold.
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- Equations should be aligned to the right and should be numbered continuously in parenthesis. (Chapters and subchapters should not contain restarted numbering.)
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- In case of further questions related to the manuscript visit the following website: *http://english.hitelintezetiszemle.hu/letoltes/authors-guide-en-1.pdf*

Thank you!

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