ANALYSES OF THE CZECH REPUBLIC'S CURRENT ECONOMIC ALIGNMENT WITH THE EURO AREA

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A   INTRODUCTION

The Czech Republic has been participating automatically in the Economic and Monetary Union (EMU) since it joined the European Union and acquired the status of a Member State with a derogation from adopting the euro. It is not currently a member of the euro area, but has committed itself to joining and introducing the euro in the future. The balance between the benefits and costs associated with introducing the euro will depend on the resolution of the current problems in the euro area and subsequently on the ability of the Czech economy to operate without an independent monetary policy. This ability will be affected by the similarity of economic developments in the Czech economy with those in the euro area, since their degree of alignment will co-determine the appropriateness of the single monetary conditions in the euro area to the current situation in the Czech Republic. Its ability to adjust rapidly to asymmetric economic shocks will be another important factor.

The analyses of the Czech Republic's economic alignment with the euro area in 2015 have been drawn up in line with the Czech Republic's Updated Euro-area Accession Strategy of 2007. They assess the current state of economic alignment in terms of long-term economic trends, the medium-term evolution of economic activity, the structural similarity of the Czech economy to the euro area economy, and the economy's ability to absorb and adjust flexibly to asymmetric shocks.

This set of analyses is a follow-up to the documents of the same name published by the CNB in previous years. As in previous years, this year's document contains a section on the economic alignment and public finance situation of euro area countries and on the institutional changes being made on an ongoing basis in response to new events in the European Union. Changes in the economic and political framework of the euro area alter the view on the economic costs and benefits of adopting the single currency, which may thus change over time for accession countries. From the perspective of future accession to the euro area it is also necessary to monitor the use and potential impacts of the unconventional instruments applied by the European Central Bank.

The analyses of the Czech Republic's preparedness for euro adoption are divided into two basic groups according to the type of question they answer. The section entitled "Cyclical and Structural Alignment" deals with the assessment of different economic developments in the Czech Republic compared to the euro area and hence the risk of the single monetary policy being highly suboptimal for the Czech economy. The section entitled "Adjustment Mechanisms" answers the question of to what extent the Czech economy is capable of absorbing the impacts of potential asymmetric shocks using its own adjustment mechanisms.

These analyses are aimed at assessing the evolution of the alignment indicators over time and in comparison with selected countries. The countries under comparison either are euro area members already (Austria, Germany, Portugal, Slovakia and Slovenia) or are expected to join in the future (Hungary and Poland).[1] All of the analyses attempted to make comparisons with all the selected countries. However, in some cases this was not possible owing to a lack of statistical data. The values of the indicators for the euro area are defined at the EA19 level.[2]

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[1] The selected euro area countries are countries that are comparable in terms of economic level and countries with which the Czech economy has trading links. This selection is not related to any assessment of how successfully these economies have performed in the euro area. Germany, the largest trading partner of the Czech Republic, also provides a useful benchmark as a core country of the euro area, although when making comparisons with aggregate or average economic indicators the large weight of Germany in the calculation of those indicators must be taken into account.

[2] The EA19 comprises the euro area Member States: Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Slovakia, Slovenia and Spain. Only in exceptional cases, owing to data unavailability, does the analysis not cover all EA19 countries. The euro area as a whole is abbreviated as EA in the tables and charts; unless indicated otherwise in a note, this refers to the EA19.

B   SUMMARY

The Czech Republic's future entry into the euro area ensues from the commitments associated with EU membership. Adoption of the single European currency should lead to the elimination of exchange rate risk in relation to the euro area and to a related reduction in the costs of foreign trade and investment. This should further increase the benefits accruing to the Czech Republic from its intense involvement in the international economic relations. Besides the aforementioned benefits, however, adoption of the euro will simultaneously imply costs and risks arising from the loss of independent monetary policy and exchange rate flexibility vis-à-vis major trading partners. The benefits and costs stemming from euro adoption will be affected by the situation in both the Czech economy and the euro area economy and its institutional framework. These factors will influence whether adoption of the euro by the Czech Republic will lead to an increase in the country's economic stability and performance.

Recent developments in the **euro area** continue to point to misalignment within the monetary union and continued divergence between southern periphery countries and euro area core countries. This is leading to changes in the institutional architecture of the euro area, changes that are affecting the costs and benefits of euro adoption. These institutional changes also apply to non-euro area countries (changes to the Stability and Growth Pact and the introduction of the European Semester and the macroeconomic imbalance procedure). In recent years, the euro area has in some respects set itself apart as a single block from the EU countries that have not yet adopted the euro.

The **problems in the functioning of the euro area** have also been the subject of an ever-growing flow of academic literature in recent years. In particular, it is apparent that the optimum currency area endogeneity hypothesis has not been confirmed for the euro area. By contrast, exchange rate fixing, sharp interest rate cuts on the periphery of the euro area and the absence of fiscal integration have resulted in a systematic accumulation of major imbalances in the euro area. With no option of exchange rate depreciation, the current single monetary policy seems too restrictive for the less competitive countries. Conversely, the single monetary conditions may be too easy for the countries with high competitiveness and rising prices of assets, especially property prices. These factors, combined with other effects, have been reflected in rising misalignment in a whole range of indicators, for example long-term interest rates, unemployment and partly also GDP growth. Although the situation in the euro area has improved recently, the economic and debt crisis still cannot be said to be definitely over. The developments in Greece last year were particularly complicated and uncertain.

The two key factors for the **Czech economy** as regards the costs and benefits of euro adoption will be the economic and structural similarity between the Czech economy and the euro area, and the flexibility of the Czech economy and its ability to absorb potential asymmetric shocks. As usual, the analyses presented in this document therefore assess the similarity of the long-term economic trends, the medium-term development of economic activity and the economic structure to the euro area, including the similarity of the functioning of monetary policy transmission, as well as the ability to adjust by means of autonomous fiscal policy and flexible labour and product markets. As in previous years, the characteristics of the Czech economy as regards its preparedness to adopt the euro can be divided into four groups.

The first group consists of **economic indicators that speak in the long run in favour of adopting the euro**. These include the high degree of openness of the Czech economy and its close trade and ownership links with the euro area. These factors provide for the existence of benefits of euro adoption, such as a reduction in transaction costs and the elimination of exchange rate risk. The strong trade links with the euro area are also fostering alignment of the business cycle with the euro area. A favourable factor is long-term alignment of inflation, nominal interest rates and the exchange rate with the euro area. The Czech banking sector is

not a barrier to joining the euro area either. It is stable and resilient to economic shocks, and it ensures that the transmission of monetary policy to the economy is essentially no different to that in the euro area.

The second group contains **areas where convergence was disrupted by the crisis, but where an improvement has been recorded again in recent years.** These include the real economic convergence of the Czech Republic to the euro area, which halted during the crisis but has resumed over the last two years. GDP per capita relative to the euro area average (converted using purchasing power parity) exceeded the pre-crisis level for the first time last year. However, there remains considerable room for long-term economic convergence. This group additionally includes the gradual stabilisation of financial markets and the renewal of their alignment with the euro area. It also includes fiscal policy, where the general government structural deficit decreased markedly in 2010–2013. Sustainable fulfilment of the medium-term budgetary objective is a necessary condition for fiscal policy to effectively play the role of stabilising factor in the event of the loss of independent monetary policy.

The third group consists of **areas where positive trends were disrupted by the global crisis, and a return to the convergence path has yet to occur**. This includes long-term convergence of the price level, whose previous convergence towards the euro area halted in 2008. The expected gradual renewal of the convergence trend would result in higher inflation after euro adoption by comparison with the core of the monetary union and hence in sustained low or even negative real interest rates. In times of economic growth, this could lead to increased risks of macro-financial imbalances.

The fourth group contains **areas which are showing long-term problems or misalignment and which, moreover, are not showing any significant improvement.** This group includes population ageing, which poses a risk to the long-term sustainability and stabilisation function of public finances. The functioning of the Czech labour market is comparable to that in other EU Member States. However, its weak points still include relatively high implicit labour taxation and relatively low labour mobility. Signs of greater flexibility can also be seen here, primarily in the form of growth in the number of employees working shorter hours, although this remains low compared to other EU countries. The flexibility of the Czech goods and services market has improved slightly, but is still being hampered by some administrative barriers, especially barriers to starting a business. Significant differences vis-à-vis the euro area persist in the structure of the Czech economy, which is characterised by a high share of industry and a low share of services. Differences also remain in the financial sector and in the structure of financial assets. These factors may be a source of asymmetric shocks and cause the single monetary policy to have different effects.

The following text summarises developments in the individual areas analysed. Part D examines the economic convergence of euro area countries, debt problems and changes in the institutional architecture of the Economic and Monetary Union. Detailed results of the analyses of developments in the Czech Republic are presented in Part E.

Situation in the euro area

Economic alignment of euro area countries is a basic prerequisite for the smooth functioning of the monetary union. However, developments in recent years point to persisting misalignment of economic performance across countries. What is more, the EU countries that do not use the euro as their currency have overcome the crisis better than the euro area members. The differences in the euro area countries' GDP growth rates widened the most in 2008–2009 and again in late 2012 and early 2013 as their economies were hit by recession in different periods and to different extents. The difference in GDP growth rates has been shrinking slightly since 2013. This is due, among other things, to lower growth in the

previously fast-growing economies. Misalignment between euro area countries is also apparent in the labour market, where the differences in unemployment rates increased sharply after 2009 due to the debt crisis. Although these differences have gradually been decreasing since mid-2013 as the economies have been recovering, they remain well above the pre-crisis level. The financial and economic crisis was accompanied by rising misalignment in the inflation rate. This misalignment has decreased again since 2011, but inflation convergence in euro area countries at very low average levels cannot be regarded as a positive trend, as it represents a risk to the economic recovery and complicates the resolution of the debt problems and a return to competitiveness of the southern periphery countries. Even the core countries of the euro area have recently been facing very low inflation. At the start of this year, some of them recorded annual deflation, due mainly to a fall in global oil prices. As from the end of 2009, very large divergence was also seen for long-term interest rates. This reflected the different magnitudes of the debt problems across euro area countries. This misalignment started decreasing in 2012 thanks to the announcement of the ECB's preparedness to take measures to protect the euro area against collapse, but it has been growing again over the last year. The fiscal criteria laid down in the Treaty on the Functioning of the EU are at present met only by five of the nineteen countries. The countries on the southern periphery of the euro area are especially afflicted by fiscal problems. The situation in Greece is particularly complicated and still unresolved.

In past years, the EU, and especially the euro area, continued to significantly **enhance economic coordination** and stimulate further integration in financial markets and their supervision. Steps continued to be taken to establish a **banking union**, whose pillars consist of (i) a Single Supervisory Mechanism (SSM, officially launched in November 2014); (ii) a Single Resolution Mechanism (SRM), under which a Single Resolution Board (SRB) has been in operation since the start of 2015 and a Single Resolution Fund (SRF) is planned to be launched in January 2016; and (iii) a Single Rulebook. The debate about insurance/resolution mechanisms (backstops) continued in 2015, but no agreement was reached on the form of the common European backstop. A political debate on possible participation in the banking union (the SSM/SRM) before euro adoption has been going on in the Czech Republic in recent years. As part of that debate, the Czech Ministry of Finance drew up an *Impact Study of Participation or Non-participation of the Czech Republic in the Banking Union*. In line with the findings of the study, the Czech government decided in February 2015 not to join the banking union in the current situation and to review the costs and benefits of participation in the banking union in one year's time. At the same time, the euro area has in some respects set itself apart as a single block from other EU Member States and the focus of decision-making on EMU matters (including issues concerning all EU Member States) has shifted towards the countries that use the euro as their currency. Turning to institutional developments in the EU, a new system for calculating a qualified majority took effect last year, thanks to which euro area countries now have a qualified majority, and the role of the Euro Summit in resolving key EMU issues, especially in connection with the Greek crisis, was renewed. Moreover, 2015 saw the publication of the Five Presidents' Report, which revived the idea of deeper reform of the EMU.

Cyclical and structural alignment of the Czech economy with the euro area economy

Greater alignment of the Czech economy with the euro area economy is a necessary condition for the euro adoption costs arising from the loss of the Czech Republic's own monetary policy to be relatively small.

The **degree of real economic convergence** is an important indicator of the Czech economy's similarity to the euro area. A higher level of such convergence fosters greater similarity of long-run equilibrium development and can also foster a lower likelihood of misalignment in the shorter run. A higher degree of convergence in the economic level prior to ERM II entry and

prior to euro adoption should further increase the relative price level, which will reduce the potential future pressures for growth of the price level and equilibrium appreciation of the real exchange rate after joining the euro area. The Czech economy had been gradually converging towards the euro area in real terms before the financial and subsequently economic crisis broke out in 2008. However, this trend halted in 2009 and has only renewed in the last two years. In 2014, the relative economic level of the Czech Republic reached almost 79% of the euro area average, visibly exceeding the 2007 pre-crisis figure for the first time. The price level in the Czech Republic relative to the euro area is also slightly higher compared to 2007 (in 2014 it stood at 63%); however, it has decreased in relative terms from the historical high reached in 2008, correcting the excessive appreciation of the koruna recorded in the pre-crisis period and then in 2013–2014 reflecting the weakening of the koruna due to the Czech National Bank's use of the exchange rate as an instrument for further easing monetary policy. The wage level in the Czech Republic in 2014 was just under 40% of the average euro area level when converted using the exchange rate and just under 60% when converted using purchasing power parity. According to the analyses, gradual equilibrium real appreciation of the koruna against the euro can be expected over the next five years provided that real GDP convergence continues. Continuing real appreciation of the exchange rate following euro area entry would mean a positive inflation differential vis-à-vis the euro area and a related rise in inflation, which would also result in low or even negative real interest rates.

Sufficient **cyclical alignment of economic activity** increases the likelihood that the single monetary policy in the monetary union will be appropriately configured from the perspective of the Czech economy. The analyses indicate a sustained above-average degree of alignment of the Czech Republic with the euro area in terms of overall economic activity, as well as exports and, to a lesser extent, industrial production. These variables show relatively high levels even when adjusted for the strong common external shock in the form of the global financial and economic crisis.

Correlation analysis of the **cyclical component of unemployment**, defined as the difference between the actual unemployment rate and its estimated equilibrium level, offers another possible view of the economy's alignment with the euro area. Significant deviations in the cycle and the size of unemployment gaps could lead to suboptimal monetary policy in the single currency area. The alignment of the Czech Republic's unemployment rate gap with the overall gap in the euro area can be assessed as relatively high.

Similarity of the **structure of economic activity** with the euro area should reduce the risk of asymmetric economic shocks. The persisting relatively high share of industry and the lower share of services in the Czech economy compared to the euro area may mean a higher risk of asymmetric shocks, to which the potential single monetary policy will not be able to respond in full. In addition, the differences in the structure of the Czech economy vis-à-vis the euro area economy are continuing to widen slightly, so structural misalignment may become a risk as regards adopting the single currency.

Fast convergence of **nominal interest rates** in connection with joining the euro area acted as an asymmetric shock in some economies in the past, generating macroeconomic imbalances and risks to financial stability. For a country planning to enter the monetary union, earlier gradual interest rate convergence is therefore an advantage. The difference between Czech and euro area market interest rates has long been very small. Unlike in Hungary and Poland, the Czech Republic did not record significant growth in the interest rate differential vis-à-vis the euro area in 2009 and 2012. The level of Czech nominal interest rates has therefore long been close to rates in stable euro area countries, hence there is no risk of euro adoption leading to a rapid fall in rates and related emergence of macroeconomic imbalances. This also indicates that financial markets view the Czech Republic's government debt situation as sustainable.

The **exchange rate** of the koruna against the euro and dollar, as well as its volatility, has been fundamentally affected since November 2013 by the Czech National Bank's use of the exchange rate as an additional instrument for easing monetary policy. Following the announcement of the exchange rate commitment, the exchange rate stabilised just above CZK 27 to the euro. This led to an increase in the correlation between the exchange rate of the koruna against the dollar and that of the euro against the dollar. Even in the previous period, however, this correlation was the highest and most stable by comparison with the currencies of the Central European region. Turning to the **volatility of the exchange rate against the euro**, a one-off increase in the historical volatility was seen after the Czech National Bank adopted its exchange rate commitment in late 2013. In the following two years, the historical volatility fell to its lowest level in the entire period under review. In the case of the Czech Republic, the volatility of the exchange rate against the euro has been the lowest among all the new EU Member States under comparison over the past ten years, even during the global financial and European debt crisis.

The Czech economy's strong **trade and ownership links** with the euro area increase the benefits of eliminating potential fluctuations in the exchange rate and reducing transaction costs. The euro area is the destination for 65% of Czech exports and the source of 61% of Czech imports. In the case of exports, this is the highest level among the countries under comparison; in the case of imports, only Portugal and Austria have higher levels. The share of intra-industry trade is relatively high as well. The ownership linkages in the Czech economy, as measured by the ratio of foreign direct investment from the euro area to GDP, are the highest among the countries under comparison; the ownership linkages in the other direction (i.e. into the euro area) in the Czech Republic are the highest among the new Member States, but lower than in the old EU Member States.

The **financial sector** in the Czech Republic is still significantly smaller than that in the euro area. Moreover, the more than three-year-long convergence in the degree of financial intermediation in the Czech Republic to the euro area levels halted in 2014. The depth of financial intermediation, as measured by the ratio of financial institutions' assets to GDP, is less than one-third of the value for the euro area. However, the depth of financial intermediation in the euro area should not be regarded as a target, as the financial crisis highlighted the risk of having an excessively large financial sector. The shallower financial intermediation in the Czech Republic is mostly due to lower indebtedness of the Czech private sector compared to the euro area. Nevertheless, gradual deleveraging of the private sector as a percentage of GDP is taking place in the euro area (from 166% of GDP in 2011 to 145% of GDP in 2014), while the debt ratio is increasing slightly in the Czech Republic (from 58% of GDP to 60% of GDP in the same period).

The **structure of the financial assets and liabilities of Czech non-financial corporations and households** is similar overall to that of euro area entities, but still shows some differences. Compared to advanced euro area countries, shares and other equity have a higher weight in the net debtor position of Czech corporations. This is due to the fact that foreign ownership is common. By contrast, the share of loans is lower. Corporations in the Czech Republic have the highest levels of highly liquid assets relative to the other countries under comparison. The ratio of liabilities in the form of securities to GDP is almost comparable with that in the euro area due to higher issuance of securities, corporate bonds in particular. The net debtor position of Czech corporations fell between 2013 and 2015. The net creditor position of Czech households is about half that in the euro area. Moreover, as in the case of corporations, there are persisting differences in structure; in particular, the debt ratio is half that in the euro area, and there is an inverse ratio of the liquid to the investment component of households' assets.

The **effect of monetary policy rates on client rates** in the Czech Republic does not differ greatly from that in the euro area. Rate transmission is fast, and more than half of it is taking place within one month. The global financial crisis led to a temporary weakening, or slowdown, of the transmission of monetary policy interest rates in the Czech economy as a result of an increase in client risk premia. This, however, is a traditional sign of cyclicality associated with a tightening of credit conditions. The spread between client interest rates on corporate loans and short-term market rates in the Czech Republic is lower than that in the euro area. The average for the euro area as a whole in this regard is affected by the countries on its southern periphery, where interest rates are substantially higher than in the core countries. The differences in client interest rates across countries represent one of the main challenges to ensuring that the single monetary policy has a symmetric effect. The structure of interest rate fixations on new loans to non-financial corporations is similar to that in the euro area. The same basically goes for mortgage loans, although in the Czech Republic they are dominated by loans with fixations of up to five years, while in the euro area longer fixations are more common.

Differences in **inflation persistence**, i.e. the speed at which inflation returns to equilibrium after a shock, can result in the single monetary policy having different impacts in the individual countries of the monetary union. Inflation persistence in the Czech Republic has long been around the average among the countries under comparison. The difference is not significant even compared to the euro area core countries. Inflation persistence thus does not pose a significant risk to the symmetric effect of the single monetary policy in the Czech economy after euro adoption.

The analysis of **alignment of financial markets** (the money, foreign exchange, bond and stock markets) with the euro area reveals that, as in the previous period, synchronisation in the individual segments of the Czech financial market has long been mostly high and comparable with the euro area countries. A natural exception is still the money market, which was already showing a lower degree and speed of integration in the pre-crisis period. In 2009, situation in the Czech financial markets started to improve and then returned gradually to the pre-crisis degree of alignment with the euro area on all the markets under review. However, this trend continues to be affected by active central bank policy-making focused on mitigating the impacts of the crisis, including unconventional measures.

The degree of **euroisation** in the Czech Republic has long been low and remains the lowest in the Central European region, although it has been gradually rising in the recent period. The low level of euroisation is due to economic agents' high trust in the domestic currency amid sustained low and stable inflation and low nominal interest rates. The use of foreign currency is concentrated primarily in the sector of corporations involved in foreign trade and in the commercial property, insurance and financial intermediation sectors. Foreign currency loans have long been used by corporations as a form of natural hedging against exchange rate risk. Unlike in the other countries in the region, Czech households' demand for foreign currency deposits and loans is negligible.

Adjustment mechanisms in the Czech economy

If set correctly, **fiscal policy** – like monetary policy – should have a countercyclical effect and thus be a stabilising element for the economy. Otherwise it becomes a source of deepening macroeconomic imbalances and economic shocks itself. The closer the structural part of the government budget deficit is to zero and the lower is the accumulated government finance debt, the more room there will be at a time of economic downturn for automatic stabilisers to function and countercyclical discretionary measures to be implemented. Czech budget policy was characterised by chronic deficits and a procyclical effect for a major part of the period

under review. Fiscal policy had the desirable countercyclical nature in 2009, when government anti-crisis and other measures were adopted, and is currently also countercyclical in 2014–2015. The fiscal consolidation launched in 2010 significantly reduced the budget deficits, albeit at the cost of a procyclical restrictive effect of fiscal policy and an economic downturn in 2012 and 2013. In addition, the fall of the economy into recession made the government shift its originally declared intention to comply with the medium-term budgetary objective in 2015 to 2018. Meeting the medium-term budgetary objective is a precondition for fiscal policy to be ready to fulfil its macroeconomic stabilisation role effectively after the loss of independent monetary policy associated with euro adoption. The structural component of the government sector deficit is expected to decrease slowly in the years ahead, following its current temporary increase. The Czech Republic's total general government debt is lower than that of many EU countries. However, the high and steadily rising share of mandatory expenditures poses a risk to public finance sustainability. Nevertheless, according to the government's draft state budget, mandatory expenditures are expected to decline moderately in 2016. Coping with population ageing by reforming the pension and health systems will also be of key importance for sustainability. Although compliance with the fiscal convergence criteria can thus be expected in the years ahead and the preparedness to enter the euro area has improved in this respect, the functioning of fiscal adjustment mechanisms remains a limiting area in the assessment of the Czech Republic's ability to adopt the euro.

The **labour market** is another important mechanism through which the economy can cope with asymmetric shocks in the absence of independent monetary policy. The functioning of the Czech labour market is comparable to that in other EU Member States. However, its weak points still include relatively high implicit labour taxation and relatively low labour mobility. Since 2014, the economic recovery has resulted in a decline in the total unemployment rate, which is one of the lowest among the countries under comparison, and in a reduction in the number of unemployed persons amid an increase in vacancies. This indicates that developments on the labour market are mostly cyclical in nature and its flexibility is not likely to have changed. The share of foreign nationals in the population more than doubled compared to the period before and shortly after accession to the EU, but has been flat at substantially lower levels than those typical of the advanced euro area countries in recent years. The Czech Republic still has large differences in unemployment across regions, despite the fact that they have gradually shrunk. On the other hand, the labour market is showing signs of greater flexibility, primarily in the form of growth in the number of employees working shorter hours. This has been particularly apparent in the economic recession phase in recent years. The rate of economic activity among the working age population has also gone up.

The **institutional rules on the labour market** have a strong effect on its flexibility. The ratio of the minimum wage to the average wage was falling until mid-2013, when the minimum wage was increased. Since then it has been rising steadily, and the current government plans to gradually raise it further. A high minimum wage can have an adverse effect mainly on low-skilled jobs, where it can greatly reduce wage flexibility and increase long-term unemployment. Overall labour taxation in the Czech Republic is relatively high, and has increased slightly further in the last year. The implicit taxation rate, expressing the average effective tax burden, is the third highest among the countries under comparison. The incentives to work arising from the configuration of taxes and benefits remain relatively low in the Czech Republic, especially for the initial phase of unemployment of childless individuals, and compared to some countries also for long-term unemployed families with children. Protection of regular employment is still relatively high, while protection of temporary jobs is relatively low.

The **response of wages to the business cycle** can enhance the economy's ability to absorb shocks to which the single monetary policy cannot respond sufficiently. The Czech Republic is around the average among the countries under comparison in terms of the strength of the

correlation between output and unemployment and the correlation between output and wages. However, these correlations are weaker than in the euro area as a whole. In recent years, however, the Czech Republic has seen labour market adjustment through the aforementioned use of shorter working hours, and a decline in real wages was also recorded in 2012–2013.

Although the Czech Republic's position in the area of **product market flexibility** improved slightly compared to the previous year, its business environment is more burdened by administrative barriers (barriers to starting a business in particular) than those in the other countries under comparison. The Czech Republic's ranking as regards barriers to growth and competitiveness has been relatively unchanged since 2006. Its score for factors affecting economic growth has been improving, while quality of institutions is a weakness. Although the Czech corporate tax rate, as measured by the statutory tax rate, is one of the lowest among the countries monitored, the overall tax burden as measured by implicit taxation of corporations in the Czech Republic is one of the highest.

Stability and effectiveness of the **banking sector** is a necessary condition for the sector to be able to absorb shocks. By contrast, an unsound banking sector can generate shocks and propagate them to the real economy. It can also cause problems in the fiscal area. The resilience of the Czech banking sector to adverse shocks is high by international comparison, and has further increased over the last year. The domestic banking sector is therefore not a source of shocks and should be able to absorb fluctuations emanating from the domestic economy or from abroad. The link of domestic banks to the euro area banking sector is due mainly to the foreign ownership structure of the domestic banking sector, which may pose a risk upon the Czech Republic's potential entry into the banking union due to the transfer of many banking supervision competences.

C   THEORETICAL FOUNDATIONS OF THE ANALYSES

The basic theoretical starting point for the analyses contained in this document is the **theory of optimum currency areas**.[3] This theory examines whether individual countries are good candidates for introducing a single currency. In the context of the creation of the single European currency, knowledge of this theory is often used to assess the appropriateness of the adoption of the euro by the existing euro area countries and the rationality of the same step for the new EU Member States.

Although economists agree on the general set of fundamental **costs and benefits of the single currency**, the significance of the individual arguments may change over time or depending on the specific features of the economies concerned. The main benefits are improved functionality of money and reduced trade costs, including in particular the elimination of exchange rate risk and the costs of hedging against it, as well as lower transaction costs and easier-to-compare prices. Benefits may also potentially arise from increased macroeconomic and financial stability, reflected in a more favourable investment environment, thanks to the elimination of excessive exchange rate fluctuations, financial market integration and potentially an overall increase in the credibility of the monetary authority.[4]

The costs are broken down into non-recurring ones, associated with the change of legal tender,[5] and long-term ones. The latter include a reduction in the effectiveness of domestic macroeconomic policies and the risk of greater volatility in economic activity and consumption due to the loss of independent interest rate policy and the exchange rate upon transition to the single currency. The reason is that the single monetary policy cannot respond to a sufficient extent to shocks which affect only a small part of the currency area's economy. The costs of the loss of an independent currency will depend on the extent to which the exchange rate absorbs real shocks or, on the contrary, generates real and/or financial shocks,[6] on the degree of alignment of the domestic business cycle with the cycle of the currency area, and on the ability of the economy to employ other adjustment mechanisms.[7] Additional costs may then arise from the build-up of imbalances in the monetary union as a result of suboptimal economic policy settings for individual economies or in connection with resolving the economic problems of monetary union members.

The potential costs and benefits differ depending on the specific situation, and the decision to introduce the single currency is – in addition to economic arguments – motivated by political

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[3] Mundell (1961), McKinnon (1963) and Kenen (1969) are regarded as the cornerstones of this theory. A newer literature survey can be found, for example, in De Grauwe (2013). Also worth mentioning is Dellas and Tavlas (2009), who describe the history of the optimum currency area theory over the last fifty years, including the contributions of modern macroeconomic models. Beetsma and Guiliodori (2010) is a recent overview relating specifically to the euro. Unlike the other studies, it mentions the elimination of the risk of currency wars (competitive devaluations) as one of the benefits of the single currency.

[4] The enhanced macroeconomic stability should facilitate a low and relatively stable interest rate level and a higher level of investment. An increase in foreign trade and competition, productivity growth and subsequent GDP growth per capita can also be expected. However, financial market integration can be a drawback at times of financial crises, which can spill over to other countries as the recent situation has shown. Similarly, recent developments have shown that a fall in interest rates and the elimination of exchange rate volatility can reduce the pressure for macroeconomic discipline in individual countries, with negative consequences.

[5] The non-recurring costs include the physical exchange of money, the conversion of all contracts to the new accounting unit and so on. In the context of transition to another currency, there is also a risk of incorrectly setting the conversion ratio, as an overvalued exchange rate may damage the competitiveness of the economy in the long term, while an undervalued exchange rate may generate inflationary pressures.

[6] A fundamental study in this area is Farrant and Peersman (2006), who, on a panel of advanced countries data, find evidence that the exchange rate is a source rather than an absorber of real shocks. By contrast, Audzei and Brazdik (2012), using Czech data, conclude that the exchange rate operates as an absorber rather than a generator of shocks in the case of the Czech koruna.

[7] For new EU members planning to join the euro area, another possible cost is fulfilment of the Maastricht criteria prior to euro adoption, especially the price stability criterion. A potential cost for converging countries is a persisting inflation differential (Brůha and Podpiera, 2007), which may be reflected in a rise in nominal client rates and a fall in real client rates and may adversely affect the economy (examples for individual countries can be found in the following papers: Ahrend et al. (2008), Martin (2010), Hampl and Skořepa (2011) and Lin and Treichel (2012).

and social demand.[8] However, knowledge of the theory of optimum currency areas can also be applied to identify possible sources of macroeconomic imbalances associated with entering the monetary union and to assess the economy's ability to benefit from membership. Factors that contribute to the benefits of the single currency (compared to a free nominal exchange rate) make up the set of **optimum currency area properties**.[9]

One of the key properties determining the appropriateness of joining a currency area is the degree of **openness of the economy** and its economic links with the other countries of the currency area. The greater the integration, the higher the potential benefits of the single currency against which the costs are gauged. These benefits reflect above all the elimination of exchange rate risk in economic relations, which reduces the costs of foreign trade and foreign investment and may lead to a strengthening of such relations. However, empirical studies have not produced robust conclusions.[10]

Other properties tend to reduce the negative aspects of the loss of certain macroeconomic adjustment instruments at country level, and can be summarised under the headings of **symmetry and flexibility**.[11] The traditional optimum currency area criteria therefore also include similar economic structure and economic shocks, output and consumption diversification, a similar inflation rate, stable terms of trade, mobility of labour and other production factors, price and wage flexibility, and fiscal and political integration. Some papers add to the traditional criteria democratic legitimacy and economic agents' trust in central institutions and their policies.[12]

An important role in the theory of optimum currency areas was played by the **endogeneity hypothesis**, which holds that changes leading to an optimum currency area will be an automatic result of the very introduction of the single currency.[13] However, it should be noted that greater integration does not necessarily mean convergence of economic structures. On the contrary, the elimination of trade or financial barriers may lead to growth in specialisation, which may increase the probability of asymmetric shocks.[14] That said, increased specialisation need not be undesirable for macroeconomic stability and welfare in the monetary union. On the contrary, it may increase the intensity of trade and hence amplify the benefits of the single currency.[15] Stronger trade integration may result in greater alignment of business cycles.[16]

The conclusions of **empirical analyses for the euro area** are mixed. On the basis of pre-crisis data, the review article by De Grauwe and Mongelli (2005) finds support primarily for the endogeneity hypothesis, i.e. that the similarity of economic shocks probably increases with greater economic integration. Babetskii (2005) shows an increase in the correlation of demand shocks in new EU member countries with the euro area and Germany amid rising trade

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[8] Eichengreen (2008) and Spolaore (2013).

[9] Mongelli (2002).

[10] The original literature was fairly optimistic as regards the effects of the single currency on trade. Rose (2000), for example, found effects amounting to hundreds of per cent. Micco et al. (2003) report estimates that are much lower (a few per cent), but are statistically significant. However, some later estimates – such as Baldwin (2006) – are far more sceptical, and Havránek (2010) even finds in a meta-analysis that the effect of euro adoption on trade between euro area countries is not statistically significant and with high probability is less than 5%. Glick and Rose (2015) revised the original study by Rose (2000) and showed that the results of that study are too sensitive to the econometric specification of the model. Conversely, selected newer literature returns to positive, albeit much more modest estimates than the original study by Rose (2000) (for instance, Gavin and Siedschlaga, 2011, find a statistically significant effect for Ireland; the estimates are consistent with the results of Micco et al., 2003). Furthermore, Bergin and Lin (2012) present evidence that the effects of the single currency on trade may be visible before euro adoption and this should be taken into account in empirical studies. The differences between the results of individual studies and the sensitivity of those results to econometric assumptions thus indicate that the impact of the monetary union on trade cannot be reliably estimated at present, as stated by Glick and Rose (2015).

[11] De Grauwe and Mongelli (2005).

[12] Mongelli (2013)

[13] Frankel and Rose (1998).

[14] Krugman (1993) and Kalemli-Ozcan et al. (2003).

[15] Hughes-Hallett and Piscitelli (2002) show that this effect occurs if the convergence in institutional structures and the symmetry of shocks are sufficient.

[16] Frankel and Rose (1997).

integration. Crespo-Cuaresma and Amador (2013) find that the euro area has shifted to a new equilibrium with less misalignment of business cycles compared to both historical data and other OECD countries. In recent years, however, opinions have been gaining ground that the theory of endogeneity of currency areas has not been confirmed, particularly in the case of the EMU. Giannone et al. (2009) state that euro adoption has not significantly changed the characteristics of member countries' business cycles, as countries with lower long-run volatility retain this characteristic after euro area entry. Likewise, the characteristics of countries with historically higher volatility in economic activity and lower business cycle correlation with the euro area average persist. Estrada et al. (2013) show that price levels in euro area countries have converged, whereas the pace of convergence of other variables has been comparable with non-euro area countries.

Duran and Ferreira-Lopes (2015) explore the **determinants of business cycle alignment** in the euro area, concluding that trade aligns business cycles while differences in labour market regulation act in the opposite direction. Similarly, Inklaar et al. (2008) find support for the assertion that trade increases cycle synchronisation, but this effect is not significantly greater than the effect of differences in fiscal and structural policies; those differences conversely reduce cycle alignment.

The empirical literature analysing the **symmetry of economic shocks** hitting the euro area countries is also divided. Giannone and Reichlin (2006) and Stavrev (2008) find the significance of common shocks to be decisive in explaining the variability of economic output. Different transmission of common shock may also have an asymmetric effect, but its effect is considered to be generally rather small. As for empirical research covering the post-crisis period, there is a consensus that shocks have different effects on different groups of countries. For example, Ferroni and Klaus (2014) find that macroeconomic fluctuations in Spain are caused by domestic shocks and diverge from those in Germany, France and Italy, where common shocks dominate. Similarly, Cavallo and Ribba (2015) conclude that economic fluctuations in three large euro area countries (Germany, France and Italy) are due significantly to common shocks, while those in small countries (Ireland, Portugal and Greece) are explained by domestic shocks.

Different transmission of the single monetary policy in different currency area countries can also be a significant source of asymmetric shocks. There is again no satisfactory consensus yet among empirical studies in this area. Jarocinski (2010) concludes that monetary policy transmission is similar in new and old euro area countries. Similarly, Cavallo and Ribba (2015) find evidence for a homogeneous response to monetary policy shocks in euro area countries. On the other hand, Havránek and Rusnák (2012) show that monetary transmission is faster in countries with more advanced financial markets. This is confirmed for the euro area by De Santis and Surico (2013) and van Leuvensteijn et al. (2013), who find differences arising from differences in the structure of banking sectors in individual countries. Georgiadis (2015) finds differences in the reaction to monetary policy and contributes them to differences in labour market regulation. Havránek et al. (2014) also find significant differences between European countries in the response of consumers to interest rate changes, and Havránek et al. (2015) point to different strengths of habit formation in consumption across countries, which causes differences in monetary policy transmission. Barigozzi et al. (2014) find convergence in responses to monetary shocks in euro area countries, but assert that this convergence has not reached full alignment and major differences persist across countries.

The above studies exploring the symmetry and transmission of shocks are typically empirical. However, there are also studies based on **structural macroeconomic models**. The currently most common modelling technique involves dynamic stochastic general equilibrium (DSGE) models. Ferreira-Lopes (2010) explores the costs of euro adoption for Sweden and the UK, concluding that the costs of euro adoption would outweigh the benefits in these countries.

A general conclusion of the model analyses is that the costs increase as domestic demand shocks (fiscal shocks in particular) grow in importance and decrease as the degree of trade integration declines. Ferreira-Lopes (2014) simulates the costs of euro adoption in Central European countries using a DSGE model and concludes that the costs of the loss of independent monetary policy are high for the Czech Republic and Poland relative to Hungary because of the large significance of domestic demand shocks (e.g. government consumption). The general conclusions of structural models are confirmed by an ex-post empirical study by Gomis-Porqueras and Puzzello (2015). Angelini et al. (2013) investigate differences in the reactions to negative shocks in selected euro area countries using a DSGE model and point to differences between the Baltic countries and the old Member States.

European Commission (2006) discusses the importance of the **impacts of euro adoption in the transition phase**. These include a fall in the risk premium, an easing of the credit conditions and the development of productivity in the tradable and non-tradable sectors. As a result of the monetary policy response, these shocks can also have secondary impacts on other countries. Ahrend et al. (2008) and Lin and Treichel (2012) point out that an excessive decrease (compared to that implied by the Taylor rule under independent monetary policy) in long-term interest rates after the adoption of the single currency in some economies gave rise to bubbles in asset markets, property markets in particular. Overvaluation of the real exchange rate, identified for Greece and Portugal by El-Shagi et al. (2014), may also be a risk to macroeconomic stability. Similarly, Frankel (2008), despite supporting the endogeneity hypothesis in the euro area, considers the risk of asymmetric shocks in the transition phase to be substantial; on the other hand, alignment increases over time even without euro adoption.

A significant body of literature (e.g. De Grauwe, 2010a,b; Wyplosz, 2010a,b) critically examines the **experience of the euro area during the crisis** and the efforts to strengthen fiscal policy coordination. Eichengreen (2009) considers the global crisis of 2008–2009 to be a textbook example of an asymmetric shock, but he also claims that small converging countries are better off inside the euro area than outside it during a crisis. On the other hand, some have claimed that less competitive economies diverge from the core of the euro area during a crisis (Caporale et al., 2015). Razin and Rosefielde (2012) point out that the main problem in the euro area during the crisis was weak political integration. Mongelli (2013) argues that the euro area may be functioning and beneficial to all members even without a fiscal union provided that rescue mechanisms are introduced within the banking union. This is backed by a recent study by Neri and Ropele (2015) showing that the ECB's monetary policy helped reduce the impacts of the debt crisis even without fiscal coordination.

Another section of the literature assesses the **risks arising from high debt levels** in a large proportion of euro area countries, which may pose a risk to sustainable economic growth in the monetary union as a whole. Baum et al. (2013) point out that a higher debt level in the euro area countries will not hinder economic growth until it exceeds about 70 % of GDP. However, Corsetti et al. (2013) explain this by observing that governments have often started to adopt restrictive measures around this limit, which weakened economic growth. Arnold and van Ewijk (2014) point out that the differences in rates on government bonds are a factor causing differences in credit conditions across euro area countries and are thus a risk to further convergence.

Several authors analyse the rates of **economic growth of euro area countries compared to non-euro area EU countries** during and after the global crisis. Singer (2015) shows that non-euro area EU countries have been outperforming the euro area since 2008 by roughly one percentage point a year on average. Likewise, Balcerowicz et al. (2013) report that the euro area countries grew more slowly than the EU average over the period 2008–2013. However, these results are affected by the high heterogeneity of the group of countries under review. The lower average growth of the euro area countries was caused mainly by economies on the

southern periphery with structural and debt problems (Italy, Greece, Spain and Portugal). This accords with the findings of ECB (2015) that countries which adopted the euro after 2002 and non-euro area EU countries both showed higher average economic growth rates over the period 1999–2014 than the original euro area countries. Owing to this heterogeneity, empirical studies do not provide a clear conclusion on whether euro adoption would in itself hinder economic development. The data suggest that the effects of euro adoption during and after the crisis depend on the structural characteristics of each country. Unfortunately, we currently lack rigorous empirical research on this topic analysing in greater detail the effects of euro adoption on economic growth taking into account all relevant structural characteristics of the economies under review.

D   ECONOMIC ALIGNMENT OF EURO AREA COUNTRIES

The global financial and economic crisis revealed structural weaknesses in some economies and low institutional readiness of the euro area to resolve such situations. To address this situation, a number of institutional changes have been made which are having large impacts on the functioning of the monetary union. It is thus important for countries that have undertaken to adopt the euro, such as the Czech Republic, to monitor institutional and economic developments in the euro area as a whole in addition to domestic parameters of economic alignment with the euro area.

1   ANALYSIS OF EURO AREA ECONOMIC COHESION

The previous protracted subdued economic activity in the euro area, especially in the southern periphery, raises the question of whether it is optimal or even sustainable for the monetary union to exist in its current composition of differently performing economies. Despite having met the Maastricht criteria prior to euro adoption (thanks only to inaccurate statistics in the case of Greece), the euro area countries were and still are heterogeneous and some of the differences between them widened during the debt crisis. This section tracks the alignment of key macroeconomic variables of euro area countries over the last ten years on the basis of simple descriptive statistics. The last two years have seen an improvement in some convergence indicators or a slowdown in divergence of the variables under review. On the other hand, persisting large differences in the unemployment rate, coupled with the still unsatisfactory fiscal situation of some member countries, represent a risk to further real convergence in the euro area. From this perspective, even the inflation convergence in euro area countries cannot be regarded as a positive trend, as it is taking place at low levels, which pose a risk to the still fragile economic recovery and make the resolution of debt problems more difficult.

1.1   CONVERGENCE OF REAL AND NOMINAL VARIABLES

A prerequisite for an optimum currency area is a high degree of similarity of the level of economic activity as measured by real GDP per capita. In addition, the successful pursuit of a single monetary policy requires economies to be aligned in terms of the business cycle, which can be expressed using GDP growth and unemployment.

The standard deviation and the comparison between the arithmetic mean and the median of **real GDP per capita** in the euro area over the past ten years reveal that the levels of GDP per capita differ considerably across euro area countries (see Chart 1). Moreover, the differences in economic performance between member countries had been widening moderately before the onset of the global financial crisis. The subsequent decrease in the standard deviation in 2009 was mostly due to a larger absolute fall in real GDP in better performing countries. Later, however, the standard deviation mostly increased again, with some fluctuations. This was due to the economies' different rates of recovery from the crisis-related contraction. The difference between the arithmetic mean and the median of GDP per capita in euro area countries increased the same time. This also points to an increase in the differences in performance of individual economies.

Chart 1: Real GDP per capita in euro area countries
(EUR)
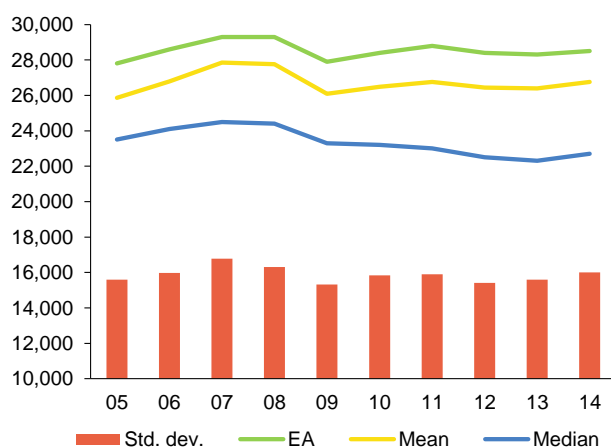
Note: GDP at 2010 prices. The mean series depicts the arithmetic mean of real GDP per capita in the given year across euro area countries.

Source: Eurostat, CNB calculations.

Chart 2: Beta-convergence of real GDP in euro area countries
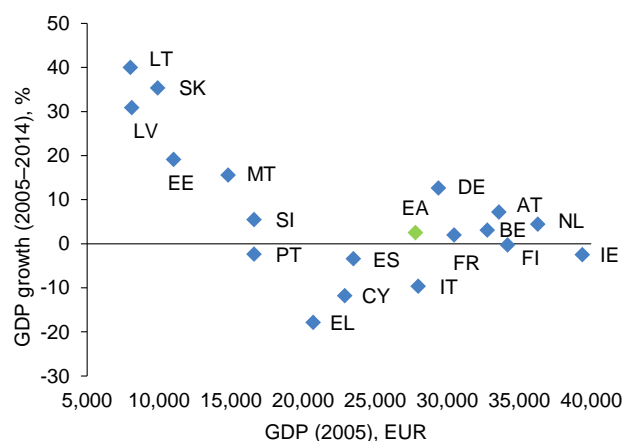
Note: The chart depicts the relation between GDP growth per capita in each country and its initial level (beta-convergence). X-axis – the GDP per capita of each country at 2010 prices. Luxembourg is not given in the chart due to the high number of foreign workers in that country.

Source: Eurostat.

In addition to descriptive GDP statistics, it is also interesting to look at the **rate of growth of individual euro area countries relative to their original level of economic development** (see Chart 2). In the optimum case, there should be beta-convergence in the monetary union, i.e. poorer countries should grow faster than wealthier ones and the differences in performance should thus level out. The faster growth in poorer economies is theoretically due to their initially lower capital stock, the adoption of technologies from wealthier countries and deepening trade integration within the monetary union. New euro area countries, especially Lithuania, Latvia, Slovakia and Estonia, are indeed showing beta-convergence (although this also applied before euro adoption). On the other hand, southern countries with high or quickly rising government debt have recorded a decline in economic activity per capita over the past ten years and have thus diverged from the best performing economies in this regard. It can also be seen that growth in euro area countries is lagging behind that in non-euro area EU countries (see Chart 3).

The **standard deviation of quarterly year-on-year GDP growth rates** in the economies under review shows no significant trend in the long term (see Chart 3). This indicates that their business cycles are displaying no major change in alignment. The dispersion of the countries' growth rates increased in 2008–2009, but this indicator then fluctuated at a similar level as before the crisis. Since 2013, it has been declining moderately as the euro area has gradually been recovering. However, the lower dispersion is due, among other things, to lower growth in previously fast-growing economies. This has negative implications for the future convergence of GDP in the euro area and for the overall growth prospects of the euro area.

Chart 3: Real GDP growth in euro area countries versus non-euro area EU countries
(y-o-y, %)
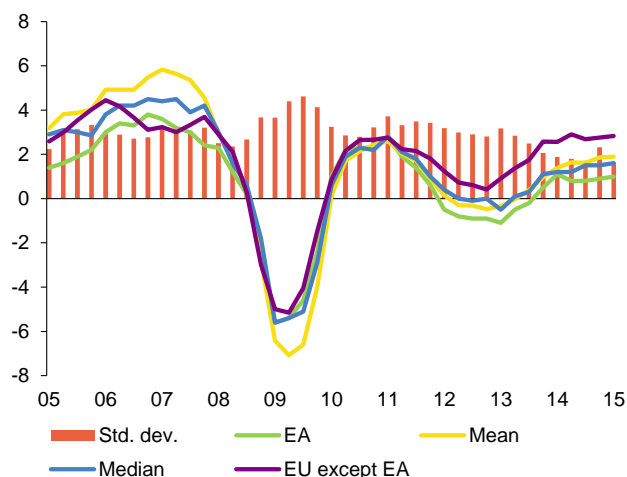
Note: The mean series depicts the arithmetic mean of GDP growth in the given quarter across euro area countries. The median and the standard deviation also relate to euro area countries. For non-euro area EU countries only the arithmetic mean is given. The source series are seasonally adjusted.

Source: Eurostat, EIU, CNB calculations.

Chart 4: Unemployment in euro area countries
(%)
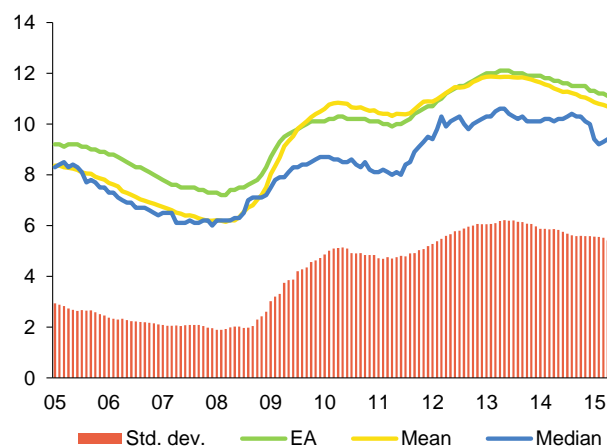
Note: The mean series depicts the arithmetic mean of unemployment in the given month across euro area countries. The source series are seasonally adjusted.

Source: Eurostat, CNB calculations.

In the case of the **unemployment rate** (see Chart 4), the mean and the standard deviation declined as from 2005, mainly because of falling unemployment in the countries with the highest rates (primarily Slovakia, Latvia and Spain). During the financial crisis, conversely, unemployment rose in almost all countries and the rates in the hardest hit countries (Spain, Estonia, Slovakia, Ireland, Greece and Latvia) started to diverge upwards from the other countries, resulting in a substantial increase of the unweighted mean above the median and widening misalignment between countries. This misalignment increased further in the following years, when unemployment rose mainly in the countries hit hardest by the debt crisis. Since mid-2013, unemployment rate misalignment has been declining slightly and the mean rate falling as the economy has gradually been recovering. However, unemployment rates remain very mixed – for example, Germany is experiencing lower levels than before the crisis, while the unemployment rates in Greece and Spain exceed 20%.

In addition to convergence of real variables, **nominal convergence** is important for the successful functioning of the monetary union. Differences in long-term interest and inflation rates signal structural differences and differences in competitiveness across economies. They also lead to differing real interest rates and thus differing monetary conditions in individual countries.

Long-term interest rates were at similar levels in the pre-crisis years (see Chart 5). In 2009, however, they recorded a surge in misalignment as the financial crisis hit individual monetary union member states to different extents and also due to the emerging debt crisis in the euro area. The differences decreased visibly only at the end of 2012 when the ECB announced its outright monetary transactions (OMT) programme, which led to a calming of the situation in euro area government bond markets. The differences continued to decline until around mid-2014. They later increased again due to a rise in the risk premia of the countries on the southern periphery of the euro area. The mean and median yields have also dropped

significantly since the end of 2012. Their downward trend was temporarily interrupted in 2013 after the Federal Reserve announced a planned tapering of its securities purchases, but re-emerged at the start of this year after the ECB announced its government bond purchase programme. However, yields edged up again towards the end of the period under review.

Chart 5: Long-term interest rates in euro area countries

(%)
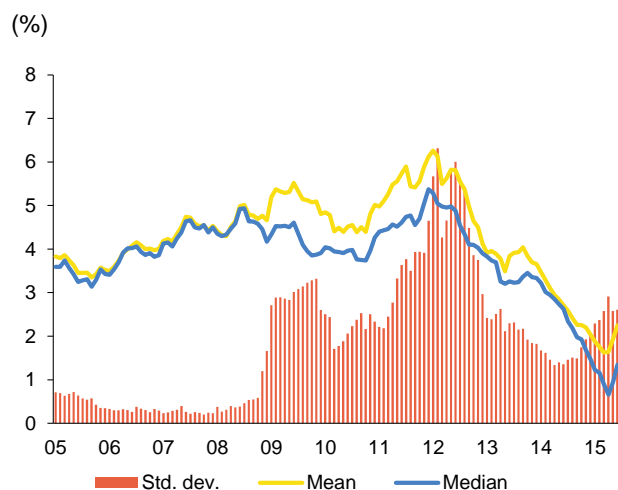
Note: Bond yields for the convergence criteria. The bond maturity is about ten years. Estonia is not included in the chart because a time series is not available.

Source: ECB, CNB calculations.

Chart 6: Inflation in euro area countries

(annual percentage changes)
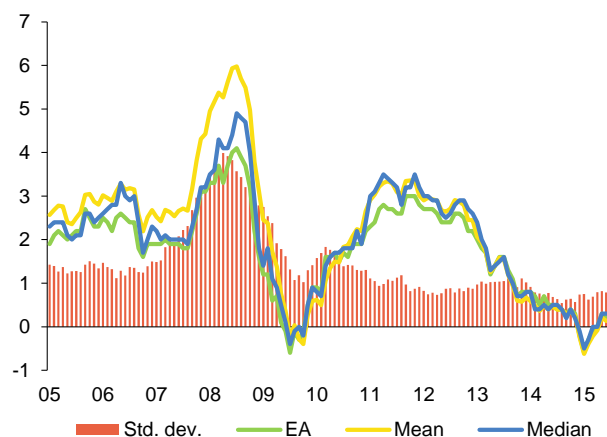
Note: The EA series is a weighted average of the inflation rates of the euro area countries, where the weights are the shares of household expenditure of the given countries in household expenditure in the euro area. The mean series depicts the unweighted arithmetic mean of inflation in the given year across euro area countries. The source series are seasonally adjusted.

Source: Eurostat, CNB calculations.

The level of **inflation** (see Chart 6) in individual euro area countries was relatively aligned until 2007. A temporary rise in misalignment emerged after the onset of the global crisis. At present, inflation is well below the ECB's definition of price stability in all euro area countries. Even the core countries of the euro area have recently been facing very low levels of inflation. Some of them even recorded shallow deflation at the start of this year, mainly because of a decrease in oil prices. Low or even negative levels of inflation pose a risk to further convergence of euro area countries for several reasons. First, the real debt of the southern countries, which are facing deflation, is rising faster than their nominal debt. The deflation in these countries coupled with still relatively high nominal **interest rates** (see Chart 7) means high real interest rates and hence also large real debt servicing costs. Second, the observed low inflation differential of the core euro area countries vis-à-vis the southern countries and the low overall level of inflation mean that the adjustment process and the return of the southern countries' competitiveness via internal devaluation will take longer than it would if the inflation differential was higher. This implies that high nominal convergence may prevent the renewal of real convergence.

The ranking of euro area countries based on six macroeconomic criteria provides an alternative view of their alignment (see Chart 8). The chart shows that the euro area contains **clusters of countries with similar characteristics** and also that countries with high government debt levels often have problematic levels of other macroeconomic indicators. The observed clusters of countries are discussed in more detail in Box 1.

Chart 7: Long-term nominal interest rates and inflation in euro area countries

(%)

Chart 8: Summary of key macroeconomic indicators in euro area countries
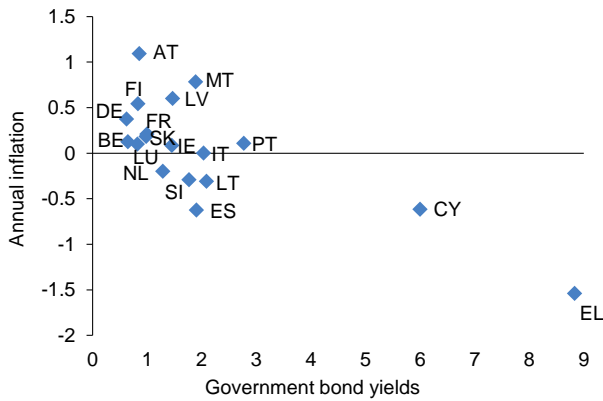
Note: Average nominal 10Y bond yields for convergence purposes and average annual inflation for July 2014–June 2015.

Source: ECB, CNB calculations.
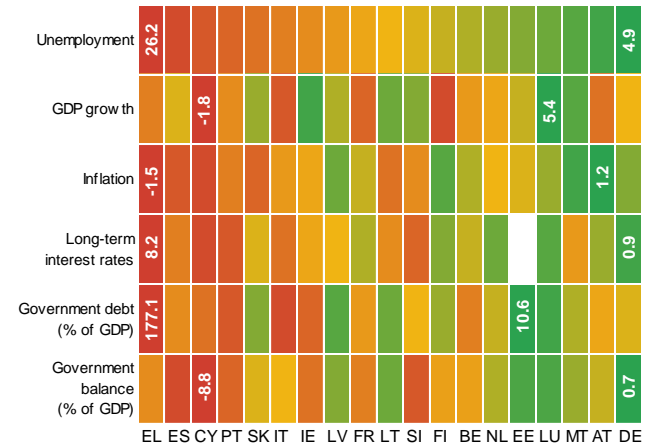
Note: The tile colour indicates the country's ranking according to the average indicator value for January 2014–June 2015. The tile colour for inflation is based on the deviation of inflation rate from 2%; the number on the tile is the level of inflation. The countries were ranked according to the unemployment rate (from highest to lowest). No time series of long-term interest rates is available for Estonia.

Source: ECB, Eurostat, CNB calculations.

Box 1: Structural alignment of euro area countries and the Central European region from the perspective of cluster analysis

Last year's Alignment Analyses offered a view of the economic alignment of euro area countries and Central European countries from the perspective of cluster analysis. This approach divides elements into clusters so as to maximise intra-group homogeneity and inter-group heterogeneity. This results in a dendrogram illustrating the allocation of countries to clusters. One of last year's conclusions was the identification of greater *cyclical* alignment of the Czech Republic with some core euro area countries (for example, Germany and Austria) compared to numerous other current euro area members. The aim of this year's box is to use the same method to assess the *structural* similarity of economies. The structure of economic activity is expressed by the shares of the main sectors of the economy (the 21 NACE sectors) in total value added. The sample of countries was unchanged.

The dendrograms illustrate the countries' different positions in the clusters in 2005 and 2011 (see Chart B1).[17] In both periods, the exclusiveness of Luxembourg as a financial centre and of Ireland as a country oriented towards new technology and financial services is visible. Mixed developments can be observed for the euro area countries that made up cluster 4 in 2005 (the Netherlands, Germany, Italy, Belgium and France). The economic structure of France, Belgium and the Netherlands remained similar throughout the period under review (as in all of them the share of manufacturing decreased while the shares of research,

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[17] The years 2005 and 2011 mark the beginning and end of the period for which a detailed structure of economic activity is available for all the countries in the sample. In reality, 20 sectors were used in the calculations, as the last sector (Activities of extraterritorial organisations and bodies) mostly took a value of zero.

education and health care went up), whereas the share of manufacturing in Germany increased. Moreover, Italy moved to the cluster of the countries on the southern periphery in 2011 and for them there is a visible move away from industry towards services such as real estate activities, administrative activities and public administration.

Chart B1: Dendrograms – sectoral structure
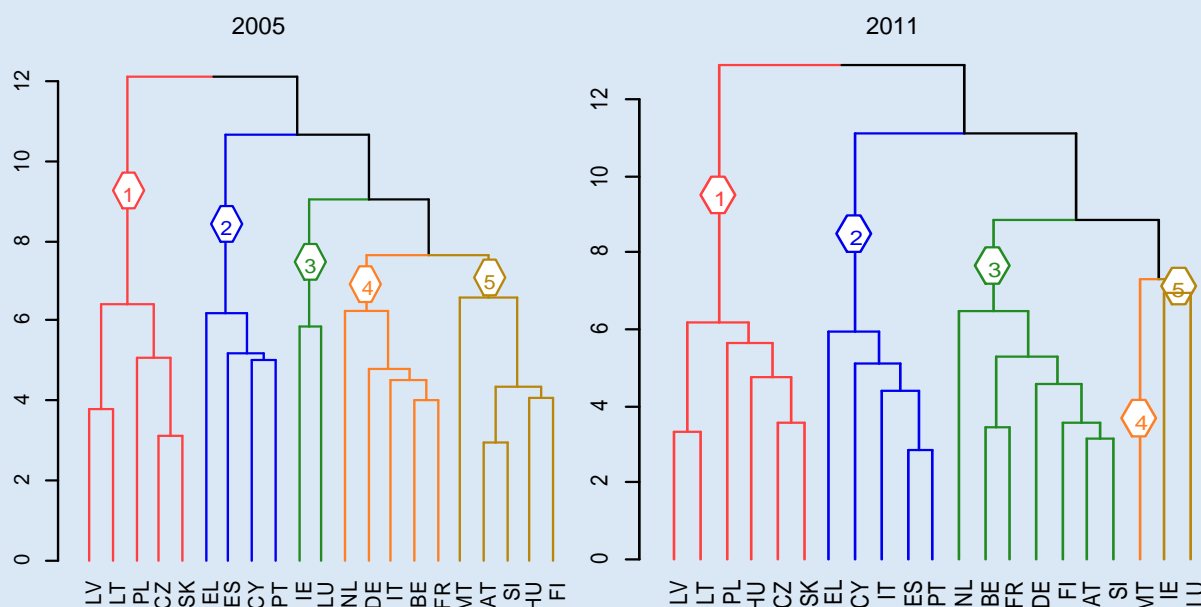
Note: The y-axis shows squared Euclidean distances. The countries are differentiated by colour from the fifth level, i.e. after five clusters have been identified.

Source: Eurostat, CNB calculations.

The countries of the Central European region (cluster 1) saw no major changes in sectoral structure between 2005 and 2011. The Czech Republic, Poland and Hungary have a higher share of industry and a lower share of services than Belgium and France and are structurally closer to Austria and Germany. The cluster analysis for a coarser sectoral breakdown (ten sectors only), which is not given here due to space constraints, even assigns these countries to a single cluster. This is due to a much smaller emphasis on services sectors, which are aggregated in the coarser breakdown.

However, the view of the structure of the economy based on the shares of sectors in value added is very narrow. In the next step, therefore, cluster analysis was also applied to institutional indicators, which will affect potential growth in the long term. These indicators can be divided into four areas: knowledge, the labour market, regulations and quality of institutions. The selection was based on Irac and Lopez (2015), who applied cluster analysis to 27 indicators for euro area countries. A consistent set of 26 indicators was obtained for 2007 for all the countries under review except Malta, Cyprus, Lithuania and Latvia. The final dendrogram is shown on the left-hand side of Chart B2.

Four main clusters can be identified in the sample of countries under review. The countries of the Central European region (cluster 3) are structurally closer to the countries on the southern periphery (cluster 4) than to the other euro area countries (clusters 1 and 2). A closer look at the individual areas (see the right-hand side of Chart B2) reveals that the largest difference between the clusters is in the quality of institutions. The average quality of institutions in the Central European region was around 70% of the average for the full sample of countries in 2007. As regards the indicators for this area, the lowest levels were recorded

by the shares of cluster 3 in the categories of rule of law and corruption (less than 50% and 60% respectively of the average for the full sample of countries). Clusters 3 and 4 also show a lower level of the knowledge indicator, in particular for business R&D spending and the number of registered patents.[18] The Central European region (cluster 3) has better results on average than the southern periphery (cluster 4) when one compares the shares of college-educated persons and the results of students' reading tests.

Chart B2: Structural indicators in 2007
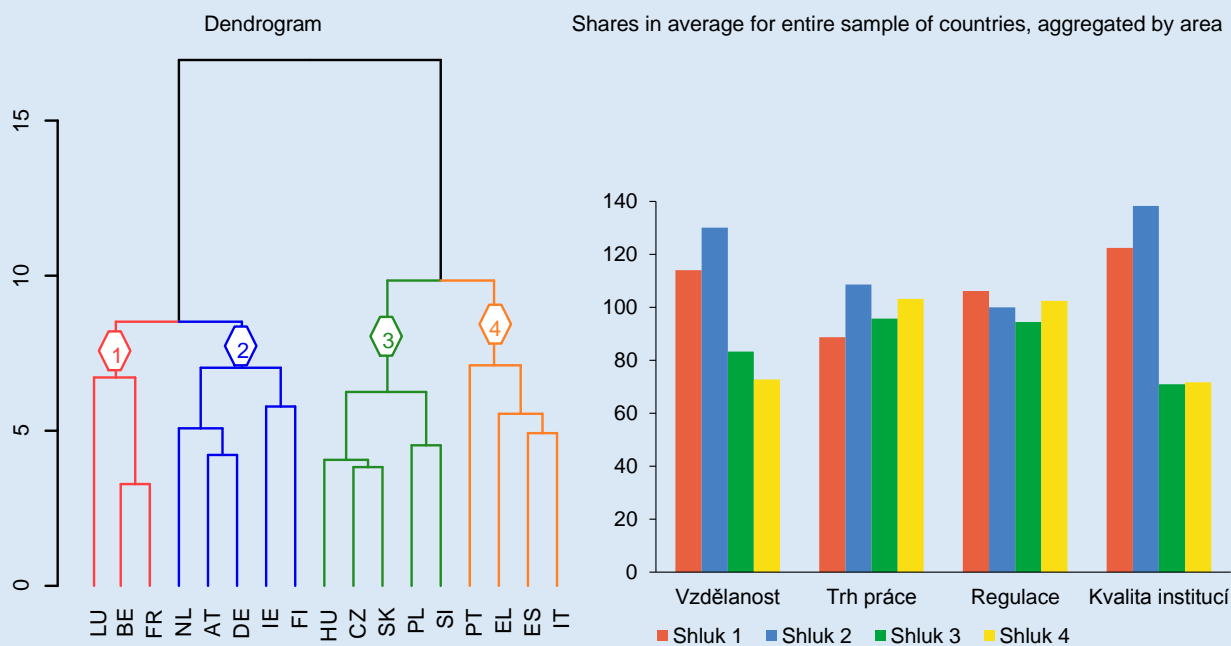
Note: The y-axis shows squared Euclidean distances. The countries are differentiated by colour from the fourth level, i.e. after four clusters have been identified. The shares in the average aggregated by area (the right-hand side of the figure) are calculated as follows: for the individual indicators the averages for the clusters are expressed as a percentage of the average for the entire sample of countries, and the values for the indicators are then averaged for the entire area.

Source: Eurostat, OECD, IMD, World Bank, World Economic Forum, CNB calculations.

Unlike the other areas, the results for regulations (especially as regards access to credit and protection of small investors) are similar for all the clusters. The differences in labour market structure are ambiguous, as the clusters face different rigidities. A higher share of short-term unemployment and greater protection of employees is apparent for the countries on the southern periphery, while a significantly higher share of long-term unemployment is visible the Central European region.

To sum up, the economic structure of the Czech Republic is broadly close to that of Germany and Austria in sectoral terms, although unlike those countries it still features relatively low shares of individual services sectors. As for institutional indicators, it lags behind in R&D spending and in the rule of law and corruption.

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[18] It can be argued that the number of registered patents is not a suitable approximation of the knowledge indicator. It is a company's business decision whether to have an invention patented and sell the licence or to keep it secret and profit from the relevant rent.

1.2 FISCAL SITUATION OF EURO AREA COUNTRIES

For successful functioning of the monetary union without fiscal transfers among its members, it is important that individual governments have room to stimulate the national economy with fiscal expansion (i.e. government expenditure or tax cuts) in the event of negative asymmetric shocks. The previous **(non-)compliance with the Stability and Growth Pact** (deficit and debt criteria) and the number of countries in an excessive deficit procedure (EDP) points to long-lasting insufficient fiscal discipline of individual EMU members (see Chart 9), which is the main cause of the euro area's current problems. The last two years have seen an improvement, particularly as regards the deficit criterion, thanks to fiscal consolidation in previous years and to a recovery in growth in some economies. This led to the abrogation of the EDP in five euro area countries last year.

Looking at the **fiscal situation** of the individual countries (see Chart 10), only five euro area countries are compliant with both the deficit and debt criteria, of which only Luxembourg is one of the founding countries of the EMU. Although most countries have reduced their budget deficits over the last two years compared to previous years, no quick and substantial improvement in the fiscal situation can be expected in the euro area as a whole. In particular, the countries on the southern periphery of the euro area are afflicted by fiscal problems, and their budget imbalances are linked with general macroeconomic and financial instability, which is hindering their economic growth. Moreover, these countries' problems include very low inflation or deflation, which on the one hand is necessary for restoring their price competitiveness in the EMU, but on the other is further increasing the real value of their debt.

Chart 9: Non-compliance with the fiscal criteria

Chart 10: Fiscal situation of euro area countries
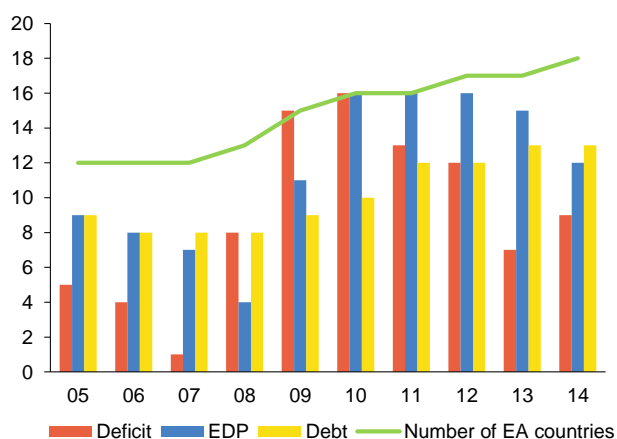
Note: The number of countries not compliant with the Stability and Growth Pact, which sets limits on government deficits (3% of GDP) and debt (60% of GDP). The EDP series shows the number of countries in an excessive deficit procedure. The number of countries in an EDP can be higher than the number of countries with an excessive deficit, as EDPs usually last several years.

Source: Eurostat, European Commission, CNB calculations.

Note: 2014 data. Countries compliant with the Stability and Growth Pact lie in the grey area (see also Chart 9).

Source: Eurostat

2 ECONOMIC POLICY AND INSTITUTIONAL DEVELOPMENTS IN THE EUROPEAN UNION AND THE EURO AREA

Economic growth continued to recover gradually in the EU in 2014 and 2015, steadily gaining momentum in most states. However, the growth remained fairly fragile and was accompanied by deflation pressures, to which central banks – headed by the ECB – responded with continued easy monetary policy, including unconventional monetary policy instruments. Growth was favourably affected by low prices of oil and other energy commodities and by depreciation of the euro. Geopolitical instability in regions close to the EU and concerns of a potential return of recession as a result of a possible spillover of economic problems in Greece to other EU countries acted in the opposite direction. Growth was also hindered by high private and public sector debt in numerous Member States, which is reducing the effectiveness of ECB monetary policy and limiting governments' room for fiscal stimulation.

In the field of **economic policy**, EU countries continued with differentiated fiscal consolidation last year and this year, supplemented by a greater emphasis on fiscal support for economic growth and investment and by structural reforms, including efforts to improve the labour market situation, which remains highly unsatisfactory in some countries.[19] Delivering growth, investment and jobs was thus a key priority of the European Commission in 2015.[20] Similar topics were reflected in the recommendations addressed to individual EU countries as part of the regular, fifth **European Semester** of economic policy coordination, launched in November 2014 on the publication of the Annual Growth Survey 2015.[21] This year's recommendations to the euro area concerned reducing labour taxation, reforming the services market, coordinating budgetary policies, implementing banking union legislation (including safeguarding the functioning of the Single Resolution Fund by spring 2016), strengthening market financing of the economy, supporting reform of national insolvency legislation and strengthening the Economic and Monetary Union and economic policy governance in the euro area.

In December 2014, the European Commission reviewed the functioning of the "six-pack"[22] and "two-pack"[23] legislation regulating the economic and fiscal coordination of EU countries. In the review, the Commission noted that the legislation had only been in operation for a short period of time and that its instruments were highly complex. It recommended some minor adjustments to the coordination framework, but proposed no legislative changes.

EU- and IMF-backed stabilisation **macroeconomic recovery programmes** are continuing in Greece and Cyprus. While the programme in Cyprus, comprising EUR 10 billion in financial assistance from the European Stability Mechanism (ESM) and the IMF, agreed in 2013, is proceeding in a satisfactory manner,[24] the situation in Greece deteriorated significantly this year following certain political decisions and measures taken by the new government that took office after snap elections in January.

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[19] For example, unemployment rate was running at 25.6% in Greece, 22.5% in Spain, 16.2% in Cyprus and 15.3% in Croatia (source: Eurostat, seasonally adjusted figures, June 2015).
[20] European Commission (2014b)
[21] European Commission (2014a).
[22] The six-pack has been in effect since 2011 and consists of six legislative measures – an amendment to the preventive and corrective arms of the Stability and Growth Pact (SGP), a regulation on the effective enforcement of budgetary surveillance in the euro area, a regulation on the prevention and correction of macroeconomic imbalances, a regulation on enforcement action to correct excessive macroeconomic imbalances in the euro area and a Council directive on requirements for national budgetary frameworks.
[23] The two-pack has been in effect since May 2013 and contains two regulations focused exclusively on euro area countries that have further increased the coordination of their economic and fiscal policies. The new regulations introduce effective budgetary surveillance of euro area countries, with enhanced surveillance for those which are subject to excessive deficit procedures and those which need financial assistance. Last but not least, the two-pack codifies and unifies the rules for submitting draft budgetary plans of euro area countries for the following year, as well as the rules governing adjustment programmes for countries experiencing financial difficulties.
[24] The last review mission in Cyprus was held on 14–24 July 2015. It stated that the financial situation was gradually improving, fiscal targets had been met and progress was being made on the structural reform agenda (European Commission, 2015b).

Although the **economic situation in Greece** improved very slightly last year,[25] the country is expected to fall back into recession this year. The situation was exacerbated by uncertainty about the country's domestic and foreign solvency. This uncertainty escalated after the Greek government failed to agree an extension of the European Financial Stability Facility (EFSF) and IMF bailout programme, which ended on 30 June 2015. The country was also in arrears with the IMF. After intensive and very complicated negotiations, however, Greece's stay in the euro area was safeguarded and an agreement was reached on a new financing programme tied to tough reforms, which the Greek government undertook to implement. Nevertheless, further developments remain very uncertain, especially as regards the sustainability of Greek government debt, which amounted to 177% of GDP in 2014.[26] Given the urgent need for the Greek government to repay debts due to its lenders, temporary financial assistance from the EU's older instrument, the European Financial Stabilisation Mechanism (EFSM) had to be used before the approval of an EUR 86 billion bailout programme under the ESM.[27] This EFSM loan was subsequently repaid on 20 August 2015 using funds granted to Greece under the ESM bailout programme.[28]

The debate about **stronger governance in the EMU** also intensified in 2015. The original plan to establish a system of bilateral contractual arrangements accompanied by solidarity mechanisms proved unrealistic for both legal and political reasons and was not discussed any further by the European Council, contrary to the conclusions of the December 2013 European Council. The idea of deeper reform of the EMU was revived instead. Its specific outlines were to be proposed in a Four/Five Presidents' Report drafted under the leadership of the President of the European Commission Jean-Claude Juncker. This report was eventually published under the title "***Completing Europe's Economic and Monetary Union***" in June 2015. The report is based on the structure of the previous three "Four Presidents' Reports" of 2012 and covers the issues of (i) economic union; (ii) financial union; (iii) fiscal union, and (iv) democratic accountability, legitimacy and institutional strengthening of the EU. It is less ambitious than the previous reports and contains fewer new themes. The previously discussed proposals to create "fiscal capacity" for the euro area, a convergence and competitiveness instrument (CCI) and institutional mechanisms for greater control of national fiscal policies either are completely absent (e.g. the controversial CCI) or are present in a highly relaxed form, as reflected in new terminology (e.g. "fiscal stabilisation function" instead of "fiscal capacity") and in a very vague definition of their role, allowing for various interpretations.

Most of the steps are formulated so as to be feasible in the relatively short term under existing EU primary law and often just through better implementation of existing legal instruments.[29] A change in primary law is not ruled out but is foreseen mainly in the longer term. The adoption of new secondary EU legal rules is foreseen in some cases, but here again, many of the proposed steps only involve reactivating previous plans (a single European deposit

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[25] In 2014, Greece recorded annual GDP growth (of 0.8%) for the first time since the onset of the 2008 economic and financial crisis (European Commission 2015a).
[26] European Commission (2015a)
[27] The EFSM was established in 2010 as a temporary instrument for safeguarding the financial stability of the EU. Under the EFSM, the EU may grant financial assistance in the form of loans or credit lines to states which are "in difficulties or are seriously threatened with severe difficulties caused by exceptional occurrences beyond their control". Financial assistance was previously granted under the EFSM to Ireland (2010) and Portugal (2011). It was meant to be replaced by the permanent ESM in 2014.
[28] On 17 July 2015, the Council of the EU decided to grant the Greek government a EUR 7.16 billion short-term bridge loan under the EFSM. This loan enabled Greece to clear its arrears with the IMF and opened the way to an agreement on an ESM bailout programme. Financial assistance granted under the EFSM is guaranteed by the EU budget, and thus indirectly by all EU Member States, including the Czech Republic. A compensation mechanism was therefore adopted at the same time. It provides all non-euro area Member States with legal guarantees that should a need arise to cover an EFSM loss, the related costs incurred by those states would be fully reimbursed by the euro area countries. If the Greek government failed to repay its obligation to the EFSM, the loss would be covered from the EU budget and the European Commission would be able to require all Member States to add relevant funds to the EU budget based on their shares in the own resources of the budget. The Czech Republic's share in the own resources of the EU budget is around 1.2%.
[29] The steps include, for example, a revamp of the European Semester and the Excessive Imbalance Procedure, the involvement of the European Parliament and national parliaments in the European Semester, single representation of the euro area in international financial institutions and the establishment of a full-time presidency of the Eurogroup.

guarantee scheme and a reinforced European Systemic Risk Board). The report also envisages revisions to some European international treaties (improving the effectiveness and accessibility of direct bank recapitalisation in the ESM) and their gradual integration into the framework of primary EU law (the Treaty on Stability, Coordination and Governance in the Economic and Monetary Union and the Agreement on the transfer and mutualisation of contributions to the Single Resolution Fund). The proposals to establish Competitiveness Authorities and a European Fiscal Board can be regarded as new elements based on older proposals made in the European debate.[30] Most of the major proposals contained in the report only concern the euro area countries, and many of them are expected to be controversial.[31]

The report does not rule out large changes to primary law in the medium and long term, but it does not outline their possible nature. This will be subject to further discussion. More detailed proposals for the longer term will be presented in a White Paper to be published by the European Commission in 2017, based on previous work conducted by expert groups. In order to change governance in the euro area, the report thus relies on changes to secondary legislation and better use of existing instruments, especially in the coordination, rather than on fundamental legal and institutional reforms and changes to primary EU law. The coordination method of integration under existing primary law may be very effective, as it potentially enables almost any measures to be *de facto* enforceably imposed on euro area countries, without any need to formally transfer more national powers to the EU level.[32]

Turning to **institutional developments in the EU**, last year saw some minor changes that affected the relationship between euro area members and non-members. Most notably, a new system for calculating a qualified majority took effect in November 2014, thanks to which euro area countries now have a qualified majority. However, a transition period applies until the end of March 2017, during which any state may request a voting procedure under the original regime. Besides this procedural change, the role of the Euro Summit in resolving key EMU issues, especially in connection with the Greek crisis, was renewed last year. The Euro Summit meetings are chaired by the President of the European Council and are informal in nature.[33]

The emphasis on the role of the Euro Summit confirmed the long-running trend of a change in decision-making and governance mechanisms in the EU and euro area and a shift towards a new intergovernmentalism, characterised, among other things, by the use of international law instruments outside the framework of EU law and the widely discussed use of EU institutions outside the legal framework of the EU.[34] At the institutional level, this change was reflected in the **reinforcement of the European Council and the Euro Summit**, which have played a key role since 2009 in adopting emergency measures to eliminate negative impacts of the crisis and to prevent any escalation or repetition.[35] This reinforced role of summits of heads of state and government has been accompanied by a weakening of the weight of the European Commission and partly also the European Parliament, although the latter took on some new roles during the crisis.[36] However, national legislators have been

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[30] See Sapir and Wolff (2015).
[31] For example, the extensive use of the macroeconomic imbalance procedure, the proposal to set up a backstop to the Single Resolution Fund (SRF) and the plans to establish a European deposit guarantee scheme, integrate capital market supervision and harmonise insolvency law. As regards fiscal policies, the proposal to set up a fiscal stabilisation function and a euro area treasury will be problematic, even though it is defined in very general terms in the report.
[32] See Belling (2012).
[33] The informal nature of the Euro Summit is in accordance with Article 12(1) of the Treaty on Stability, Coordination and Governance in the Economic and Monetary Union (Fiscal Pact). On the other hand, Article 12(3) of the Fiscal Pact, under which Euro Summit meetings attended by all the contracting parties that have ratified the Treaty should be held at least once a year, has not been implemented yet.
[34] See Curtin (2014), Bickerton, Hodson and Puetter (2015), Dawson (2015), Craig (2013) and Peers (2013).
[35] Belling (2014).
[36] See Schepers (2012: 333), Streeck (2015) and Fasone (2014). Specifically, this concerned the participation of European Parliament representatives in the preparation of the Fiscal Pact at the start of 2012 and also in the 2014 negotiations on the intergovernmental Agreement on the transfer and mutualisation of contributions to the Single Resolution Fund, under which the European Parliament is assigned no power in law. See also Dinan (2014).

weakened much more than the two supranational authorities. This effect is augmented by new instruments such as the conditionalities applied in EU cohesion policy since 2015, which increase the *de facto* enforceability of recommendations made in European Semester coordination procedures.

In 2015, steps continued to be taken to establish a **banking union**, whose pillars consist of a Single Supervisory Mechanism (SSM), a Single Resolution Mechanism (SRM) and a Single Rulebook. Key legislative acts laying down the building blocks of the banking union were adopted in 2013 and 2014. This year, work was done mainly on implementing measures, transposition into national law and ratification of the related intergovernmental Agreement (IGA) on the transfer and mutualisation of contributions to the Single Resolution Fund (SRF).[37] A sufficient number of participating member states ratifying the IGA is a prerequisite for the launch of the SRF, which is scheduled for 1 January 2016.

The SSM was officially launched within the ECB at the start of November 2014. It took over the direct performance of prudential supervision of systemically important financial institutions in the euro area. In addition, it will issue orders to national supervisory authorities which supervise other financial institutions established in the euro area in order to safeguard single supervision in the banking union. However, many issues regarding the practical functioning of the SSM, especially the setting of practical relations between the ECB and national supervisory authorities, remain open.[38] The Single Resolution Board (SRB) has been in operation since the start of this year. It convened for the first time on 25 March 2015. Its task will be to ensure resolution of credit institutions established in the participating countries under the SRM.

In parallel with the stepwise implementation of the pillars of the banking union, the transposition of legal regulations regarding the resolution of credit institutions, which apply to the whole EU, also continues. The Directive establishing a framework for the recovery and resolution of credit institutions and investment firms (BRRD) should take effect on 1 January 2015. The national transposition of the BRRD is followed by the establishment of national resolution funds, into which financial institutions in each member state should pay a sum amounting to 1% of their covered deposits in the first ten years.[39]

Ensuring sufficient funding for the resolution of credit institutions remains an important open issue relating to the establishment of the banking union. Despite a newly enacted option of applying the bail-in instrument for recapitalisation, and despite the funds of credit institutions that will be gradually accumulated in the SRF, given the amount of SRF funds available and the size of the EU banking sector publicly financed **backstops** will be needed at national and European level for the resolution of systemically important crises. Although the European debate on backstops continued in 2015, it reached no specific conclusions on the form of the common European backstop given its high political sensitivity and complexity. Under a December 2013 EU Council agreement, bridge financing of the SRF will be secured from national sources in the transition period, until it reaches its expected full capacity.[40] An agreement on a permanent backstop for the SRF should have been reached by then. Technical negotiations on the possible form of these national backstops are currently ongoing.[41]

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[37] The IGA supplements the regulation establishing the SRM and addresses some issues relating to the establishment of the SRF, in particular the gradual sharing of funds paid to this fund from national resolution funds. The IGA was signed by all EU Member States except the UK and Sweden, i.e. including the Czech Republic. However, its ratification has not been completed yet in most contracting states. As a non-euro area Member State, the Czech Republic is currently subject to no further obligations arising from the IGA, as its effect has been postponed until the Czech Republic becomes a member of the banking union.

[38] See Gren, Howarth and Quaglia (2015).

[39] According to Ministry of Finance estimates, the target amount for the Czech Republic would be around CZK 27 billion (Ministry of Finance of the Czech Republic, 2015).

[40] Council of the EU (2013).

[41] An agreement on a system of individual national credit lines for the SRB currently seems the most likely. In the meantime, ESM funds can be used to recapitalise distressed credit institutions established in the euro area, in the form of both indirect and direct

A legislative proposal for the establishment of a European Deposit Insurance System (EDIS) as another pillar of the banking union has been submitted by the European Commission in November 2015.

A political **debate on possible participation in the banking union**, or, more precisely, the SSM/SRM, before euro adoption has been going on in the Czech Republic in recent years. As part of that debate, the Ministry of Finance, in partnership with the CNB, the Office of the Government and the Ministry of Foreign Affairs, drew up an *Impact Study of Participation or Non-participation of the Czech Republic in the Banking Union*. In line with the findings and recommendations of the study, the Czech government decided on 9 February 2015 not to join the banking union in the current situation and to review the costs and benefits of participation in the banking union in one year's time on the basis of an updated impact study to be submitted by the Ministry of Finance by 29 February 2016. The issue of selected non-euro area EU Member States opting into the banking union before euro adoption was also examined in an **IMF study**, which arrives at similar conclusions.[42] It recommends that countries that have not set a euro adoption date, including the Czech Republic, should wait and, in the present conditions, not join the banking union before euro adoption. According to the latest available information, none of the non-euro area EU countries has so far officially applied to participate in the SSM (i.e. to enter into "close cooperation" with the ECB).[43]

The **monetary policy of the ECB** continued to ease the monetary conditions last year in an effort to face deflationary tendencies, boost economic growth and smooth flows of credit to the real economy. After lowering its key interest rates in September 2014, the ECB's Governing Council did not reduce them any further. They thus remained at historical lows: the main repo rate at 0.05%, the deposit rate at -0.20% and the marginal lending facility at 0.30%. Instead, the ECB used additional quantitative easing tools and programmes to increase liquidity in the banking market, specifically targeted longer-term refinancing operations (TLTROs) and the extended asset purchase programme (EAPP). In January 2015, the Governing Council decided to extend its asset purchase programme by adding an asset-backed securities purchase programme (ABSPP) and a covered bond purchase programme (CBPP3), which were both launched at the end of last year, as well as a public sector purchase programme (PSPP). Combined monthly purchases should amount to around EUR 60 billion and the ECB intends to carry out these purchases at least until September 2016 in order to steer inflation expectations to the level consistent with the definition of price stability, i.e. below, but close to 2%, in the medium term.[44]

To sum up, the EU and especially the euro area have made further progress in past years towards significantly strengthening economic and fiscal policy coordination and stimulating further integration in financial markets and their supervision. At the same time, the euro area has in some respects set itself apart as a single block from other EU Member States and the focus of decision-making on EMU matters (including issues concerning all EU Member States) has shifted towards the countries that use the euro as their currency. New institutions (the ESM, the SSM and the SRM) and the regulations created in response to the recent economic and financial crisis have fundamentally changed the form of the euro area and hence the content of the obligation to adopt the euro, which the Czech Republic assumed upon its

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recapitalisation, whose use was approved by the ESM Board of Governors on 8 December 2014. The total amount of resources available for direct recapitalisation is limited to EUR 60 billion. See ESM (2015).

[42] See IMF (2015a).

[43] Unofficially (according to media reports), only Bulgaria, Romania and Denmark have indicated that they are considering participating in the SSM.

[44] The ECB's monetary policy was also reviewed by the European Court of Justice in a preliminary ruling from the Bundesverfassungsgericht in Germany. It ruled that the outright monetary transactions (OMT) programme announced by the ECB in September 2012 was in accordance with EU law (Judgment of the European Court of Justice, Gauweiler and Others, C-62/14, 16 June 2015). Nevertheless, the final ruling on the lawsuit filed with the Bundesverfassungsgericht (which will be interesting, as it is the first preliminary ruling from this court to the European Court of Justice) has not been made yet.

accession to the EU. The related costs must be duly considered when deciding on the timing of euro area entry. Besides the direct costs arising from participation in the euro area's rescue mechanisms and the limits imposed on national powers in the supervision of credit institutions, account should also be taken of the possible implications stemming from the future set-up and institutional changes in the euro area itself as outlined in the Five Presidents' Report on completing economic and monetary union and of the fiscal costs associated with any fiscal problems in euro area member states and their financial sectors.

E RESULTS OF THE ANALYSES

1 CYCLICAL AND STRUCTURAL ALIGNMENT

Greater similarity in economic structure and the business cycle between the Czech Republic and the euro area will lead to lower euro adoption costs. For the Czech economy, the risk of time misalignment or suboptimal intensity of the response of the single monetary policy to economic shocks will decrease. The functioning of the monetary policy transmission mechanism will also converge. The direct indicators of alignment (describing various aspects of similarity with the euro area) and the effect of international relations and the financial sector (which can increase or decrease alignment) are both monitored.

1.1 DIRECT ALIGNMENT INDICATORS

The principal direct alignment indicators are the development of domestic economic activity, the exchange rate and interest rates compared to the euro area. Convergence in economic and price levels fosters a situation where similar long-term processes will proceed in the economy and there will be no major differences in equilibrium development compared to the euro area. High synchronisation of the business cycle increases the probability that cyclical developments in the economies will also be aligned in future. Differences in the business cycle can stem, among other things, from different economic structures and from insufficient convergence at the interest rate level.

1.1.1 Real economic convergence

The degree of real economic convergence, as measured by GDP per capita at purchasing power parity and the relative price level of GDP derived from this parity, is a fundamental indicator of the similarity of two economies. A low degree of real economic convergence with the euro area may be a substantial disadvantage as regards euro adoption. Assuming that the gap in the relative GDP level will close gradually in the future, this process will probably be associated with convergence of the price level towards more advanced countries. The related real appreciation of the exchange rate vis-à-vis the euro may make fulfilment of the Maastricht convergence criteria more difficult.[45] Following the adoption of the euro, price convergence will imply a positive inflation differential compared to the euro area average because the option of a real strengthening of the exchange rate through nominal appreciation will be closed. One of the consequences will be lower real interest rates compared to the euro area average. Such rates have many favourable impacts, such as investment support, faster long-term convergence and lower public debt service costs. However, as the experience of many converging economies with fixed exchange rates in the last ten years or so shows, they can contribute to creating serious macro-financial imbalances such as excessive lending, property market bubbles and high current account deficits.[46]

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[45] The simultaneous restriction placed by the Maastricht criteria on the inflation differential and the appreciation of the nominal exchange rate represents an implicit restriction on the speed of appreciation of the real exchange rate. If the equilibrium real appreciation is faster than this restriction, the fulfilment of the convergence criteria may require a temporary undervaluation of the exchange rate. However, this problem is mitigated by the fact that the exchange rate criterion is significantly more tolerant of nominal exchange rate appreciation than depreciation and by the option of revaluing the central rate in the ERM II system. Moreover, the increased emphasis laid for some time now on sustainable fulfilment of the price stability criterion means that a converging country – like Slovakia in 2009 – may be willing to adopt the euro with an overvalued real exchange rate so as to avoid inflationary pressures associated with price level convergence in the years following euro area entry. However, this approach leads to a temporary worsening of the country's price competitiveness.
[46] Ahrend et al. (2008); Taylor (2009); Martin (2010).

The process of convergence of the Czech Republic to the euro area in **GDP per capita at purchasing power parity** (see Table 1) has gradually renewed since 2013. In 2014, the level of Czech economic activity reached almost 79% of the euro area average, visibly exceeding the 2007 pre-crisis level for the first time. Among the countries under comparison the Czech Republic has been in third position in recent years, but it still lags well behind Austria and Germany, i.e. the advanced euro area countries.[47]

Table 1: GDP per capita at purchasing power parity

(EA = 100)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CZ	73.8	74.7	77.1	75.4	77.2	75.2	76.6	76.5	77.2	78.8
AT	115.5	115.8	113.9	115.0	116.3	116.8	118.1	120.0	119.6	119.5
DE	106.7	106.8	106.8	107.1	106.1	110.2	112.8	114.0	114.4	116.1
PT	73.4	73.6	73.2	72.9	75.3	75.2	72.3	70.5	73.0	73.3
HU	57.1	57.0	56.1	57.9	59.7	59.9	60.3	60.0	62.1	63.4
PL	46.0	46.8	48.9	50.4	54.8	57.3	59.2	61.1	62.8	63.7
SI	79.4	79.6	80.4	82.9	78.7	77.0	76.2	76.1	76.5	77.4
SK	55.2	57.7	62.1	66.1	66.2	67.5	67.0	68.8	70.2	71.6

Source: Eurostat, CNB calculations.

The **price level of GDP** in the Czech Republic relative to the euro area is also slightly higher compared to the pre-crisis year of 2007 (Table 2). However, it has decreased in relative terms from the historical high reached in 2008, partly correcting the excessive appreciation of the koruna recorded before the fall of Lehman Brothers. The real weakening of the koruna in 2013–2014 primarily reflected the Czech National Bank's use of the nominal exchange rate as an instrument for further easing the monetary conditions at the zero lower bound on nominal interest rates.[48] In 2014, the Czech price level of GDP was roughly 63% of the euro area average, substantially lower than in Austria and Germany. The Czech price level of GDP was also lower, albeit to a lesser extent, by comparison with Portugal and Slovenia and, for the first time, also with Slovakia. By contrast, as usual it remains higher than in Hungary and Poland.

Table 2: Average price level of GDP

(EA = 100)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CZ	56.2	59.8	61.2	71.2	66.2	69.8	69.9	68.5	66.1	62.8
AT	103.6	103.4	105.7	106.0	106.4	106.4	107.1	107.5	108.3	108.2
DE	101.4	101.2	101.3	101.0	101.9	100.7	100.6	100.8	101.8	102.1
PT	80.0	80.0	80.5	80.8	79.8	79.9	79.5	77.7	75.5	76.3
HU	60.6	58.7	63.7	64.1	56.4	57.6	57.3	56.8	55.9	55.4
PL	54.3	57.2	59.4	65.7	54.3	57.6	56.9	56.2	55.7	56.7
SI	71.6	73.5	76.7	79.0	81.1	81.1	80.8	79.0	78.1	78.3
SK	51.7	54.3	59.4	63.9	64.3	64.4	66.5	66.7	65.8	65.3

Source: Eurostat, CNB calculations.

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[47] The lower GDP per capita at purchasing power parity in Portugal and Slovenia largely reflects the problems these countries faced in previous years. This applies even more so to Greece, which was clearly ahead of the Czech Republic in 2010 but now lags well behind it (67.5% of the euro area average). Despite their rapid convergence, all three Baltic countries are also less advanced than the Czech Republic: Estonia (68.2% of the euro area average), Latvia (60.3%) and Lithuania (69.2%).

[48] Franta et al. (2014).

An **analysis of the empirical relationship** between the price level of GDP and GDP per capita at purchasing power parity for 36 European countries (Model I)[49] reveals that the Czech price level in 2014 continued to lie below the level corresponding to the performance of the economy in international comparison. According to the estimated relationship, the Czech price level should be roughly 19 pp higher in relation to the euro area average, i.e. it should be slightly above that in Portugal or Slovenia. On the other hand, the Czech Republic's main trading partner countries (Germany, Austria, Slovakia and Poland) also showed large deviations from the model-estimated price level in the same direction within a range of 8–13 pp. The Czech price level thus does not seem very low relative to these main trading partners. Moreover, an alternative fixed-effects panel estimate of the empirical relationship between the price level of GDP and GDP per capita at purchasing power parity (Model II) reveals that other characteristics (not captured individually by the model) of the Czech economy systematically reduce the Czech price level by more than 18 pp overall. According to this alternative model, the Czech price level should be 63% of the euro area average. This suggests that the koruna's real exchange rate in 2014 was broadly at its equilibrium level.[50]

Table 3 presents the **evolution of the real exchange rate** against the euro. Between 2005 and 2014, the real exchange rate of the koruna appreciated by 20%, i.e. at an average rate of 1.8% a year. The real appreciation of the Czech currency was concentrated in the first half of the above ten-year period and its average rate was much higher than in the current euro area countries under comparison except Slovakia. In the case of Germany (and Portugal), the real exchange rate actually depreciated somewhat, increasing its price competitiveness.[51] The Hungarian forint and Polish zloty have also appreciated less than the Czech koruna in the last ten years. Since 2008, however, the real koruna-euro exchange rate has depreciated on average, reflecting the relatively adverse evolution of the Czech economy and since November 2013 the use of the nominal koruna-euro rate as an additional instrument for easing monetary policy.

Table 3: Real exchange rate against the euro

(HICP deflated; 2004 = 100; average annual rate in %)

| | Basic index (2004=100) | | | | | | | | | | Avg. annual rate | Outlook[a] | |
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2005–2014	Model I	Model II
CZ	106	112	115	131	124	130	133	131	127	120	1.8	3.5	1.0
AT	100	99	99	99	99	99	100	100	101	102	0.2	0.6	-0.8
DE	100	99	99	99	99	98	98	98	98	98	-0.2	1.0	0.6
PT	100	101	101	100	99	99	100	100	99	98	-0.2	0.7	1.4
HU	103	98	109	112	104	109	109	108	106	101	0.1	3.4	2.4
PL	113	115	119	129	109	119	117	116	115	115	1.4	3.7	3.5
SI	100	100	102	104	105	105	104	105	105	105	0.5	0.8	0.0
SK	104	110	121	132	138	136	138	140	140	139	3.4	2.3	0.4

Note: [a] Estimate of the average rate of equilibrium real appreciation for the next five years (see the *Methodological Part*).

Source: Eurostat, CNB calculations.

Continued **equilibrium real appreciation** can be expected for the currencies of the converging countries once the impacts of the European debt crisis have definitively faded away

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[49] See the *Methodological Part* and Čihák and Holub (2003; 2005).

[50] IMF (2015) assessed the real exchange rate of the koruna as being roughly in line with Czech economic fundamentals. The analyses of the CNB lead to the same conclusion (see Box 2 in Inflation Report III/2015).

[51] The price levels of Germany and Austria are below the level corresponding to their GDP per capita in international comparison (see above). For this reason, the estimates (see Table 3) predict equilibrium real appreciation going forward (in the case of Austria according to Model I only), even though these countries are not converging economies. This could occur via low inflation or even deflation in other euro area countries which have lost price competitiveness and must now undergo a process of "internal devaluation".

and the process of catching up with the advanced economies is renewed in the long term. Its pace, however, will probably be lower than before the crisis (when in the Czech Republic, for example, it reached 3–4% per year), as the initially sizeable differences in the economic performance and price levels of converging countries compared to the euro area average narrowed visibly in the pre-crisis period, hence the room for further convergence is already smaller. Moreover, the real appreciation in converging countries in future years is likely to take place partly via a slightly positive inflation differential vis-à-vis the average in the euro area, where inflation is expected to return only very slowly to 2%. Outlooks of equilibrium real appreciation for the next five years based on the two aforementioned alternative panel estimates of price convergence[52] are given in the last two columns of Table 3. For the Czech Republic, the range of the estimates from both models is quite wide at 1.0–3.5%.[53,54] However, it evidently lies at a higher level than for all the existing euro area members. For countries outside the euro area, i.e. Hungary and Poland, the equilibrium real appreciation estimates are conversely similar or even higher than those for the Czech koruna. The above range of estimates corresponds to the average inflation differential vis-à-vis the euro area which could be expected in the Czech Republic if the euro were to be adopted within the next five years. Assuming average euro area inflation in line with the long-run forecasts,[55] inflation in the Czech Republic could therefore increase to 2.6–5.1% during the initial years following euro area entry.[56] This would mean a marked increase in inflation compared to the 2% target set by the Czech National Bank as from 2010 and therefore a deviation from price stability.[57]

Owing to higher inflation, the Czech Republic, Hungary and Poland would have lower **real interest rates** (see Table 4) compared to the euro area average and to most of the euro area countries under comparison (Austria, Germany, Portugal and Slovenia) in the event of euro adoption. Their short-term real money market interest rates could even be significantly negative for an extended period. In the Czech Republic, the real three-month interest rate would be between -2.0% and +0.5% on average according to the above range of estimates. Nevertheless, in this respect euro adoption would not generate such a strong economic shock for the Czech Republic as it would for Hungary and Poland, as the Czech Republic has shown a low average real interest rate level over the past ten years.

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[52] Model I and Model II – see above and the *Methodological Part* for details.

[53] Starting with Inflation Report IV/2013, the CNB's forecasts work on the assumption of long-term equilibrium real appreciation of the koruna vis-à-vis the "effective euro area" at a rate of 1.5% a year. One should bear in mind, however, that Germany, Slovakia and Austria have large weights in the effective euro area. For these countries, the method used (in particular Model I) implies equilibrium real appreciation vis-à-vis the euro area as a whole, and therefore above-average inflation. The real appreciation of the koruna will thus probably be lower vis-à-vis the effective indicator than vis-à-vis the euro area itself (the real exchange rate will probably appreciate vis-à-vis the latter partly via a positive inflation differential).

[54] An estimate based on the model in Brůha and Podpiera (2012) indicates equilibrium real appreciation of the koruna vis-à-vis the effective euro area at a pace of 1.8% a year for the coming years assuming permanent renewal of GDP growth in the effective euro area at 2.1% and in the domestic economy at 3.2%.

[55] The Consensus Forecasts long-term prediction of euro area inflation for the next five years is 1.6% on average.

[56] The estimate of equilibrium real appreciation of the koruna based on Brůha and Podpiera (2012) would imply inflation of 3.4% in the Czech Republic after the koruna exchange rate is fixed definitively. However, these inflation estimates are conditional on adoption of the euro at the koruna's current real exchange rate. This is unlikely, as the koruna can be expected to show an appreciation tendency during its stay in ERM II, which may eliminate some of the convergence pressures on inflation after the euro is introduced.

[57] The public debate on the Czech National Bank's use of exchange rate of the koruna as a monetary policy instrument since November 2013 revealed that a large section of the Czech public regards even the current 2% inflation target as too high in relation to its understanding of price stability (see Franta et al., 2014).

Table 4: Three-month ex-post real interest rates

(%; HICP deflated)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Average[a]	Outlook[b]
CZ	0.4	0.2	0.1	-2.1	1.6	0.1	-0.9	-2.4	-0.9	-0.1	-0.4	(-2,0 ; 0,5)
AT	0.1	1.4	2.0	1.4	0.8	-0.9	-2.1	-2.0	-1.9	-1.2	-0.2	(0,9 ; 2,3)
DE	0.3	1.3	2.0	1.8	1.0	-0.3	-1.1	-1.5	-1.4	-0.6	0.1	(0,5 ; 0,9)
PT	0.1	0.0	1.8	1.9	2.1	-0.6	-2.1	-2.1	-0.2	0.4	0.1	(0,1 ; 0,8)
HU	3.1	3.1	-0.1	2.6	4.9	1.4	2.5	2.3	2.4	2.5	2.5	(-1,9 ;-0,9)
PL	3.0	2.9	2.1	2.1	0.4	1.2	0.6	1.2	2.2	2.5	1.8	(-2,2 ;-2,0)
SI	1.5	1.0	0.5	-0.9	0.4	-1.3	-0.7	-2.2	-1.7	-0.2	-0.3	(0,7 ; 1,5)
SK	0.1	0.1	2.4	0.2	0.3	0.1	-2.6	-3.1	-1.2	0.3	-0.3	(-0,8 ; 1,1)

Note: [a] Average for 2005–2014; [b] Estimated equilibrium real average interest rate for the next five years derived from the range of estimates of the pace of equilibrium real exchange rate appreciation (see Table 3), assuming a zero money market risk premium and an equilibrium real interest rate in the euro area of 1.5%.

Source: Eurostat, CNB calculations.

Wages are another key aspect of economic convergence. The evolution of wages in market economies is related mainly to labour productivity growth and the share of the service sector in total employment and GDP. Chart 11 compares the average annual wage with the figure for the euro area in 2014. The data converted to euro using the market exchange rate reveal the external purchasing power and wage competitiveness of the economy, while the purchasing power of wages on the domestic market is described by the purchasing power standard (PPS) indicator. The chart shows a persisting large difference between the average wage level in the euro area as a whole and in Germany and Austria (and partly in Slovenia) on the one hand, and in the rest of the countries under comparison on the other hand. In 2014, the wage level in the Czech Republic was 36% of the euro area average when converted using the exchange rate (compared to 31% in 2004) and roughly 57% using PPP data (which means virtual stagnation compared to 2005). In comparison with the Czech Republic, wages remained slightly lower in Hungary and Poland, and, for the first time ever, were slightly higher in Slovakia in 2014.[58] Looking to the future, it can thus be expected that the renewed convergence of GDP and labour productivity will be accompanied by further wage catch-up with the advanced euro area countries.

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[58] The Slovak wage level exceeded the Czech one not only after conversion at the current exchange rate, but also at PPP. The slightly higher wage level in Slovakia is therefore not due primarily to the weakening of the nominal exchange rate of the koruna by the Czech National Bank in November 2013, as the PPP parity figures are not directly affected by the exchange rate conversion.

Chart 11: Average annual wage in 2014
(EA = 100)
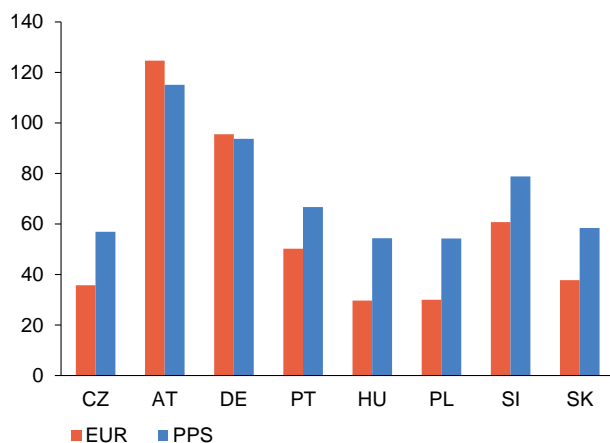
Source: European Commission, CNB calculations.

To sum up, the Czech Republic's convergence in economic activity towards the euro area is gradually renewing. Going forward, this creates room for an increase in the Czech relative price level and wages. The equilibrium real appreciation of the exchange rate associated with this process may still imply higher inflation compared to the core of the monetary union and thus a deviation from price stability. The related low or even markedly negative real interest rates may simultaneously increase the risk of macrofinancial imbalances.

1.1.2   Correlation of economic activity

Upon euro area entry, a country's independent monetary policy decision-making is replaced by the single monetary policy of the European Central Bank. That policy responds to economic developments at the monetary union level. For a country that is in a different phase of the business cycle than the euro area average, the monetary policy settings may thus be suboptimal and cause economic costs. From the point of view of the optimum currency area theory, the loss of independent monetary policy is therefore less costly for a country with a more correlated business cycle. The following analysis focuses on the degree to which the cycles of the Czech economy and the other countries under review are similar to that of the euro area.

Economic activity in the Czech Republic can be compared with that in the euro area both overall using **annual real GDP growth** and specifically in industry using the **annual changes in the industrial production index** (IPI, see Chart 12).[59] In the pre-crisis period, the Czech economy recorded roughly double the rate of growth of both GDP and the IPI compared to the euro area, whereas after the onset of the global financial crisis the growth rates equalised. The growth rates started to differ again in the second half of 2012 – the recovery in the Czech Republic initially lagged behind that in the euro area, whereas in the last year or more the domestic economy has been growing much faster.

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[59] The industrial production index responds to changes in the economic environment more flexibly than total GDP. The information obtained by comparing the correlation of industrial production is only complementary, as industry typically accounts for less than one-third of total output in the advanced economies, and, moreover, the economies of the countries under comparison differ in terms of structure (see section 1.1.4). Boone and Maurel (1999) criticise the use of the industrial production index for analysing the similarity of economies and business cycles, because of its high volatility.

Chart 12: Year-on-year changes in real GDP and in the industrial production index
(%)

GDP   IPI
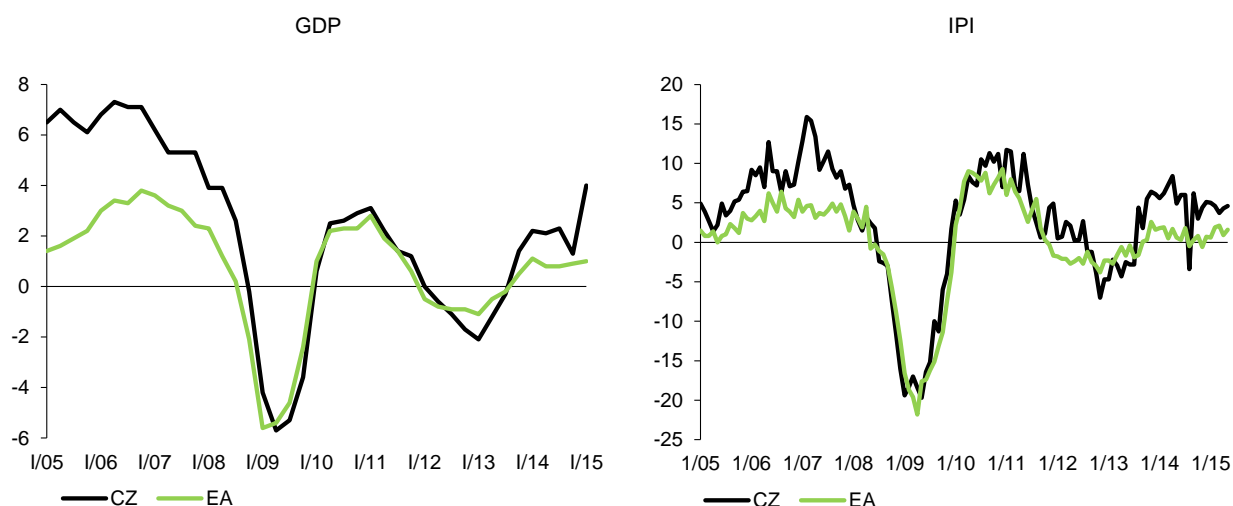
Source: Eurostat, CNB calculations.

A simple **correlation analysis** calculated for various lags of the individual countries' GDP and IPI time series compared to the euro area time series (lags of 0–2 quarters for GDP and 0–3 months for the IPI) allows us to assess whether individual countries' economic activity is correlated with the euro area and whether it follows it with a lag. For all the economies under comparison, the global financial and economic crisis represented a large common external shock strongly affecting the measured correlations, so the correlations of the time series adjusted for crisis volatility are given in addition to the overall results.[60]

In the overall comparison with other countries (see Table 5), the positive and statistically significant GDP correlations measured between the Czech Republic and the euro area can be evaluated as above average; only Germany displays a higher GDP correlation than the Czech Republic.[61] Slovenia is at a comparable level. By contrast, Poland has the lowest correlation (additionally shifted by one quarter). Unlike the other countries, Poland displays a stronger correlation adjusted for the crisis period, as it was one of the few European countries not to record a decline in economic activity. Conversely, the correlations between Hungary and Slovakia and the euro area are largely due to co-movement in the crisis quarters.

The correlations between the individual countries and the euro area measured using the IPI are also positive and statistically significant, but, with the exception of Germany, are generally smaller than the GDP correlations. The Czech Republic ranks alongside Austria, Slovenia and Slovakia as one of the countries with the lowest coefficents, especially when adjusted for the crisis. This is due to significantly higher industrial production growth in the Czech Republic than in the euro area after 2013.

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[60] The quarters in which the euro area recorded the highest quarterly growth volatility – 2008 Q4 and 2009 Q1 – are dropped from the correlation calculation.
[61] The high correlation of economic activity between Germany and the euro area is natural, as Germany accounts for 28% of euro area GDP.

Table 5: Correlation coefficients of economic activity

	GDP				GDP		
	2005Q1–2015Q1				Adjusted for crisis		
	t	t-1	t-2		t	t-1	t-2
CZ	**0.85** **	0.69 **	0.43 **		**0.69** **	0.64 **	0.51 **
AT	**0.71** **	0.50 **	0.31 *		**0.63** **	0.35 **	0.29 *
DE	**0.95** **	0.56 **	0.29 *		**0.86** **	0.46 **	0.33 **
PT	**0.70** **	0.38 **	0.15		**0.56** **	0.31 *	0.27 *
HU	**0.78** **	0.51 **	0.29 *		**0.37** **	0.28 *	0.18
PL	0.43 **	**0.51** **	0.44 **		0.63 **	**0.76** **	0.55 **
SI	**0.87** **	0.70 **	0.49 **		0.69 **	**0.70** **	0.66 **
SK	**0.66** **	0.45 **	0.23		**0.33** **	0.31 *	0.35 **

	IPI					IPI			
	2005M1–2015M5					Adjusted for crisis			
	t	t-1	t-2	t-3		t	t-1	t-2	t-3
CZ	**0.35** **	0.12	0.27 **	0.17 *		**0.19** **	-0.05	0.20 **	0.10
AT	**0.39** **	0.18 **	0.22 **	0.21 **		**0.28** **	0.03	0.13	0.05
DE	**0.84** **	0.13	0.33 **	0.35 **		**0.78** **	-0.32 **	0.08	0.23 **
PT	**0.45** **	-0.08	0.02	0.13		**0.47** **	-0.20 **	-0.01	0.15
HU	**0.43** **	0.24 **	0.13	0.11		**0.34** **	0.06	0.01	0.03
PL	**0.50** **	0.08	0.06	0.06		**0.49** **	0.00	0.05	0.06
SI	**0.35** **	0.22 **	0.18 **	0.10		**0.25** **	0.00	0.10	0.02
SK	0.27 **	**0.30** **	0.13	0.13		0.09	0.15	-0.03	0.14

Note: The calculation is based on the quarter-on-quarter/month-on-month differences in the logarithms of the seasonally adjusted data. The significance of the correlation coefficient is marked ** and * for the 5% and 10% significance levels respectively. The columns indicate the lag of the given country's time series relative to the euro area time series. For example, t-1 denotes a lag of one period (quarter/month). The correlations for the entire period analysed are presented in the left-hand panel, while 2008 Q4 and 2009 Q1 are dropped from the calculation in the right-hand panel. The highest statistically significant correlations for each country are highlighted in bold.

Source: Eurostat, CNB calculations.

Supplementary information on the alignment of economic activity over time is provided by an analysis of the correlation for moving five-year time periods (**rolling correlation**). The rolling correlations of real GDP growth indicate a gradual increase in alignment for most countries over the last 10 years (see Chart 13). In some countries (Austria, the Czech Republic and Slovenia) the correlation of economic activity rose after 2009 owing to the global financial crisis and the subsequent European debt crisis, whereas in others it stayed at low levels (Hungary) or has risen only in the last two years (Slovakia). In the case of the Czech Republic, we can see long-term robust growth in the rolling correlation of GDP. In the past two years, however, this correlation has fallen slightly and this trend strengthened further at the start of 2015 as a result of domestic economic growth accelerating well above the euro area level. In recent years, however, it has still been one of the highest among the countries under review.

Chart 13: Rolling correlations of economic activity
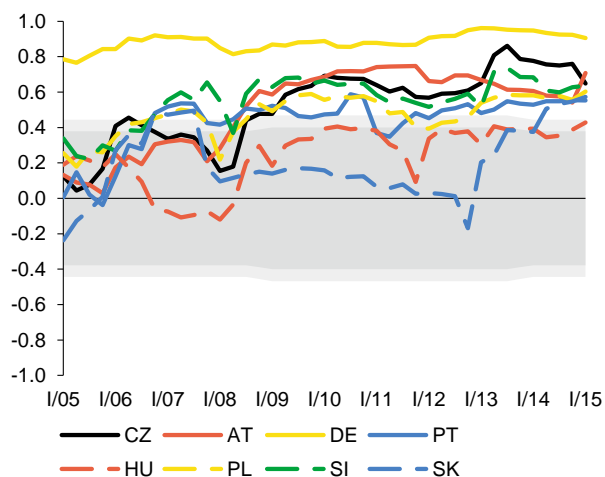
Note: The time data indicate the end of the rolling period of 5 years (in periods containing the crisis quarters of 2008 Q4 and 2009 Q1, those quarters are dropped from the calculation, i.e. the periods are 4.5 years long). The calculation is based on the quarter-on-quarter differences in the logarithms of the seasonally adjusted data. The statistical significance of the correlation coefficients is indicated in the chart: values statistically significant at the 5% level lie in the white area of the chart, and values statistically significant at the 10% level lie in the white and light grey parts of the chart. Values in the dark grey part of the chart are not statistically significant at the 10% level.

Source: Eurostat, CNB calculations.

Exports are an important channel of transmission of euro area economic activity to small open economies such as the Czech Republic. With the exception of Poland, all the countries under comparison recorded a high positive **correlation of exports to the euro area with euro area GDP** (see Table 6).

Table 6: Correlation coefficients of exports to the euro area with euro area GDP

	Exports to the euro area vs. euro area GDP					
	2005Q1–2015Q1			Adjusted for crisis		
	t	t-1	t-2	t	t-1	t-2
CZ	**0.72** **	0.45 **	0.19	**0.60** **	0.31 *	0.17
AT	**0.73** **	0.38 **	0.16	**0.46** **	0.12	0.18
DE	**0.82** **	0.62 **	0.26	**0.60** **	0.41 **	0.29 *
PT	**0.80** **	0.33 **	0.07	**0.51** **	0.10	0.02
HU	**0.46** **	0.33 **	0.21	**0.44** **	0.25	0.15
PL	0.11	0.11	0.08	**0.49** **	0.30 *	0.08
SI	**0.74** **	0.48 **	0.25	**0.55** **	0.34 **	0.30 *
SK	**0.78** **	0.50 **	0.14	**0.63** **	0.29 *	0.09

Note: The calculation is based on the quarter-on-quarter differences in the logarithms of the data seasonally adjusted using the TRAMO-SEATS method. The significance of the correlation coefficient is marked ** and * for the 5% and 10% significance levels respectively. The columns indicate the lag of the given country's time series relative to the euro area time series. For example, t-1 denotes a lag of one quarter. The correlations for the entire period analysed are presented in the left-hand panel, while 2008 Q4 and 2009 Q1 are dropped from the calculation in the right-hand panel. The highest statistically significant correlations for each country in the period under review are highlighted in bold.

Source: Eurostat, CNB calculations.

The **dynamic correlation** results are based on spectral analysis of the time series of quarterly GDP changes (see Chart 14). The aim of this method is to separate medium-term economic fluctuations, which correspond to the business cycle, from other short-term and long-term movements of the variables describing economic activity. The standard cycle length of

1.5–8 years is depicted by vertical dashed lines. For this cycle length, the results of the analysis indicate a high positive correlation for all the countries under review over the last ten years, the only exception being Poland, which has been at relatively low levels.

Chart 14: Dynamic correlations of economic activity with the euro area
(q-o-q changes in real GDP)

2005 Q1–2015 Q1
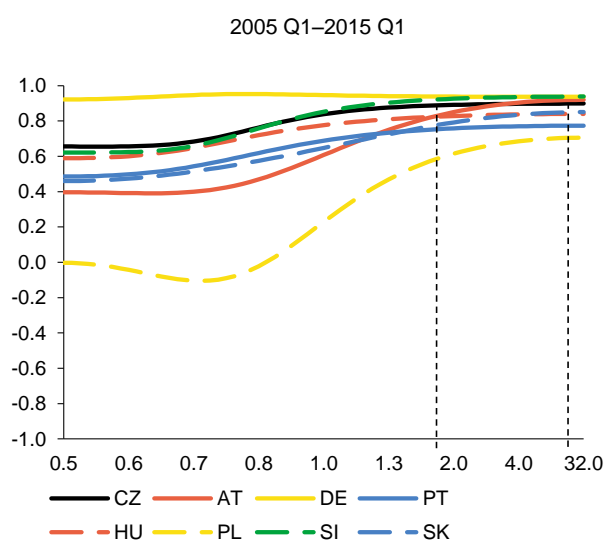
Note: The x-axis shows the spectrum of possible duration of the cycle in years on a logarithmic scale. The interval depicted by the two vertical dashed lines indicates the cycle length considered, i.e. 1.5–8 years. The calculation is based on the quarter-on-quarter differences in the logarithms of the data seasonally adjusted using the TRAMO-SEATS method.

Source: Eurostat, CNB calculations.

To sum up, over the last ten years the Czech Republic has been showing high statistically significant positive correlations of economic activity, exports and, to a lesser extent, industrial production with the euro area both in absolute terms and relative to the other euro area and non-euro area countries under comparison. These high correlations are due in large part to the temporary effect of a strong common external shock in the form of the global financial and economic crisis, which dominated shocks affecting individual countries only. That said, even when adjusted for the crisis, all the observed variables display strong correlation with those in the euro area. Overall, therefore, the cyclical alignment of economic activity in the Czech Republic and the euro area can be described as high.

1.1.3   Correlation of the cyclical component of unemployment

Correlation analysis of labour market data using the unemployment gap offers another possible view of the economy's alignment with the euro area alongside the measurement of correlations of economic activity using GDP or the industrial production index. The unemployment gap is defined as the difference between the general unemployment rate and the equilibrium employment rate estimated on the basis of the NAIRU.[62] If Okun's law is applied, for example, the unemployment gap can substitute for the output gap in the Taylor rule for determining the optimal level of monetary policy rates.[63] In a single currency area, large fluctuations in the

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[62] The non-accelerating inflation rate of unemployment, i.e. the equilibrium rate towards which unemployment converges in the absence of temporary supply or demand shocks once the dynamic adjustment of inflation to previous shocks is completed. A semi-structural approach using the Kalman filter is applied for the estimates (see section 2.2.2 of the *Methodological Part*). If the unemployment gap is positive, the labour market is anti-inflationary. A negative gap conversely has an anti-inflationary effect.
[63] See, for example, Rudebusch (2010).

cycle and the size of unemployment gaps could therefore lead to suboptimal monetary policy. In other words, the loss of independent monetary policy could, from this perspective, be more costly for the acceding country.

In the first half of the ten-year period under review, similar cyclical patterns are apparent for the unemployment gaps in all the countries under comparison and in the euro area as a whole (see Chart 15). However, there are quite large cross-country differences in the unemployment gap levels. The majority of countries saw a gradual narrowing of the positive unemployment gap. In the Czech Republic, sustained robust growth in economic activity was reflected from 2006 onwards in the opening up of a negative unemployment gap. With the onset of the economic crisis in 2008 and subsequent growth in the unemployment rate, however, the negative unemployment gap closed and turned positive again. The impacts of the recession coupled with the subsequent debt crisis were strongest in Portugal. In the individual countries under comparison, the unemployment gaps have recently started to close again (the Czech Republic, Slovakia, Portugal, Hungary and Slovenia), flattened out (Austria) or turned negative (Germany and Poland). The narrowing of the unemployment gap in the Czech Republic meanwhile accelerated further in the first half of 2015.

Chart 15: Unemployment gaps

(pp)
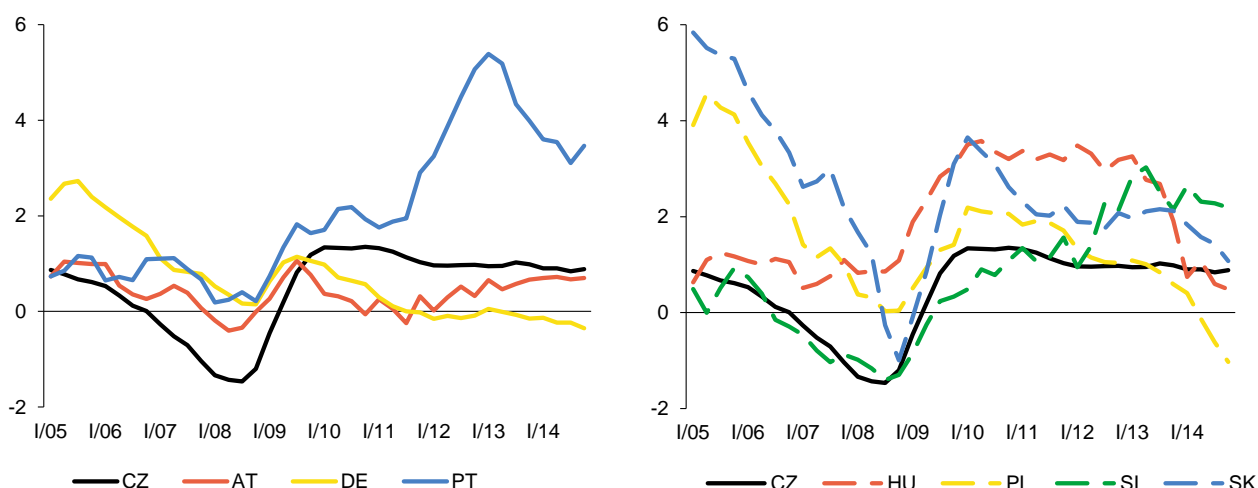
Source: Eurostat, CNB calculations.

Our analysis of the correlation of unemployment gaps in 1998–2014[64] reveals a relatively high correlation between the unemployment gap in the Czech Republic and that in the euro area and, among the individual countries under review, Slovenia. However, the correlation with Slovenia alone is of little relevance with regard to its economic size and the issue of euro adoption, and moreover has loosened recently (see Table 7 and Chart 15). By contrast, the essentially zero unemployment gap correlation between the Czech Republic and Germany does not seem intuitive. It is due to sizeable differences in the evolution of the two countries' unemployment gaps before 2004. If, however, we split the data into two significantly shorter periods (2004–2009 and 2010–2014), the resultant correlation in these two periods is conversely high (0.8 and 0.9 respectively) and highly significant. Generally, it can be concluded that in terms of unemployment gap correlation, the Czech Republic is aligned with

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[64] Given the length of NAIRU cycles, use of the standard 2005–2015 reference period in this report would distort the correlation analysis. For that reason, the maximum length of the available time series is used to calculate the NAIRUs and their gaps and statistical properties.

the euro area as a whole, with Austria, Hungary, Portugal and Slovenia, and, abstracting from the unconvincing results for the time period as a whole, also with Germany.

Table 7: Unemployment gap correlations

	CZ	AT	DE	PT	HU	PL	SI	SK	EA
CZ	1.00	0.29 **	-0.01	0.39 **	0.43 **	0.02	0.68 **	0.19	0.70 **
AT		1.00	0.44 **	0.43 **	0.14	-0.18	0.30 **	-0.08	0.45 **
DE			1.00	-0.42 **	-0.16	0.26 **	-0.28 **	0.32 **	0.10
PT				1.00	0.59 **	-0.58 **	-0.66 **	-0.55 **	0.45 **
HU					1.00	-0.61 **	0.41 **	-0.59 **	0.42 **
PL						1.00	-0.23 *	0.93 **	-0.17
SI							1.00	-0.13	0.85 **
SK								1.00	-0.06
EA									1.00

Note: The significance of the correlation coefficient is marked ** and * for the 5% and 10% significance levels respectively.

Source: Eurostat, CNB calculations.

Concordance statistics (Table 8) are also important for optimally configuring a single monetary policy with regard to labour market developments. These statistics describe the length of time for which two unemployment gaps are in the same phase of the cycle, i.e. both gaps are positive or both gaps negative. The concordance results indicate a high degree of alignment in the cyclical position of the labour market between Slovakia and Poland and between Poland and Germany. The Czech Republic displays the highest concordance with the euro area and, of the individual countries, with Hungary and Slovenia (which, however, is of little relevance as regards euro adoption) and only slightly lower concordance with Slovakia. On the other hand, the Czech Republic's concordance with Germany – its biggest trading partner – is low. This is due mainly to the recently observed negative unemployment gap in Germany, while the positive Czech unemployment gap is only now starting to close gradually. Moreover, an inverse relationship applied to the Czech Republic and Germany in 2007–2008. Overall, the concordance between individual countries is higher than 0.7 in a slight majority of cases. As regards comparison with the euro area, the values observed for the alignment of the cyclical position of the labour market are high for all the countries under review. The figure for the Czech Republic is one of the highest among the countries under comparison.

Table 8: Unemployment gap concordance

	CZ	AT	DE	PT	HU	PL	SI	SK	EA
CZ	1.00	0.69	0.54	0.66	0.79	0.68	0.79	0.76	0.82
AT		1.00	0.59	0.79	0.69	0.72	0.75	0.78	0.78
DE			1.00	0.56	0.66	0.87	0.57	0.78	0.72
PT				1.00	0.75	0.69	0.60	0.69	0.63
HU					1.00	0.79	0.65	0.79	0.74
PL						1.00	0.71	0.91	0.85
SI							1.00	0.79	0.85
SK								1.00	0.91
EA									1.00

Source: Eurostat, CNB calculations.

To sum up, based on the commonly used macroeconomic theory, labour market alignment in the countries under review can be assessed as mixed as regards the indications for configuring monetary policy. However, the Czech Republic's alignment with the euro area as a whole is

relatively high. The question remains to what extent the alignment will be affected in the next few years by the strong economic growth currently being observed in some countries and its subsequent pass-through to the labour market.

1.1.4 Structural similarity of the economies

The risk of occurrence of asymmetric shocks decreases with increasing similarity of the structure of economic activity between an acceding economy and the monetary union. The structural similarity of the economies of the countries under comparison with the euro area can be measured using the **Landesmann index**, which compares the shares of the ten main sectors of the economy (according to the NACE classification) in total value added between the countries under comparison and a reference country, in our case the euro area (see Chart 16). The index takes values in the range [0, 1]. The closer the index is to zero, the more similar is the structure of the economies under comparison.

The difference in the structure of the value added of GDP in the Czech Republic by comparison with Austria, Germany and Portugal was growing until 2008, but the index then stabilised around 0.10; in recent years the structure of economic activity in the Czech Republic has been comparable with that in Slovakia. Poland differs the most from the euro area average.[65]

Chart 16: Structural similarity vis-à-vis the euro area
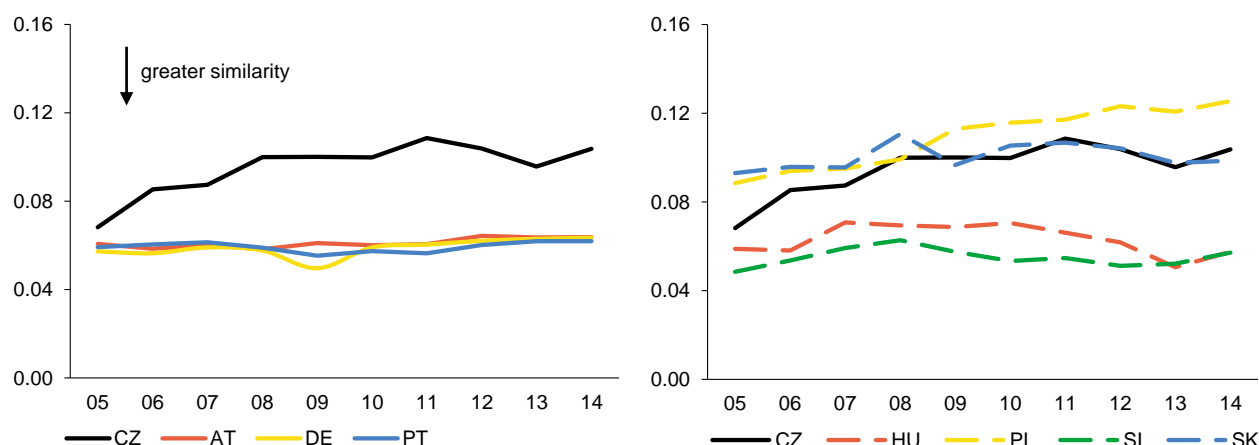
Note: The methodology for the calculation of key national accounts indicators in EU countries was changed in September 2014. The previous ESA 95 System of National and Regional Accounts was replaced by ESA 2010. The time series were recalculated retroactively. According to Eurostat, the impact of the methodological change on the national accounts differs from country to country (for details see http://ec.europa.eu/eurostat/web/esa-2010/overview). For this reason, the Landesmann index published in past issues of this publication is not fully comparable with this year's results.

Source: Eurostat, CNB calculations.

The difference in the structure of Czech GDP lies mainly in the share of industry (30%), which is the highest of all the countries under comparison (see Chart 17). The high share of industry (car manufacture in particular) and the lower share of services in the Czech economy compared to the euro area may lead to asymmetric shocks to which the single monetary policy will not be able to respond in full. The relatively low structural similarity of the Czech economy to the euro area economy thus creates a risk as regards adopting the single currency.

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[65] However, the aggregate index does not always reveal fundamental differences in the economic structures of individual countries. In Portugal, for example, the share of industry (categories B–E) in 2014 was 17%, which is below the euro area average (see Chart 17); by contrast, the share of value added in the public sector (categories (O–Q) in Portugal is above average (at 22%). In Austria, the shares of these sectors in value added are almost exactly the opposite, i.e. 23% and 17%, yet overall the two economies have the same Landesmann index.

Chart 17: Shares of economic sectors in GDP in 2014

(%)
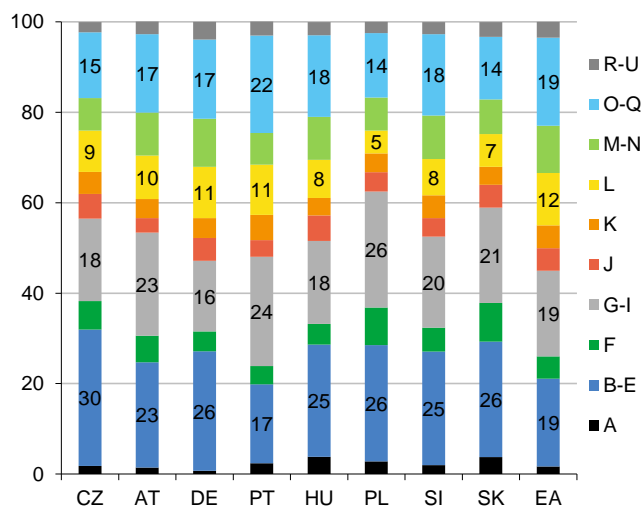
Note: The sectors are broken down according to the NACE classification: A – Agriculture, forestry and fishing; B–E – Industry (except construction); F – Construction; G–I – Wholesale and retail trade, transport, accommodation and food service activities; J – Information and communication; K – Financial and insurance activities; L – Real estate activities; M–N – Professional, scientific and technical activities; administrative and support service activities; O–Q – Public administration, defence, education, human health and social work activities; R–U – Arts, entertainment and recreation; other service activities; activities of household and extra-territorial organisations and bodies.

Source: Eurostat, CNB calculations.

1.1.5   Interest rate convergence

Some countries entering the euro area faced fast nominal interest rate convergence[66] to the union level, which acted as an asymmetric shock manifesting itself, for example, in the emergence of property market bubbles or weaker fiscal discipline. Earlier nominal interest rate convergence – gradual and based on fundamentals – is thus better for smoother economic developments after accession to the euro area, as it will not leave room for the asymmetric shock associated with sudden elimination of the risk premium upon euro adoption.[67] A comparison of the **nominal interest rate differential** vis-à-vis the euro area/Germany[68] thus indicates the probability of the asymmetric shock described above. The closer the nominal interest rate differential is to zero, the smaller is the risk that joining the monetary union will cause a rapid change in both nominal and real interest rates, which would have a destabilising effect on the economy.

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[66] Although real economic activity is affected primarily by real interest rates, nominal interest rates may also have a significant effect via credit or budgetary constraints (e.g. the loan repayment to financial income ratio).
[67] See also section 1.1.1.
[68] EURIBOR is used as the reference rate for short-term rates. German government bond yields are used for long-term rates. The long-term rates in some euro area countries have been showing extreme values in recent years, so the euro area average influenced by such countries cannot be considered a suitable benchmark.

Chart 18: Differences in three-month interest rates vis-à-vis the euro area
(pp)
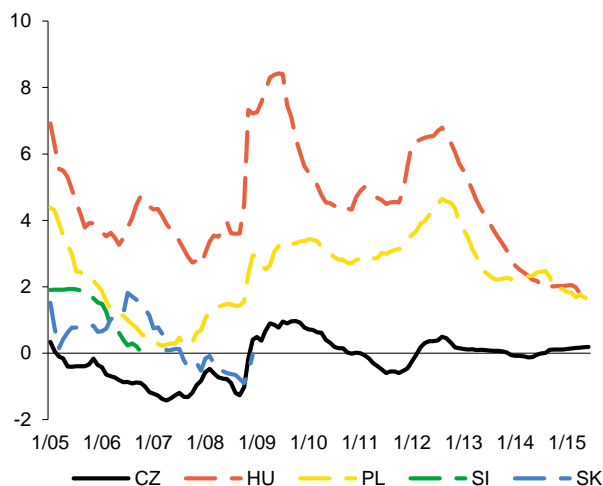
Source: Datastream, CNB calculations.

Chart 18 shows the nominal interest rate differential for short-term rates. In the case of the Czech Republic, the three-month interest rate differential vis-à-vis the euro area has long been very small and, unlike for Hungary and Poland, did not increase significantly during the episode of financial turbulence in 2009 or during the debt crisis in the euro area in 2012. Hungary has the largest interest rate differential in the long term. However, this differential started to decrease in early 2013, reaching 1.6 pp in June 2015, i.e. a level comparable to Poland. This substantial fall in the spread of Hungarian rates vis-à-vis euro rates is due mainly to an easing of Hungarian monetary policy. Over the past two years, inflation in Hungary has turned negative and the central bank has responded by gradually cutting its policy rate to 1.5%.

Turning to the interest rate differentials for ten-year government bonds (see Chart 19), as in the case of money market rates the long-term rate differentials in Hungary and, to a lesser extent, Poland recorded increases in 2009 and 2012. Since 2013, these differentials have been narrowing, the same as in Slovakia and Portugal, for example. Slovenia, which was hit by a major banking crisis, did not see any significant fall in its differential until 2014. The yield differentials in Poland and Hungary are currently at 2–3 pp. The differential for Portuguese yields relative to German government bond yields has stabilised around 2% since the start of 2014. In the other countries, these differentials are below 1 pp. Compared to the other countries, long-term rates in the Czech Republic remain closest to the level in Germany, while their deviations approximately copy the trend and level of Austrian rates. Rates in all the countries under review responded only partially to the escalation of the crisis in Greece.

Chart 19: Differences in ten-year interest rates vis-à-vis Germany
(pp)
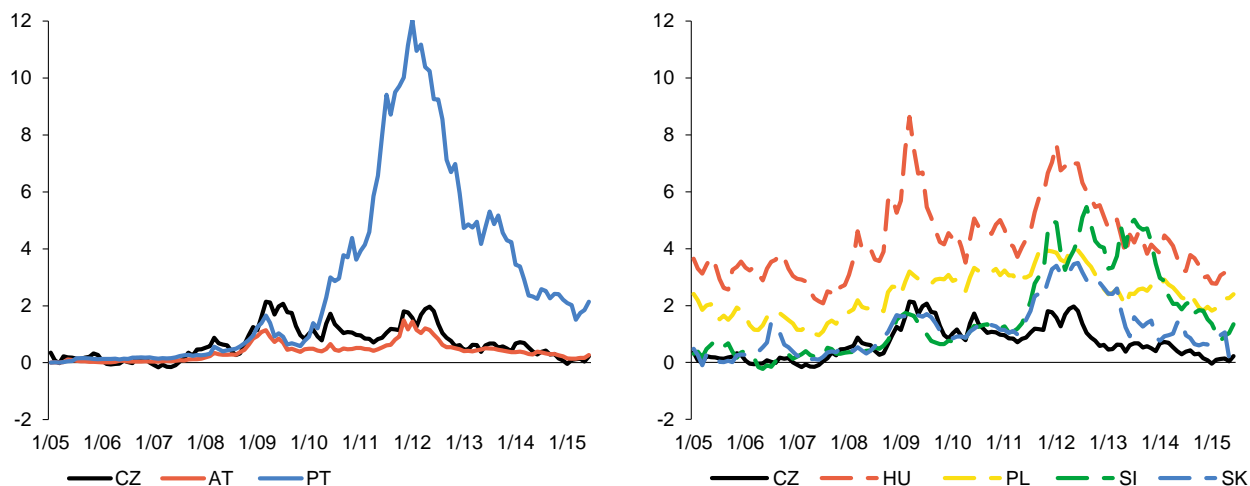
Source: Eurostat, CNB calculations.

To sum up, Czech nominal interest rates have long been close to rates in stable euro area countries and so do not create a risk of a rapid fall in rates and related emergence of macroeconomic imbalances and threats to financial stability upon euro adoption. This also indicates that financial markets view the Czech Republic's government debt as sustainable.

1.1.6 Exchange rate alignment

Long-term alignment of movements in the nominal exchange rates of two currencies vis-à-vis a third reference currency reflects similarity in the factors which affect those exchange rates, implying a lower probability of major asymmetric shocks. A high **correlation of movements in the exchange rates** of two currencies vis-à-vis a reference currency is an indicator that the two countries could share a single currency.[69] The following analysis uses a GARCH model to estimate the correlation between the exchange rates of the Czech koruna, the Hungarian forint and the Polish zloty on the one hand and the euro on the other hand vis-à-vis the US dollar.[70] A high degree of correlation reflects high similarity of exchange rate dynamics and less intense asymmetric pressures; the exchange rate correlation of currencies in a monetary union is one by definition.

The correlation coefficients for the Central European currencies under review displayed sizeable downward swings followed by increases in 2013 and 2014. These were a reaction, among other things, to changes in the monetary policy stances of central banks on both sides of the Atlantic. During 2015, the correlations showed a growth tendency, reaching coefficients of 0.83–0.96 in the middle of the year (see Chart 20). As in previous years, the largest fluctuations in the correlation coefficient were recorded by the Hungarian forint.[71] The correlation between the Hungarian forint and the euro increased sharply, albeit only temporarily, after the unexpected exit from the Swiss exchange rate commitment. The Polish zloty also reacted strongly to this event.

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[69] See Aguilar and Hördahl (1998).
[70] GARCH estimates of the correlations of the Slovenian tolar and the Slovak koruna until joining the monetary union can be found in previous issues of this publication (2005–2012).
[71] The Hungarian forint reacted the most quickly and strongly of all the currencies to the geopolitical conflict in neighbouring Ukraine. This was because the Hungarian banking sector was the most exposed to Ukraine and had the strongest trade links with it.

Chart 20: Correlation coefficients of exchange rates against the US dollar

CZK/USD and EUR/USD

HUF/USD and EUR/USD

PLN/USD and EUR/USD
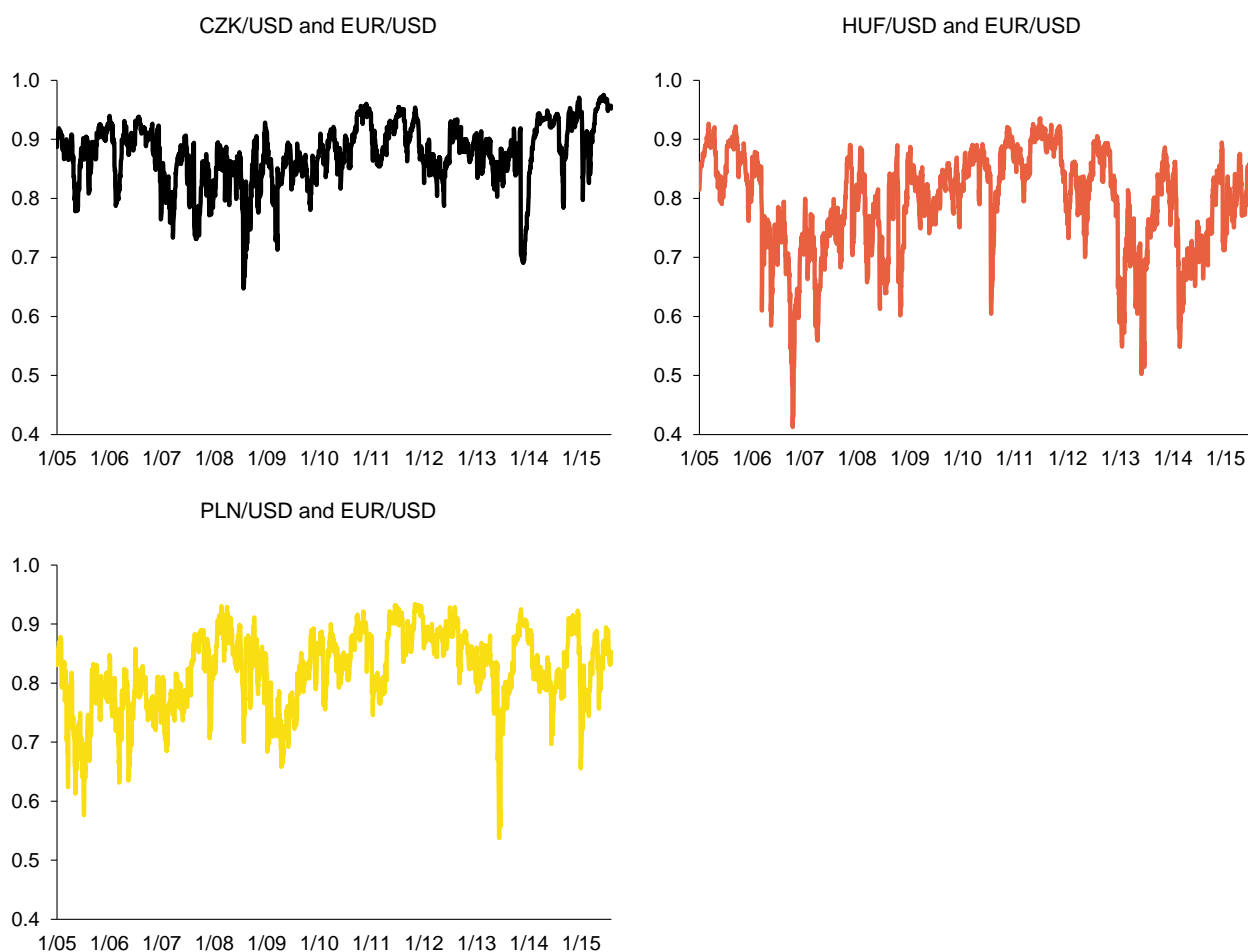
Source: Thomson Datastream, Eurostat, CNB calculations.

The correlation between the Czech koruna and the euro has been fundamentally affected over the past two years by the Czech National Bank's use of the exchange rate as an additional instrument for easing monetary policy. Following the announcement of the exchange rate commitment in November 2013, the exchange rate stabilised just above CZK 27 to the euro. This led to a further increase in the correlation between the exchange rate of the Czech koruna against the dollar and that of the euro against the dollar. Even in the previous period, however, this correlation was the highest and most stable by comparison with the currencies of the Central European region. As a result, we can sum up that from the long-term perspective the Czech currency reacts to changes in the external environment outside the euro area similarly to the euro itself. This indicates a high degree of alignment.

1.1.7 Analysis of exchange rate volatility

Another way of assessing the risk of occurrence of asymmetric shocks in the Czech economy vis-à-vis the euro area is to analyse exchange rate volatility.[72] Low volatility of the exchange

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[72] CNB (2009) estimates the fundamental-based (i.e. theoretically expected) exchange rate volatility. For Slovakia and Slovenia this refers to a purely hypothetical situation. It can be said that the lower the fundamental-based exchange rate volatility, the higher the ability of two countries to share a common currency (for details see, for example, Horváth, 2005).

rate between two countries may be regarded, under the floating exchange rate regime, as an indicator of their potential to share a single currency (see also section 1.1.6).

Chart 21 illustrates the **historical volatility** of selected countries' exchange rates vis-à-vis the euro. The indicator of volatility is the annualised standard deviation of daily returns for the last six months. The volatility of the Czech koruna has been lower than that of the Hungarian forint and the Polish zloty over the past ten years, even at a time of sharp growth in volatility connected with the global financial and European debt crisis.

Chart 21: Historical volatility of exchange rates vis-à-vis the euro
(%)
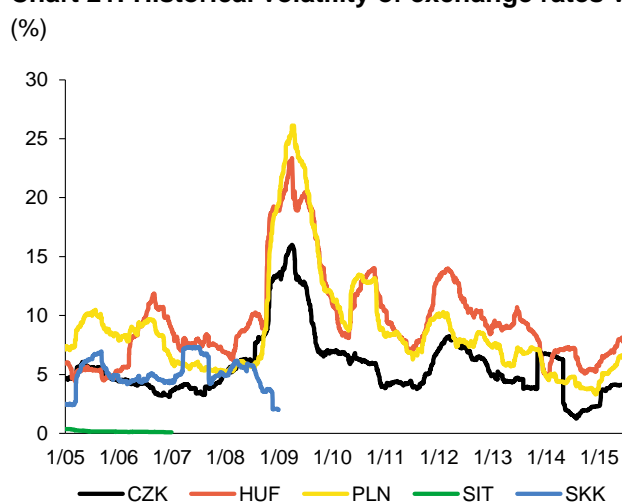
Note: The historical volatility is described by the annualised standard deviation of daily returns in the past six months.
Source: Datastream, CNB calculations.

A one-off increase in the historical volatility can be seen for the Czech koruna in late 2013, reflecting the Czech National Bank's decision to start using the exchange rate as an additional instrument for easing monetary policy. After the adoption of the exchange rate commitment, the exchange rate stabilised just above CZK 27 to the euro. It later fluctuated in a narrow range of CZK 27.3–27.6 to the euro. As a result, its historical volatility fell in 2014 to the lowest level in the entire period under review.

An outlook for exchange rate volatility can be derived from financial market data. The **implied volatility**, i.e. the expected volatility of the exchange rates of the countries under comparison as reflected in the prices of options for the individual currencies (see Chart 22), displays a relatively similar pattern in the Czech Republic, Hungary and Poland over the entire period under review. This suggests a volatility spillover effect among Central European currency markets.[73] The implied volatility of the Czech koruna against the euro fell to a historical low in 2014 in response to the adoption of the exchange rate commitment by the Czech National Bank. The one-off upward shift in implied volatility recorded by the three Central European currencies in early 2015 was due among other things to the Swiss central bank's decision to discontinue its exchange rate commitment.

To sum up, except during the financial crisis, the volatility of the Czech koruna's exchange rate against the euro has been relatively low and stable, which is a favourable factor for euro adoption. At the same time, the relatively high volatility immediately before the crisis and after its onset largely reflects desirable dampening of the impacts of economic shocks on the Czech

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[73] According to Bubák, Kočenda and Žikeš (2011), the volatility spillover effects among markets are marked between the Polish and Czech currencies, while the MNB's interventions on the Hungarian foreign exchange market have dampened the volatility spillover effects on this currency. An overall increase in the spillover effects is apparent in the post-crisis period.

Republic via the exchange rate. The introduction of the exchange rate commitment by the Czech National Bank caused a one-off increase in the historical volatility of the Czech koruna against the euro, but subsequently led to a further decline in both the historical and implied volatility.

Chart 22: Implied volatility of exchange rates vis-à-vis the euro
(%)
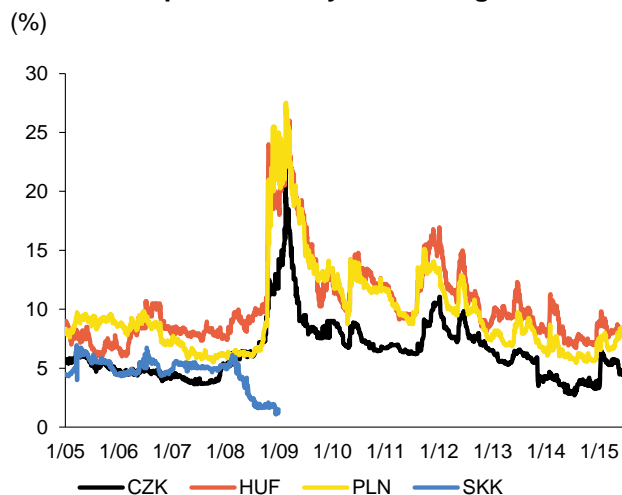
Source: Datastream, CNB calculations.

1.1.8 Integration of the economy with the euro area

The degree of integration of an economy into trade and ownership relations with the monetary union states is crucial for assessing the costs and benefits of the single currency. Greater integration into trade with euro area countries increases the potential benefits of joining the monetary union, as the adoption of the single currency eliminates the exchange rate risk and reduces the transaction costs of such trade. At the same time, greater intensity of international economic relations usually leads to greater synchronisation of economic shocks and cyclical alignment and hence to lower costs associated with the loss of independent monetary policy.[74]

International trade with the euro area

The **intensity of trade** of the countries under comparison with the euro area average can be assessed using export and import shares. The share of exports to the euro area in total exports is very high in the Czech Republic[75] (see Chart 23), higher than in any of the other economies under review; only Portugal has a similar level. In the case of imports (see Chart 24), the Czech share is similarly high, reaching the highest levels of the countries under comparison along with Portugal and Austria. However, these shares have shown a gradual downward trend in recent years as exporters have tried to penetrate emerging markets and non-European markets in general, which have been hit less hard by the global economic crisis or offer good prospects in some other respect.

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[74] Closer trade links increase the correlation of economic activity within a single currency area (Frankel and Rose, 1997). On the other hand, higher trade intensity may lead to growing specialisation and decreasing structural similarity and thus to less economic symmetry (Krugman, 1993).
[75] Around half of Czech exports to the euro area go to Germany and around 14% go to Slovakia. The Czech Republic's other major trading partners in the euro area include France, Austria and Italy (5–8%).

Chart 23: Shares of exports to the euro area in total exports
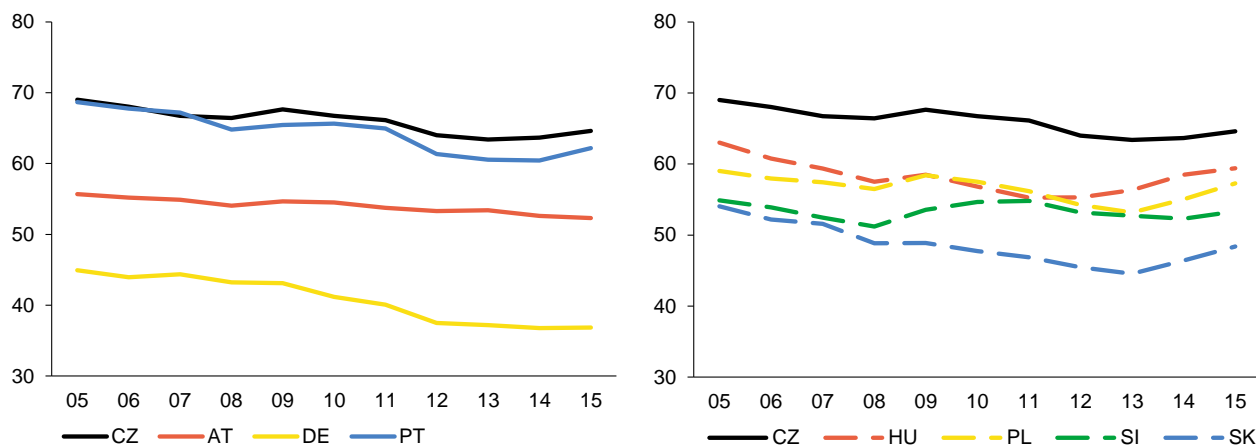
(%)

Note: The 2015 figure is for the first four months of the year.

Source: Eurostat, CNB calculations.

Chart 24: Shares of imports from the euro area in total imports
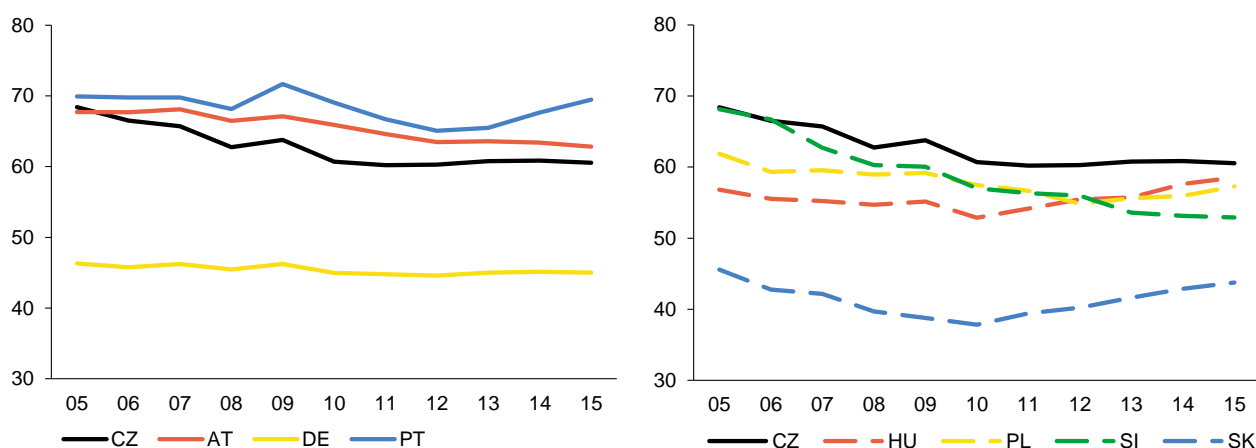
(%)

Note: The 2015 figure is for the first four months of the year.

Source: Eurostat, CNB calculations.

The statistics on **intra-industry trade** give a more detailed view of international trade. Intra-industry trade is usually particularly significant for technology-intensive products, which similarly advanced countries trade among themselves. It is thus another indicator of the structural similarity of economies. Strong intra-industry trade fosters cyclical convergence[76] and can also affect the economy's ability to absorb economic shocks.[77] The theory of intra-industry trade assumes the greatest intensity of intra-industry trade in capital- and research-intensive industries, which can benefit most from economies of scale; as a rule these are industries with high market concentration. On the other hand, the lowest level can be expected

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[76] Frankel and Rose (1997). For more on the theory of intra-industry trade see Krugman (1981) and Hoekman and Djankov (1996).

[77] Among other things, intra-industry trade growth may have a positive effect on the costs and speed of restructuring, since the transfer of resources may be faster and less expensive if effected within an industry rather than between industries. An increase in the proportion of intra-industry trade (horizontal in particular) after accession to a monetary union may also indicate refutation of the specialisation hypothesis, which would predict an increase in inter-industry foreign trade.

in industries associated with natural resources. To analyse intra-industry trade we used the Grubel-Lloyd index, which indicates the share of the absolute amount of intra-industry trade in total foreign trade turnover with the euro area.

Chart 25: Intensity of intra-industry trade with the euro area
(under SITC5)
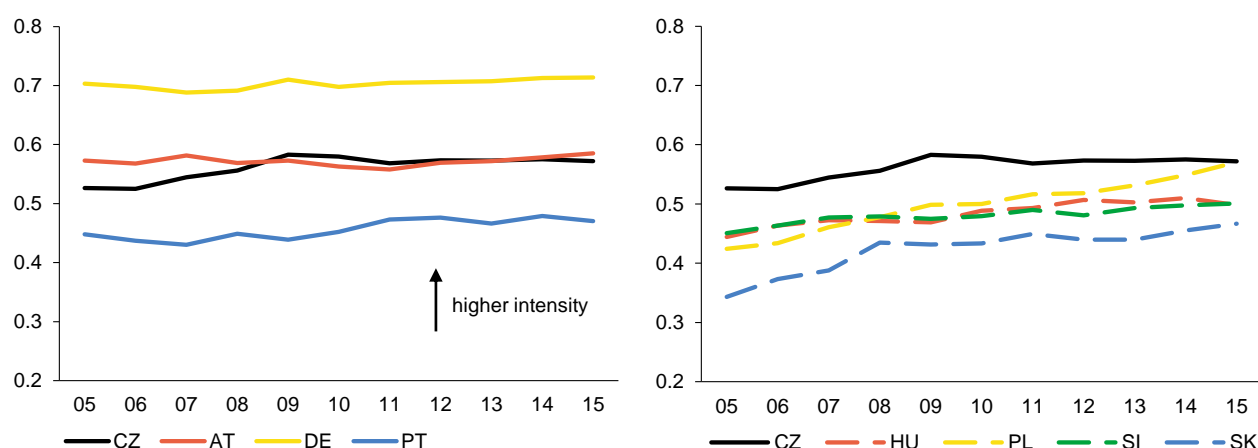
Note: The presented results are based on the five-digit SITC classification. The 2015 figure is for the first four months of the year.
Source: Eurostat, CNB calculations.

The SITC5-based Grubel-Lloyd index (see Chart 25 and Table 9) shows relatively high values for the Czech Republic in the long term, values comparable with those for Austria. Only Germany has a higher intensity of intra-industry trade with the euro area. Portugal has lower Grubel-Lloyd index values than the Czech Republic), similar to the Central European new EU Member States, which, however, show a slight upward trend in the period under review. Overall, then, the Czech Republic has an above-average share of intra-industry trade with the euro area compared to the other countries.

Table 9: Grubel-Lloyd indices by degree of aggregation
(for 2014)

	SITC 1	SITC 2	SITC 3	SITC 5
CZ	0.83	0.75	0.68	0.57
AT	0.88	0.79	0.71	0.58
DE	0.92	0.86	0.81	0.71
PT	0.76	0.69	0.62	0.48
HU	0.86	0.76	0.69	0.51
PL	0.86	0.78	0.67	0.55
SI	0.84	0.76	0.65	0.50
SK	0.88	0.77	0.58	0.46

Note: SITC 1, 2, 3 and 5 represent the one-, two-, three- and five-digit SITC breakdowns.
Source: Eurostat, CNB calculations.

Intensive foreign trade represents a significant channel for the transmission of economic impulses from the euro area to the Czech economy. Swings in euro area demand have been one of the main sources of the business cycle in the Czech Republic in the last ten years. This reduces the potential costs associated with adopting the single monetary policy. This trade integration creates potential for large benefits stemming from the removal of exchange rate

risk and from transaction cost savings upon euro adoption, and has therefore long been one of the most significant arguments for the Czech Republic's joining the euro area.

Foreign direct investment

Alignment of economic activity is also fostered by a higher level of ownership linkages. If domestic companies are part of multinational groups, this helps to transmit economic impulses.[78] In addition, capital integration between two countries can help to dampen negative unilateral demand shocks. Ownership linkages with the euro area are measured by the ratio of the **foreign direct investment** (FDI) stock from the euro area in the countries under review to GDP (see Table 10) and by the ratio of the direct investment (DI) stock from the country under review in the euro area to GDP (see Table 11).

Table 10: Ratios of FDI stock from the euro area to GDP

(%)

	2008	2009	2010	2011	2012	2013
CZ	48.9	57.4	60.5	56.7	64.0	62.8
AT	41.1	46.6	37.3	36.6	36.9	37.5
DE	21.7	23.8	24.2	24.3	26.4	26.7
PT	31.8	37.9	42.4	42.0	57.1	58.9
HU	43.4	50.6	51.5	49.3	58.7	57.2
PL	24.9	31.9	36.8	33.6	37.8	39.1
SI	18.1	18.9	19.2	20.5	21.2	20.3
SK	47.6	49.8	49.7	51.0	49.9	49.4

Note: The euro area is defined as the EA-18.

Source: Eurostat, Hungarian central bank for Hungary, CNB calculations.

The ratio of FDI from the euro area to GDP in the Czech Republic was the highest among the countries under comparison in 2013. High levels of ownership linkages were also recorded by Portugal and Hungary, with Slovakia a small distance behind.

Table 11: Ratios of DI stock in the euro area to GDP

(%)

	2008	2009	2010	2011	2012	2013
CZ	9.0	11.4	13.6	13.4	15.7	19.0
AT	19.8	22.9	25.2	26.0	25.9	27.4
DE	20.5	23.4	23.7	24.9	27.0	27.8
PT	17.0	17.9	18.1	24.4	29.0	32.3
HU	6.3	6.4	5.3	5.6	10.2	10.1
PL	3.1	4.4	7.2	7.6	8.5	8.2
SI	3.2	4.7	4.9	4.8	4.0	3.9
SK	5.3	6.3	6.2	8.3	6.7	7.9

Note: The euro area is defined as the EA-18.

Source: Eurostat, Hungarian central bank for Hungary, CNB calculations.

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[78] Thanks to the penetration of technology, foreign investment also has a favourable effect on the productivity of domestic firms (Javorcik, 2004; Havránek and Iršová, 2010); the high investment volumes from the euro area are therefore furthering convergence.

By contrast, ownership linkages with the euro area defined in the other direction, i.e. direct investment from the countries under review in the euro area as a percentage of their GDP, are still low in the case of the new EU members. Among the new Member States, the Czech Republic is characterised by much higher ownership linkages to the euro area, but those linkages are still lower than in the old EU Member States.

The Czech economy's intensive ownership integration with the euro area, as represented by a high level of FDI from the euro area in the Czech Republic, coupled with its high degree of openness, increases the probability of economic alignment with the monetary union economy, thus reducing the risk of asymmetric shocks if the euro were to be adopted.

1.2 SIMILARITY OF MONETARY POLICY TRANSMISSION

When assessing the Czech Republic's preparedness to join the monetary union, it is important to consider to what extent the settings and impacts of the single monetary policy will be appropriate for the Czech Republic. Given the similar course of the business cycle and strong links between the Czech economy and the euro area core, the European Central Bank's single monetary policy is likely to be quite often in line with the needs of the Czech economy. However, to take advantage of this possible benefit, the transmission of monetary policy in the Czech Republic from monetary policy rates (or other monetary policy instruments) to real economic activity and particularly inflation, needs to be similar to the transmission mechanism in the euro area as a whole.

This section presents analyses of alignment in areas relating to monetary policy transmission. These areas include similarity of the financial system, the structure of assets and liabilities of households and firms, the relationship between market and client rates, the degree of financial market integration, inflation persistence and the degree of euroisation of the Czech economy.

1.2.1 Financial system

The **depth of financial intermediation** in the Czech Republic in 2014, as expressed as the ratio of financial institutions' assets to GDP, was 174%, compared to 628% in the euro area as a whole and just over 400% in Germany, Austria and Portugal (see Chart 26). The importance of financial intermediation thus remains considerably lower in the Czech Republic and is comparable with that in Poland, Slovenia and Slovakia. Nevertheless, the depth of financial intermediation in the euro area should not be regarded as a target to which the Czech financial sector should converge.[79] The financial crisis highlighted the fact that an excessively large financial sector can represent a source of substantial risks, limiting the ability of institutions or economic policy makers to solve potential problems in the financial system.[80] While financial intermediation in the Czech Republic was flat in 2014, the euro area saw a year-on-year increase of 51 pp, due mainly to growth in the total assets of investment funds and other non-bank financial intermediaries. The three-and-a-half-year-long convergence in the degree of financial intermediation in the Czech Republic to the euro area levels thus halted in 2014.

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[79] The depth of financial intermediation should correspond to the country's level of economic development.
[80] Financial accounts statistics and monetary and financial statistics data were used to prepare this section. These statistics enable international comparisons to be made, but may not always be identical to the national supervisory statistics on supervised financial institutions in individual countries due to certain methodological differences.

Chart 26: Depth of financial intermediation

(assets of financial institutions as % of GDP)
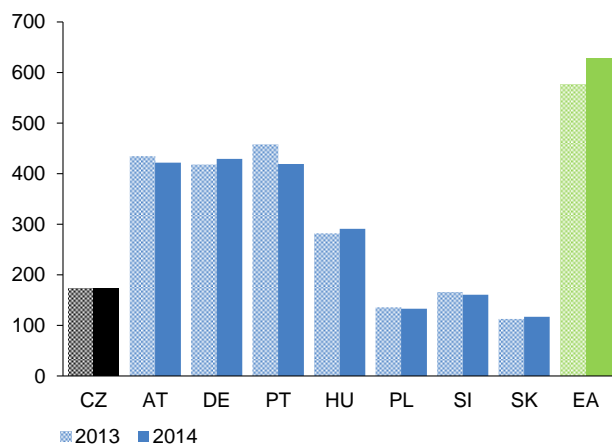
Note: The euro area value exceeds the other countries in the charts owing to the large volume of assets of financial corporations in Luxembourg, Ireland, the Netherlands and France both as a percentage of their GDP and in comparison with the total financial assets of the euro area.

Source: CNB, ECB, Eurostat, central banks.

The depth of financial intermediation is linked to the **private sector debt ratio.** The shallower financial intermediation in the Czech Republic is mostly due to lower indebtedness of the Czech private sector compared to the euro area. The debt ratio is comparable with Central European countries such as Slovenia and Poland (see Chart 27). However, the euro area is experiencing a gradual decline in the private sector debt ratio, from 166% of GDP in 2011 to 145% of GDP in 2014. By contrast, the Czech Republic saw a slight increase from 58% of GDP to 60% of GDP in the same period. It can be assumed that convergence towards the euro area will continue in this area, as private sector debt in the Czech Republic is still below the level corresponding to the income level[81] and private sector deleveraging is still ongoing in some euro area countries.

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[81] See Geršl and Seidler (2011).

Chart 27: Private sector debt
(% of GDP)
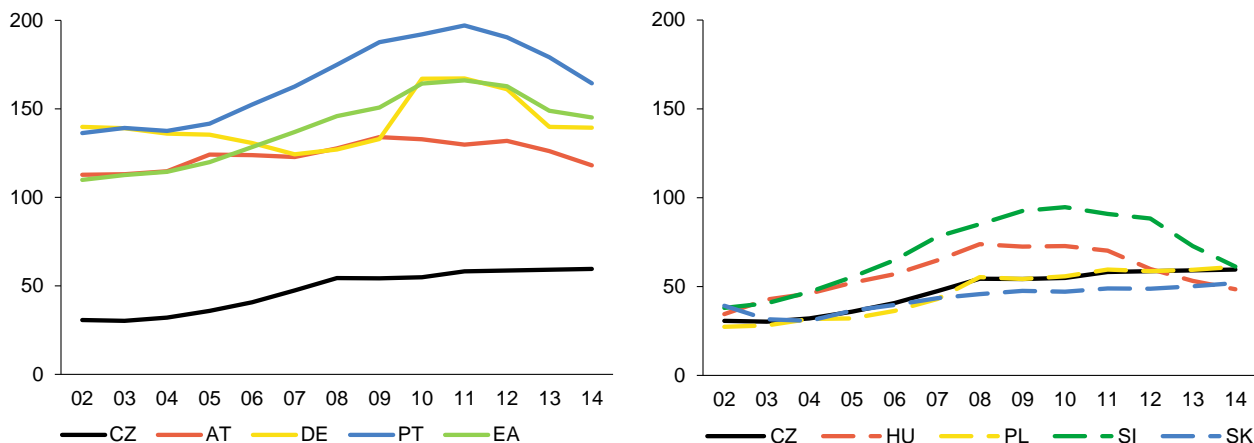
Note: EA represents the average of the euro area member countries weighted by the size of GDP.
Source: IMF IFS, Eurostat.

1.2.2 Structure of financial assets and liabilities of corporations and households

A similar financial position and structure of financial assets and liabilities of sectors of individual economies is a key condition for the single monetary policy to have a symmetric effect and for the transmission mechanism to function. The financial position, as expressed by net financial assets, can be used to compare to what extent the sectors of non-financial corporations and households in individual countries are able to finance other sectors and, conversely, to what extent they need the funds of other sectors to finance their activities. Given the different responses of different financial asset and liability items to a monetary policy impulse, it is necessary to compare not only the level, but also the structure of the net financial position. A look at the structure of financial balance sheets of the corporate and household sectors also provides information on the link of the real economy to the financial sector and especially the banking sector. The banking sector's exposure to other sectors is high in all the economies under comparison. This is because bank loans are historically the primary source of external financing of non-financial corporations and households. There is still the topical question of whether bond financing will remain a complement to bank loans or whether it will become a substitute for bank loans thanks to the favourable market conditions (low interest rates and demand for corporate bonds) and institutional conditions for issuing corporate bonds observed over the last three years.[82]

The **structure of the financial balance sheet and the net financial assets of non-financial corporations** as a percentage of GDP are shown in Chart 28.[83] Compared to 2013, the net debtor position of this sector,[84] which is due generally to a large proportion of non-financial assets in the balance sheet, decreased in the Czech Republic, Hungary, Slovenia, Austria and Portugal and, by contrast, increased in the remaining countries under comparison and in the euro area as a whole.

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[82] The tighter capital requirements for banks are acting in the same direction, i.e. supporting capital financing, as they are limiting non-investment-grade loans due to stricter regulation.
[83] Given the limited length of the time series due to the switch to EAS2010, the analysis covers the period from 2013 Q1 to 2015 Q1.
[84] The net debtor position is the difference between financial assets and liabilities, including non-debt items such as shares.

Chart 28: Structure of the financial balance sheet and net financial assets of non-financial corporations
(% of GDP)
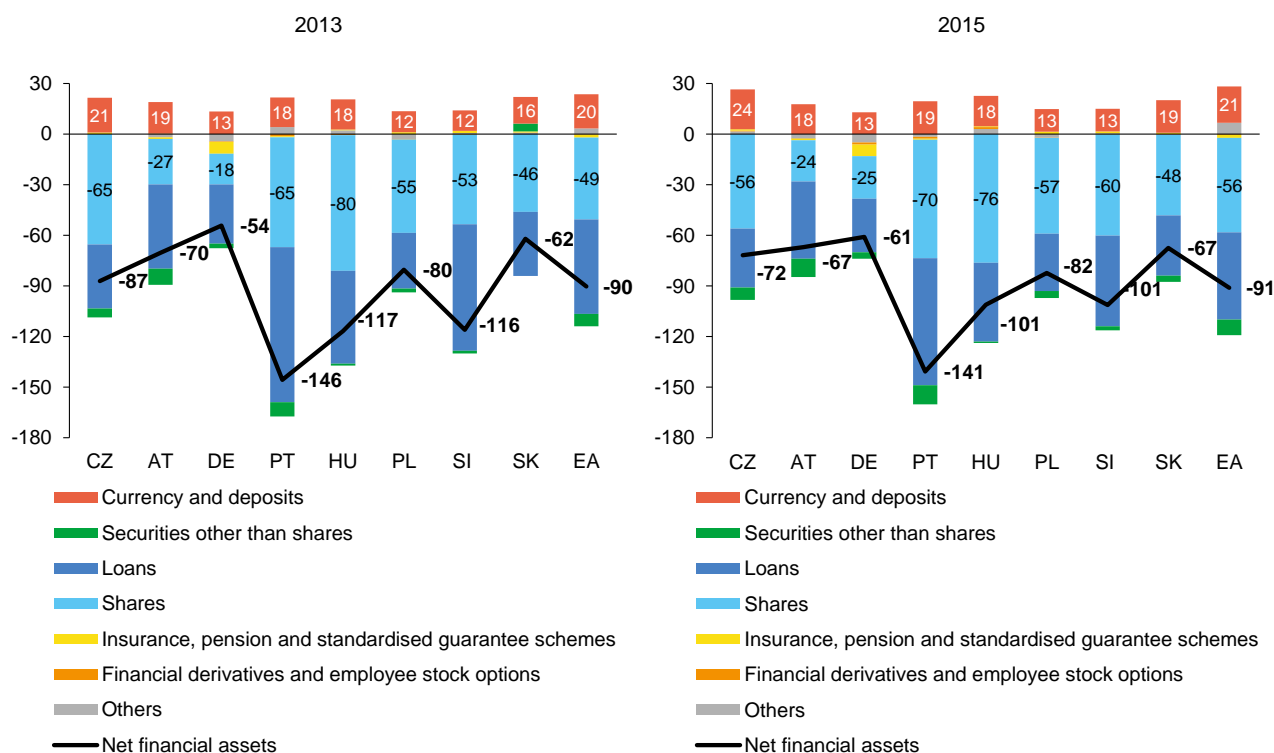
Note: The 2013 and 2015 data are as at the end of Q1.
Source: ECB, CNB calculations.

In both years under comparison the financial balance sheet structure of Czech non-financial corporations is similar to that of euro area corporations, except that in the euro area the loan-to-GDP ratio is higher, which is the main reason for a slightly more negative net debtor position in the euro area than in the Czech Republic. The loan-to-GDP ratio increased in all of the countries under comparison except Poland. This testifies to low credit growth relative to the performance of economies across Europe. Compared to advanced euro area countries, shares and other equity[85] have a higher weight in the net debtor position of corporations in the other countries (including the Czech Republic). This is due mainly to a far lower proportion of shares in financial assets, linked with a lower rate of corporate investment in other non-financial corporations in the domestic economy and, in particular, abroad. In the Czech Republic, the net debtor position of corporations fell between 2013 and 2015 (see Chart 28), mainly reflecting subdued growth in liabilities and faster growth in financial assets in the form of currency, deposits, shares and other accounts receivable. As regards the level of corporate loan debt, the Czech Republic is broadly comparable with Germany, Poland and Slovakia, but below the euro area level. The ratio of currency and deposits of non-financial corporations to GDP in the Czech Republic exceeds that in the other countries under comparison. Due to higher securities issues, the ratio of net liabilities in the form of securities to GDP is almost comparable with that in the euro area.

The contributions of the individual forms of financing of non-financial corporations to growth in total liabilities in the last two years (see Chart 29) confirms a growing role of financing through

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[85] Quoted shares, unquoted shares and investment fund units.

securities, particularly bonds.[86] In the Czech Republic, the contribution of securities exceeded that of loans.[87] The opposite was true for Austria and Germany, where traditional bank loan financing contributed more to growth in financial liabilities than bond financing did. In Poland and Slovakia, long-term loans and long-term securities both contributed considerably to the growth of liabilities. In Slovenia and Portugal, loans contributed negatively, considerably outweighing the positive contributions of bonds. Different trends in bank financing are thus apparent across euro area countries, with some experiencing a decline in the stock of loans and others recording growth.

Chart 29: Contributions of individual forms of financing to growth in total liabilities
(pp)
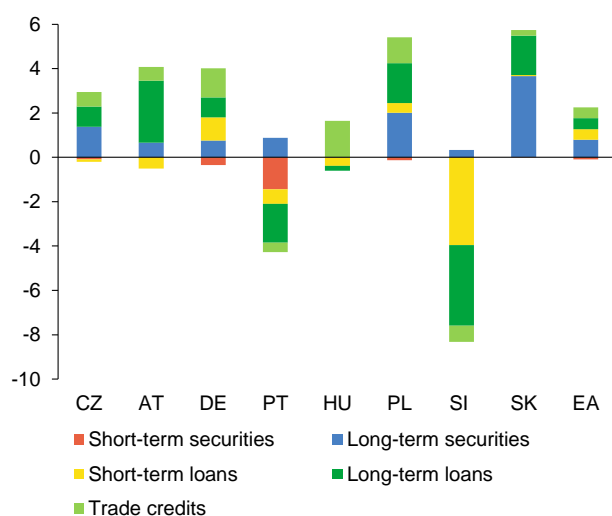
Note: The contributions to growth are calculated for the period of 2013 Q1–2015 Q1.
Source: ECB, CNB calculations.

Debt financing of non-financial corporations is expressed by the **debt to equity ratio** (see Chart 30),[88] which can be used to assess the risk of overleveraging. In the Czech Republic, this ratio has been fluctuating above 100% and showing a modest upward trend since the start of 2013. Throughout the period, it has been above that of Germany and the euro area, where it has dropped markedly, and is below that of Austria and Portugal; it is also higher than in Poland and Hungary.

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[86] This form of financing is used for investment projects that would otherwise be funded by syndicated loans. For a firm, the cash flows associated with a bond issue are more favourable than those associated with a loan, as until the bond matures the firm only pays interest (once or twice a year) and redeems the principal in full at maturity, whereas a loan is typically repaid in regular instalments.
[87] Trade credits, i.e. short-term loans arising from the maturity of transactions between corporations at a contractually agreed future date, recorded growth similar to that of long-term loans. Trade credits are used to some extent as short-term financing, but no interest or penalty is paid if they are repaid on time.
[88] Debt consists of bonds issued, loans accepted and trade credits or shares issued.

Chart 30: Debt-to-equity ratios of non-financial corporations
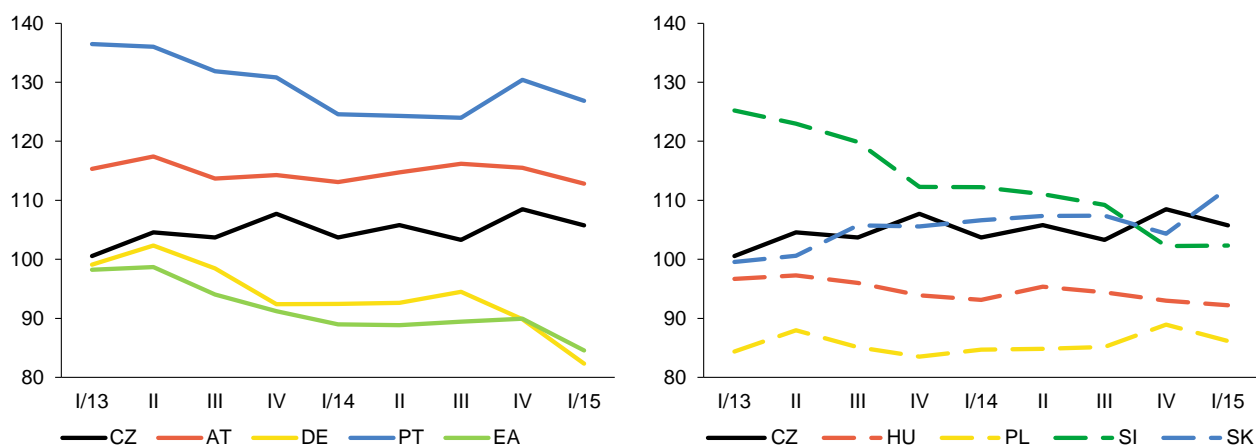
Source: ECB, CNB calculations.

A more detailed **breakdown of the debt-to-equity ratio** (see Chart 31) reveals a high proportion of trade credits for corporations in the Czech Republic and Slovakia. By comparison, the ratio in the euro area is roughly one-half. The share of securities in equity is slightly higher in the Czech Republic than in the euro area and also higher than in Poland and Hungary. This is due to increased issuing activity by non-financial corporations over the last few years. This indicator also clearly shows a generally higher share of loans compared to other corporate financing instruments.

Chart 31: Components of the debt-to-equity ratio
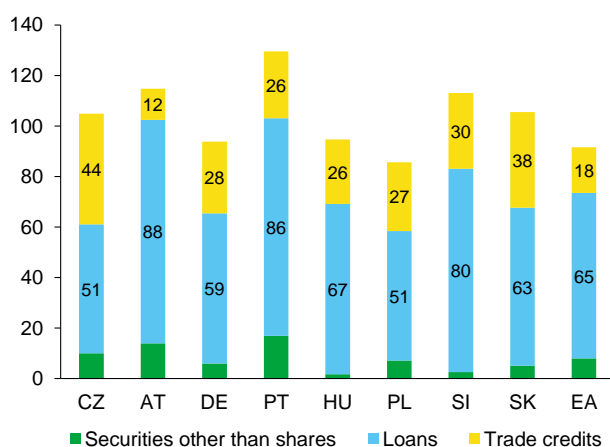
Note: The components are calculated as the share of the given instrument in equity and as the average for 2013 Q1–2015 Q1.
Source: ECB, CNB calculations.

To sum up, despite similar patterns in the financing of non-financial corporations in the Czech Republic and the euro area, these economies continue to differ in some respects in terms of the overall level and structure of corporate liabilities. This is due mainly to different pre-crisis leveraging levels, which were lower in the Czech Republic than in the euro area, and also to different post-crisis responses of debt.

Unlike non-financial corporations, the **household sector** is in a net creditor position (see Chart 32).[89] The ratio of net financial assets of households to GDP rose over the last two years in all the countries under review. While some experienced a rather sharp rise (such as Hungary, Poland and the euro area as a whole), the Czech Republic recorded only a moderate increase. The net financial position of Czech households is about half that in the euro area, corresponding to about half the level of their financial wealth.

Chart 32: Structure of the financial balance sheet and net financial assets of households
(% of GDP)
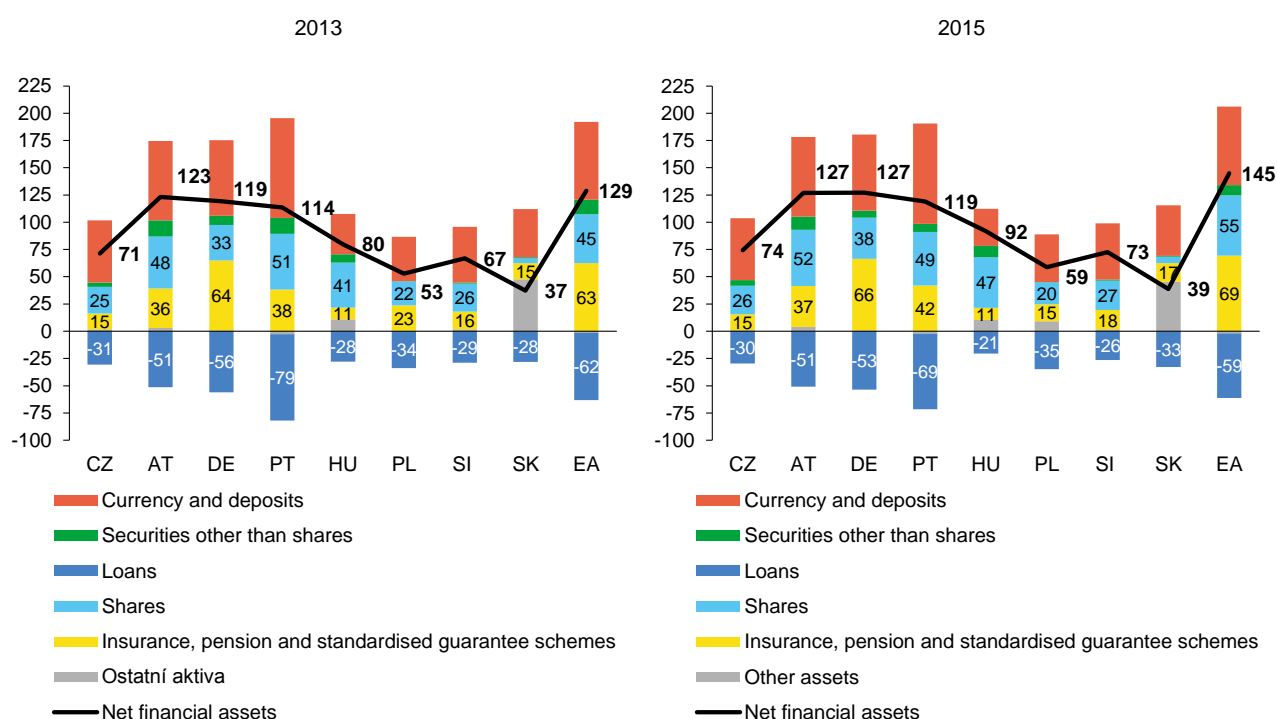
Note: The 2013 and 2015 data are for Q1.
Source: ECB, CNB calculations.

The majority of the countries under comparison (except Poland and Slovakia) experienced a decrease in the ratio of net loans to households to GDP. However, the decrease may have been caused either by a real drop in the volume of loans, or by slower growth in loans to households coupled with renewed GDP growth. While the volume of loans to Czech, Austrian and German households rose moderately, in Hungary, Portugal and Slovenia the stock of loans went down (see Chart 33). By contrast, Poland and Slovakia recorded substantial annual growth in loans to households. Despite a slightly different loan trend, the Czech household debt ratio remains around half that in the euro area as a whole.

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[89] Given the limited length of the time series due to the switch to EAS2010, the analysis covers the period from 2013 Q1 to 2015 Q1.

Chart 33: Annual growth in loans to households
(%)
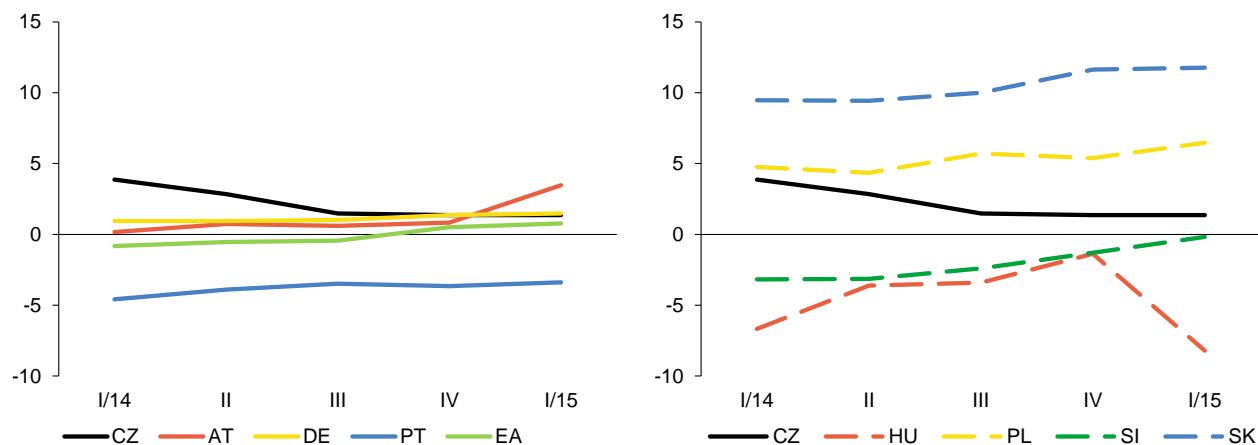
Source: ECB, CNB calculations.

The liquid component of the **household portfolio**, i.e. currency and deposits, has a high and relatively stable ratio to GDP over time. To some extent, this is due to households' conservative approach to managing their financial portfolio (even at the cost of a small return on these funds in an environment of low interest rates) and also to the still abating liquidity preferences of households in the post-crisis financial environment. The ratio of currency and deposits to total financial assets exceeds 50% for households in the Czech Republic (53%) and Slovakia (61%; see Chart 34), while for households in the euro area as a whole it is only one-third (34%). In Hungary, the ratio is even slightly lower (29%), due to higher foreign currency loan instalments caused by past depreciations of the forint.[90] Czech and Slovak households mostly prefer cash and easy-to-access funds on bank accounts.

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[90] The depreciation trend of the forint against the euro has been going on since approximately 2008.

Chart 34: Household portfolio structure

(%)
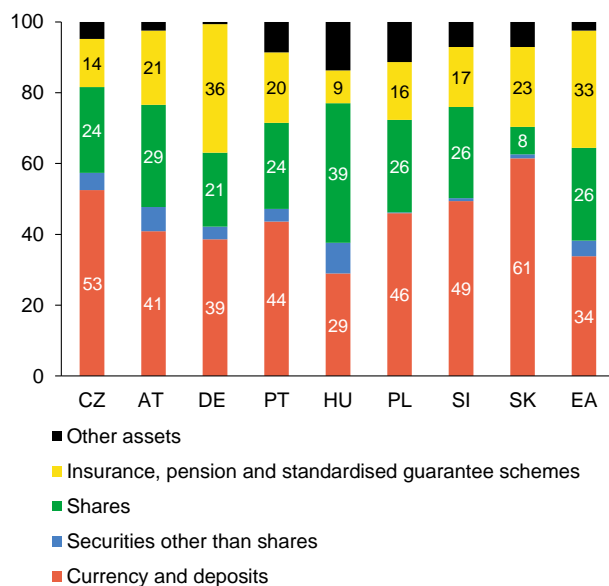
Note: The data are for 2015 Q1. Other assets comprise other accounts receivable, loans, derivatives and employee stock options.
Source: ECB, CNB calculations.

The **investment component of the household portfolio** contains equity, in particular shares and units, as well as insurance, pension and standardised guarantee schemes and securities other than shares (e.g. government bonds). The evolution of these instruments reflects the tendency of households to invest on the capital market through individual investment (e.g. bond purchases) or collective investment (e.g. purchases of fund units). The share of the investment component in the portfolio of Czech households (42%) is similar to that for Polish and Slovenian households. By contrast, the investment component share of Austrian and German households as well as of the euro area as a whole is higher (approximately 60%). Compared to their Czech counterparts, Austria households have a higher percentage of shares and securities, while German households have a higher percentage in insurance and pension schemes.

The contributions of individual financial asset instruments to the total assets of households differed across the countries under comparison. Unlike households in Austria, Germany, Portugal and the euro area as a whole, Czech households in past years tended to purchase securities other than shares – mostly bonds (see Chart 35).[91] As regards the structure and share of securities in the portfolio, Czech households shifted closer to those in Austria and the euro area as a whole (see Chart 34). By contrast, euro area countries experienced a slightly different trend in securities holdings in the period under review, as households in Portugal, Austria and Germany tended to sell securities from their portfolios.

Households in the original euro area member states hold a larger proportion of shares than Czech households in relation to GDP (see Chart 32), but shares rose considerably in households in all the countries under comparison in the period under review (see Chart 35), due mainly to investment in investment fund units. **Insurance and pension schemes** also

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[91] In the Czech Republic, these were mostly investments in government saving bonds, which became both a saving instrument for households with a conservative risk profile and a portfolio diversification instrument for households with a preference for the investment component.

contributed to the growth in households' financial assets across all the countries under review. However, the growth in this instrument in the portfolio of Czech households was lower than that in the individual euro area countries and in the euro area as a whole. In the period under review, households in the Czech Republic increased not only the volume of securities holdings, the value of shares and the value of insurance and pension schemes, but also the value of currency and deposits, confirming their conservative and well-balanced approach to portfolio management. Households in the euro area as a whole acted similarly, though with lower growth in the liquid component and a slight decrease in securities holdings. A common feature of the investment behaviour of all the European households under comparison is thus growth in holdings of demand deposits and collective investment through investment fund units.

Chart 35: Contributions of individual financial asset instruments to total assets

(pp)
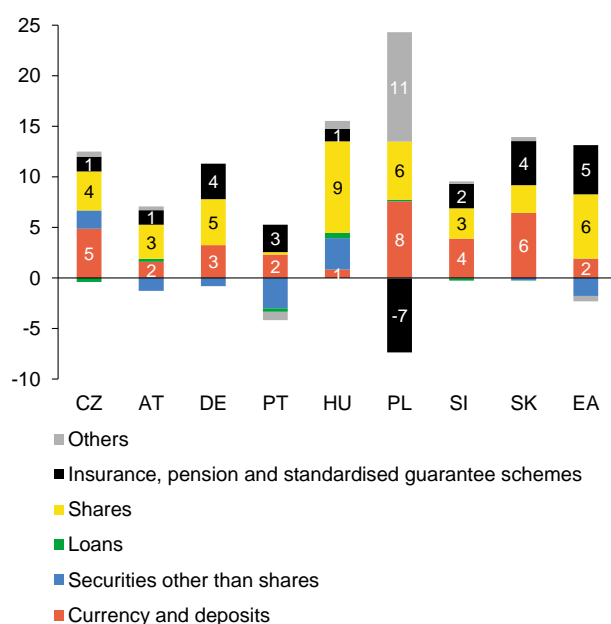
Note: Contributions to growth in total assets are calculated for the period of 2013 Q1–2015 Q1. Other assets comprise loans, derivatives and employee stock options, and trade credits.

Source: ECB, CNB calculations.

To sum up, the net creditor position of the Czech household sector is about half that in the euro area as a whole. Moreover, as in the case of corporations, there are persisting differences in structure; in particular, the debt ratio is half that in the euro area, and there is an inverse ratio of the liquid to the investment component of the asset portfolio. These differences may give rise to an asymmetric effect of monetary policy, as the lower ratios of household assets and liabilities to GDP in new Member States may lead to weaker monetary policy transmission.

1.2.3   Effect of monetary policy on client interest rates

A similar function of the interest rate channel of monetary policy transmission, i.e. transmission of changes in financial market interest rates to client rates, is a prerequisite for successful functioning of an economy under a single monetary policy.

The **transmission of changes in financial market interest rates** to client rates is relatively fast in the Czech Republic, although full pass-through is observed only for loans for house purchase. Rates on large and small loans with short fixations or floating rates follow money

market developments relatively quickly, with around 60% of the transmission taking place within a month.[92] Client rates on corporate loans with a fixation of over one year (whose weight is low though; see below) are linked more to long-term government bond yields, with the transmission taking around 2–3 months. The pass-through time for loans for house purchase, which are also linked to government bond rates, is about three months. The transmission of interest rates during the financial crisis was somewhat weakened as a result of an increase in client risk premia. This, however, is a traditional sign of cyclicality associated with a tightening of credit conditions due to the increasing level of risk associated with clients and their projects and with more prudential behaviour by banks. In the euro area, client interest rates with short fixations are also derived from money market rates, and long-term rates are traditionally derived from long-term government bond yields. Client rates on loans to non-financial corporations are more affected by changes in interbank rates than are rates on loans to households. This applies both to financial crisis episodes (higher volatility) and to quiet times.[93] The strength of transmission differs greatly across the euro area member states. The pass-through of changes in financial market rates to client rates is usually incomplete and the dynamics of adjustment of client rates are different for rises and falls in money market rates.[94]

Chart 36 shows the structure of new loans to non-financial corporations broken down by interest rate fixation period. A higher share of loans with short-term rates generally indicates greater **sensitivity of new loans to non-financial corporations to changes** in monetary policy rates and, subsequently, **market rates**. In all the countries under review, corporations typically take out loans with floating rates or rates with a fixation of up to one year. Of the countries under review, Hungary[95] and Germany, and to a lesser extent the Czech Republic, have a larger share of loans with longer fixations. A high share of loans with short fixations enables relatively fast transmission of client interest rates to corporate balance sheets and is quickly reflected in demand for loans. Large loans (i.e. those over EUR 1 million) have the largest share in all the countries except Poland and Portugal, and this share has generally increased since 2004.

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[92] Horváth and Podpiera (2009) and Babecká-Kucharčuková et al. (2013).
[93] Aristei and Gallo (2012).
[94] Beckmann et al. (2013).
[95] Hungary has seen a major change in maturities over the last two years, as the share of small forint-denominated loans fixed for over 1 year and up to 5 years and for over 5 years in total loans has gone up. This is due mainly to institutional conditions created by the state, in particular the Funding for Growth Scheme, which provides small and medium-sized enterprises with access to medium-term forint-denominated loans with an average maturity of 7 years and a 2.5% interest rate. These loans are funded by interest-free loans of a specified amount provided to commercial banks by the central bank.

Chart 36: Structure of new loans to non-financial corporations by interest rate fixation
(%)
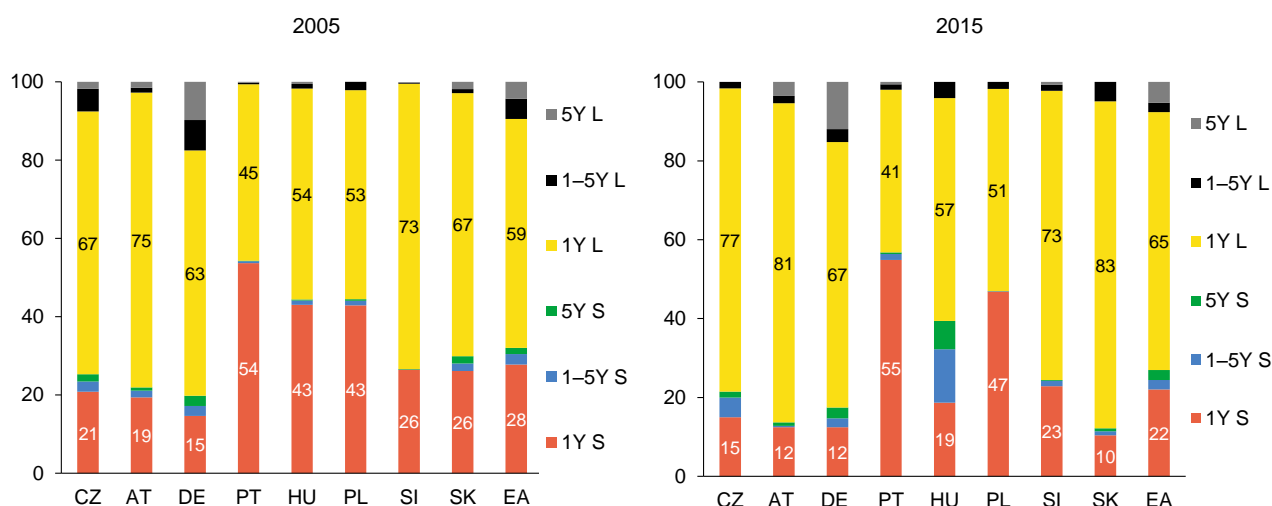
Note: 1Y S and 1Y L stand, respectively, for small (up to EUR 1 million) and large (over EUR 1 million) loans with a floating rate or a rate fixed for up to one year, and the other items in the key denote such loans with longer interest rate fixations. The structure of the euro area total varies according to the increasing number of euro area member countries. The 2015 data are as of June.

Source: ECB, CNB calculations.

A simplified estimate of the strength and lag of the transmission from market to client rates in the countries under review can be obtained by conducting a correlation analysis of changes in these rates. This analysis identifies the maximum value of the coefficients of correlation between interest rates on client loans and the relevant market interest rate for several possible lags. Table 12 shows the correlations between three-month money rates and rates on loans to non-financial corporations (fixed for up to one year), lagged by 0–2 months. The correlations of most countries reach statistically significant levels with no lag, suggesting fast pass-through of changes in market rates to client rates. The exception is Portugal, where there is a one-month lag for both small and large loans. Germany, Austria and the euro area as a whole have the highest correlations with no lag for both small and large lags. In the case of Slovakia, a one-month lag occurs for large loans only, as no significant relationship between the lending rate and the market rate was found for small loans. These results indicate strong and largely symmetrical links between client interest rates and the relevant interbank rates.

Table 12: Correlation between changes in rates on loans to non-financial corporations (fixed for up to one year) and changes in three-month market rates

	loans up to EUR 1 million			loans over EUR 1 million		
	2004M1–2015M6			2004M1–2015M6		
	t	t-1	t-2	t	t-1	t-2
CZ	**0.38** **	0.14	0.02	**0.42** **	0.18	0.08
AT	**0.85** **	0.72 **	0.58 **	**0.75** **	0.55 **	0.47 **
DE	**0.74** **	0.63 **	0.47 **	**0.74** **	0.47 **	0.33 **
PT	0.50 **	**0.63** **	0.39 **	0.25 **	**0.37** **	0.25 **
HU	**0.18** **	0.09	0.08	**0.28** **	0.11	0.09
PL	**0.14** *	0.12	0.07	**0.16** *	0.08	0.09
SI	**0.50** **	0.35 **	0.15	**0.36** **	0.23 *	0.07
SK	**0.00**	0.16	0.03	0.11	**0.21** *	0.08
EA	**0.88** **	0.76 **	0.55 **	**0.85** **	0.59 **	0.45 **

Note: The highest correlations between the interest rate on loans to non-financial corporations and the relevant three-month market interest rate (mostly the 3M EURIBOR, otherwise the 3M PRIBOR, the 3M WIBOR or the 3M BUBOR) are shown in bold. The correlation analysis was performed on the first differences of the individual time series.

Source: ECB, CNB calculations.

Different risk premia may be another source of asymmetry in client interest rates after entry into a monetary union. The various aspects of financial risk can be expressed by decomposing the **spread between interest rates on new loans to non-financial corporations and the monetary policy rate** (Rl-Rp) into three components (see Chart 37):[96] (i) The difference between the overnight interbank rate and the monetary policy rate (Rb-Rp) can be interpreted as a signal of tension or rising risk on the money market and includes the liquidity and credit risks faced by banks when lending money. This signal is clearly visible for the euro area after the onset of the financial crisis, and is still moderately apparent today. (ii) The difference between the government bond yield[97] and the overnight interbank rate (Rg-Rb) indicates the term premium and the credit risk of government bonds. This difference surged at the beginning of the financial crisis and remained strongly elevated in the euro area until last year. It then it shrank but still persists due to the credit risk of euro area periphery countries. (iii) The difference between the client interest rate and the government bond yield (Rl-Rg) captures the credit risk of the set of clients and banks' willingness to assume the risk associated with lending to them. Despite the current very low client rates on loans, which basically reflect banks' margins, this difference has shown a rising tendency in the last two years, as bond yields are at historical lows (near zero in the Czech Republic). Overall, the spread between rates on loans to non-financial corporations and the monetary policy rate in the Czech Republic is lower than that in the euro area.

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[96] Illes and Lombardi (2013).
[97] Owing to a mostly lower term premium and financing of corporations with fixations of up to one year, it would have been more appropriate to use one-year government bonds. However, these were not available, so five-year government bonds were used instead.

Chart 37: Decomposition of the spread between interest rates on loans to non-financial corporations and monetary policy rates
(pp)
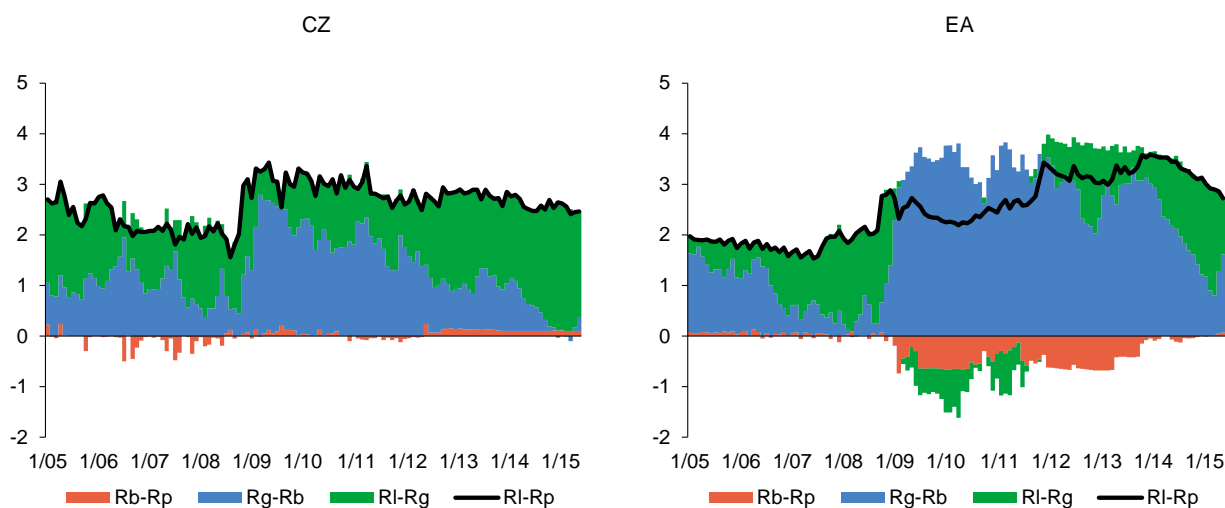
Note: Rl-Rp is the difference between the interest rate on loans to non-financial corporations and the monetary policy rate; Rb-Rp is the difference between the overnight interbank rate and the monetary policy rate; Rg-Rb is the difference between the government bond yield and the overnight interbank rate; Rl-Rg is the difference between the client interest rate and the government bond yield; the rates are calculated using a weighted rate on total corporate loans. End-of-month data were used for the key monetary policy rate. Five-year government bonds are used.

Source: ECB, CNB calculations.

Loans for house purchase make up the main segment of household debt. Chart 38 shows their structure by interest rate fixation. In the Czech Republic, as in Germany, Slovakia and the euro area as a whole, households mostly take out loans with fixations of over one year. This creates conditions for similar monetary policy transmission to households' balance sheets. While loans with fixations of over one year and up to five years are predominant in the Czech Republic, loans with longer fixations, namely over five years, dominate in the euro area as a whole. Given the favourable market conditions, households (for example in Germany and the euro area) also started to make use of mortgage with fixations of over ten years. The share of loans with longer fixations has also increased recently in the Czech Republic. For example, the share of loans with fixations of over five years and up to ten years went up from 10% in 2014 to 18% in 2015, while the shares of loans with shorter fixations declined. Households' motivation to fix loans for longer periods is due to the very low client interest rates. From this point of view, transmission is thus getting less sensitive. By contrast, a majority share of loans fixed for up to one year, and thus a higher sensitivity of transmission, can be observed in Austria, Portugal, Hungary, Poland and Slovenia. The differences between countries are due to different financial products, market structure and some regulatory measures.[98]

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[98] In Poland, for example, standard loans for house purchase have a floating interest rate linked to the WIBOR and are usually changed once every three or six months. The volume of longer fixations is negligible.

Chart 38: Structure of new loans to households for house purchase by interest rate fixation
(%)
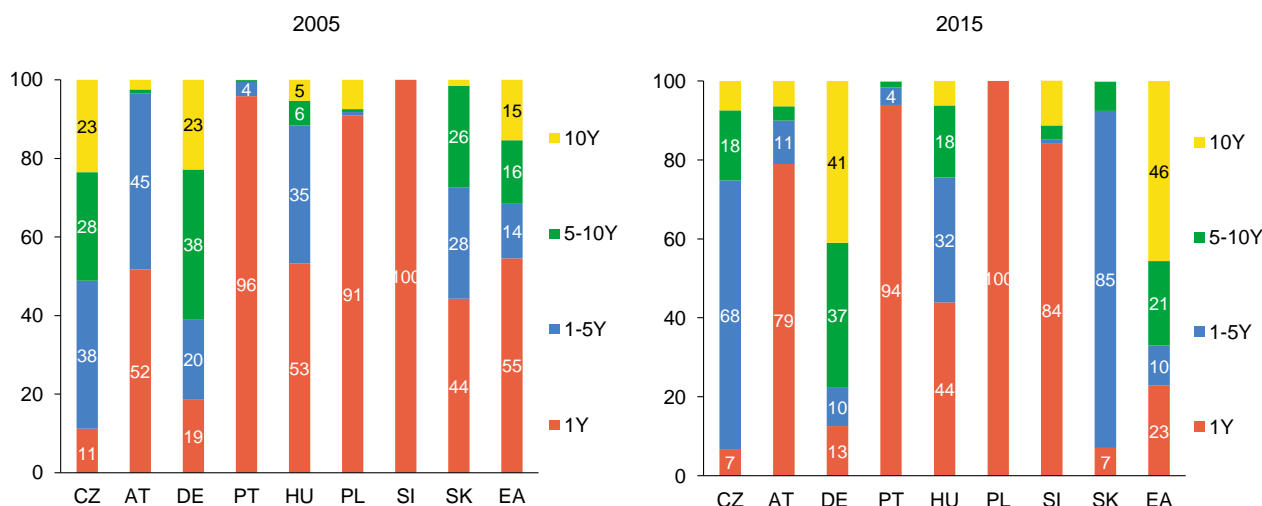
Note: The structure of the euro area total varies according to the increasing number of euro area member countries. The 2015 data are as of June.

Source: ECB, CNB calculations.

In all the countries under review, changes in rates on loans for house purchase fixed for up to one year are correlated most strongly with changes in the relevant three-month market rates with a one-month lag. This suggests that interest rate transmission is fairly fast in the countries under review (see Table 13: Correlation between changes in rates on loans for house purchase and changes in market rates

Table 13: Correlation between changes in rates on loans for house purchase and changes in market rates

). However, the correlation is weaker in the Czech Republic than in the other countries under review. The exception is Poland, where no significant relationship was found. Rates on new loans for house purchase fixed for over one year are statistically significantly correlated with yields on ten-year government bonds in the Czech Republic and even more strongly with those in Germany and the euro area as a whole.[99] Most loans for house purchase in these countries are fixed for a longer period than one year: for over one year and up to five years in the Czech Republic, and for over five years and up to ten years and for over ten years in Germany and the euro area. The lag on the strongest response of client rates to a change in market rates on these loans ranges between one month in Germany and the Czech Republic and two months in the euro area. No significant correlation between loans fixed for over one year and the relevant government bonds was identified in Austria, Hungary, Portugal and Slovakia.[100]

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[99] Links between client rates and government bonds are observed for two reasons. First, ten-year bonds approximate the longer end of the yield curve, thus representing the long-term cost of financing. The other reason is the previously econometrically confirmed link between Czech government bonds and koruna loans for house purchase (Babecká Kucharčuková et al., 2013).

[100] In the cases of Hungary and Portugal, the absence of a correlation with government bonds may be due to an elevated and fairly volatile risk premium since the outbreak of the financial crisis. In the case of Austria, no correlation was found between loans for house purchase with maturities of over one year and the ten-year bond, but the analysis revealed a correlation with the 3M EURIBOR (0.35**) with a one-month lag. In Portugal, the share of loans for house purchase with rates fixed for over one year is low.

Table 13: Correlation between changes in rates on loans for house purchase and changes in market rates

	rate fixed for up to one year			rate fixed for over one year		
	3M market interest rates			10Y government bonds		
	2004M1–2015M6			2004M1–2015M6		
	t	t-1	t-2	t	t-1	t-2
CZ	0.13	**0.22** *	0.16	0.04	**0.28** **	0.27 **
AT	0.51 **	**0.51** **	0.50 **	-0.02	-0.03	0.07
DE	0.60 **	**0.65** **	0.45 **	0.43 **	**0.73** **	0.55 **
PT	0.65 **	**0.88** **	0.64 **	0.07	0.05	-0.06
HU	0.20 **	**0.30** **	0.22 *	0.07	-0.01	0.01
PL	0.14	0.14	0.08		–	
SI	0.76 **	**0.84** **	0.59 **		–	
SK	0.11	**0.41** **	0.22 *	-0.13	-0.12	0.04
EA	0.78 **	**0.85** **	0.70 **	0.29 **	0.54 **	**0.54** **

Note: The highest correlations over time between the interest rate on loans for house purchase and the relevant three-month market interest rate (the 3M EURIBOR for the euro area countries, otherwise the 3M PRIBOR for the Czech Republic, the 3M WIBOR for Poland and the 3M BUBOR for Hungary) are shown in bold; the figures for bonds relate to the ten-year government bonds of the given country. For the euro area, the table shows the correlation with German government bonds. In Poland and Slovenia, the share of loans for house purchase fixed for over one year is almost negligible. The correlation analysis was performed on the first differences of the individual time series.

Source: ECB, CNB calculations.

To sum up, the degree of heterogeneity of client interest rates in the euro area has increased further due to the financial crisis and subsequently the debt crisis. This represents one of the main challenges to ensuring that the single monetary policy has a symmetric effect. Client interest rates in EU countries are likely to remain more differentiated in the future. Liquidity and risk premia, which reflect the financial soundness of each economy, will probably continue to play a much more important role than in the pre-crisis period. In the Czech Republic, the current spread between client rates on loans to non-financial corporations and the monetary policy rate is lower than that in the euro area. The correlation between client rates on loans to non-financial corporations and market rates in the Czech Republic is strong and similar to that in the other countries under comparison. As regards loans for house purchase, maturities of over one year are significant in terms of volume in the Czech Republic, as they are in Germany and the euro area as a whole. This is related to a stronger correlation between client rates and government bond yields in these countries. The pass-through of changes in financial market interest rates to client rates in the Czech Republic thus does not differ greatly from that in the euro area and represents no barrier to future euro adoption.

1.2.4   Inflation persistence

Price flexibility affects both the ability of the economy to absorb shocks effectively and the functioning of monetary policy transmission. One of the ways of examining **price flexibility** is to analyse inflation persistence (inertia), i.e. the speed at which inflation returns to equilibrium after a shock. Substantial differences in inflation persistence in the countries of a monetary union can result in the single monetary policy having different impacts. The differences in inflation observed between individual euro area countries can largely be explained by different inflation persistence.[101]

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[101] Angeloni and Ehrmann (2004).

Inflation persistence is measured by three different methods. The non-parametric method (Method 1) uses a procedure according to which the longer it takes actual inflation to return to its mean value, the more rigid is the inflation.[102] This indicator takes values between 0 and 1. The closer the values are to one, the more persistent is inflation.

Methods 2 and 3 are based on a model of inflation as an autoregressive process, monitoring the sum of the coefficients of the autoregressive terms. The values of the persistence indicators in these methods (as in Method 1) increase with rising inflation persistence. Method 2 assumes a constant mean value of inflation. It has been demonstrated,[103] however, that the results of modelling inflation persistence are largely dependent on the assumption regarding the mean to which inflation converges. If the inflation time series contains structural changes or breaks in trend which the model process does not allow for, the inflation persistence estimate is typically biased upwards. Because of the transformation process, accompanied by disinflation, price convergence, gradual price deregulation and changes in monetary policy regime, it is the time series of transition countries that are most affected by breaks in the mean values of inflation. Method 3 therefore models the autoregressive process with the mean value of inflation changing over time.

According to the non-parametric Method 1, the inflation persistence in the Czech Republic, Austria and Poland was the highest of the countries under comparison between 2005 Q1 and 2015 Q2 (see Table 14). According to the estimates made using the other two methods, it was roughly in the middle. However, the differences in the estimated persistence between the countries under comparison are economically insignificant for all three methods and there is no obvious difference between the existing euro area countries and the non-euro area countries.[104]

Table 14: Inflation persistence estimates

	Method 1	Method 2	Method 3
CZ	0.88	0.90	0.50
AT	0.88	0.78	0.52
DE	0.85	0.82	0.57
PT	0.83	0.83	0.59
HU	0.83	1.01	0.47
PL	0.88	1.01	0.45
SI	0.78	1.01	0.46
SK	0.85	0.91	0.50

Note: Method 1 – non-parametric technique; Method 2 – sum of autoregression coefficients, constant mean assumed; Method 3 – sum of autoregression coefficients, time-varying mean assumed.

Source: OECD MEI, CNB calculations.

1.2.5   Financial market alignment

Financial markets can be identified as aligned if financial assets having comparable risk factors and yields are priced identically by the markets no matter which country they are traded in. The similarity in the behaviour of prices of comparable financial assets across markets thus illustrates the level of financial market alignment or synchronisation in the

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[102] The technique proposed in Marques (2004).
[103] In Marques (2004) and Cecchetti and Debelle (2006).
[104] Baxa et al. (2012) estimate inflation persistence through the lens of the new Keynesian Phillips curve with an assumption of stochastic volatility and show that inflation persistence in the Czech Republic is considerably lower than that in Poland and Hungary and is thus the closest to the low persistence levels observed in the euro area.

countries under review. This application of the law of one price was used – with awareness of its limitations – to measure the alignment of the financial markets of selected countries with the euro area. The more the individual segments of the financial markets of individual countries become aligned with the euro area market, the more these asset prices should be affected by common (global) factors rather than by national (local) factors.

The following analysis of the alignment of financial markets (money, foreign exchange, government bond and stock markets) applies two methods: (i) price-based measures and (ii) news-based measures.[105] Price-based measures use the concepts of beta-convergence and sigma-convergence. Beta-convergence enables identification of the speed of convergence of the national market to the euro area, while sigma-convergence identifies the degree of convergence. News-based measures are based on the assumption that in the case of an aligned market, prices of individual national assets respond to common news rather than to local news. The sensitivity of asset prices to global news is measured by gamma, which shows the extent to which countries' asset prices respond to news in the same way as euro area asset prices.[106] When interpreting the results, we compare the pre-crisis period with the period following the outbreak of the financial crisis, which was marked by generally high market price volatility.

Table 15: Beta coefficients

	Money market		Forex market		Bond market		Stock market	
	1/02–7/07	8/07–6/15	1/02–7/07	8/07–6/15	1/02–7/07	8/07–6/15	1/02–7/07	8/07–6/15
CZ	-0.66	-0.39	-0.89	-0.87	-0.74	-0.74	-0.93	-0.80
AT	–	–	–	–	-1.09	-0.88	-1.03	-0.71
DE	–	–	–	–	B	B	-0.71	-0.84
PT	–	–	–	–	-0.68	-0.88	-1.05	-0.88
HU	-0.83	-0.77	-0.96	-0.89	-0.90	-0.70	-0.86	-1.00
PL	-0.48	-0.47	-0.82	-0.96	-0.81	-0.81	-0.93	-0.87
SI	–	–	–	–	–	-0.83	-0.73**	-0.82
SK	-0.79	–	-0.98	–	-0.99*	-0.87	-0.78	-0.94
EA	B	B	B	B	–	–	B	B

Note: The closer the value of the beta coefficient is to -1, the higher is the speed of convergence; the first time interval in the analyses is the period before the outbreak of the financial crisis (up to July 2007); the second is the period following the onset of the financial crisis. Other symbols: B = benchmark; * from 22 June 2002; ** from 1 April 2003. All the estimates were statistically significant at the 1% level.

Source: Thomson Datastream, CNB calculations.

The results of **price-based measures** signal that in the pre-crisis period the speed of price beta-convergence on the stock, bond and foreign exchange markets of the countries under review vis-à-vis the euro area (or Germany in the case of the government bond market) was relatively high (beta coefficients close to -1; see Table 15). Convergence has slowed in most of the markets under review since the onset of the financial crisis. In the Czech Republic, the beta coefficient has fallen most markedly on the money market and subsequently on the stock market. The level of sigma-convergence did not differ much across the countries under review in the case of these markets (see Chart 39). The results of the beta- and sigma-convergence of individual financial markets rank the Czech Republic among the countries with a higher degree of alignment, i.e. those where global factors have a greater effect on financial asset

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[105] The literature also provides some other approaches to measuring alignment which are based not on the law of one price but, for example, on quantitative indicators (quantity-based measures). These usually entail various surveys of statistical information monitoring change in investor behaviour in the process of financial market integration.
[106] Asset prices are monitored at an aggregate level and it is assumed that euro area assets respond primarily to global news.

prices. The alignment of the individual segments of the Czech financial market with the euro area is increasing again following a temporary weakening during the global crisis starting in 2009. A minor recent exception is the foreign exchange market, which has been affected by increased forex market volatility and the recent depreciation of the euro against the US dollar. Even on this market, however, the level of alignment is much higher than in 2009, i.e. comparable with the pre-crisis period.[107]

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[107] In an analysis of the bilateral linkages between EU sovereign bond markets, Claeys and Vašíček (2012) show that the spillover between markets has increased substantially over time. The Czech, Polish and Hungarian markets affect one another and are simultaneously affected by developments in the euro area. This effect of euro area markets on Central European markets is more pronounced than that on, for example, other EU countries with their own currency such as Denmark, Sweden and the UK.

Chart 39: Sigma coefficients

Money market

Foreign exchange market

Government bond market

Stock market
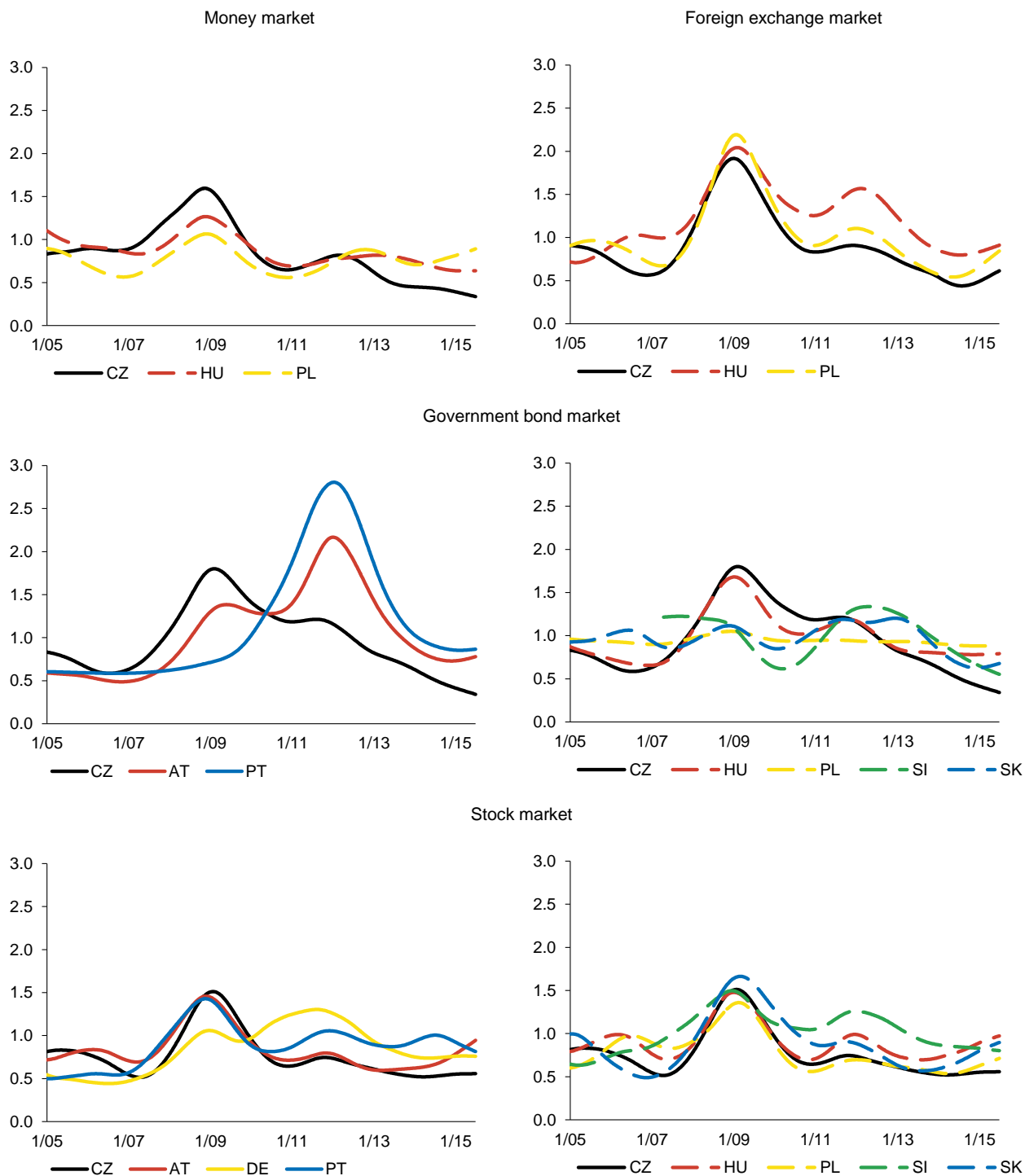
Note: Lower standard deviation values on the y-axis) correspond to a higher convergence level. The differences in the standard deviations in individual markets are not statistically significant, except for the Slovenian and Slovakian foreign exchange markets, where volatility dropped to zero due to euro adoption.

Source: Thomson Datastream, CNB calculations.

The results of **news-based measures** (see Chart 40) indicate that the local factors affecting the national markets were quite significant in the pre-crisis period. Increased importance of

global news is generally apparent on stock and foreign exchange markets in the crisis period. The transmission of global shocks also intensified on these markets in the Czech Republic. Higher sensitivity to global shocks is not surprising for both these markets given the greater influence of foreign investors there. The reaction to common news on the stock and bond markets is low in the Czech Republic relative to the advanced euro area countries (a lower gamma coefficient). On the other hand, on these two markets it is one of the highest among the Central European countries under review (while it is virtually the same on the foreign exchange market and lies between Hungary and Poland on the money market).

Chart 40: Gamma coefficients

Money market

Foreign exchange market

Government bond market

Stock market
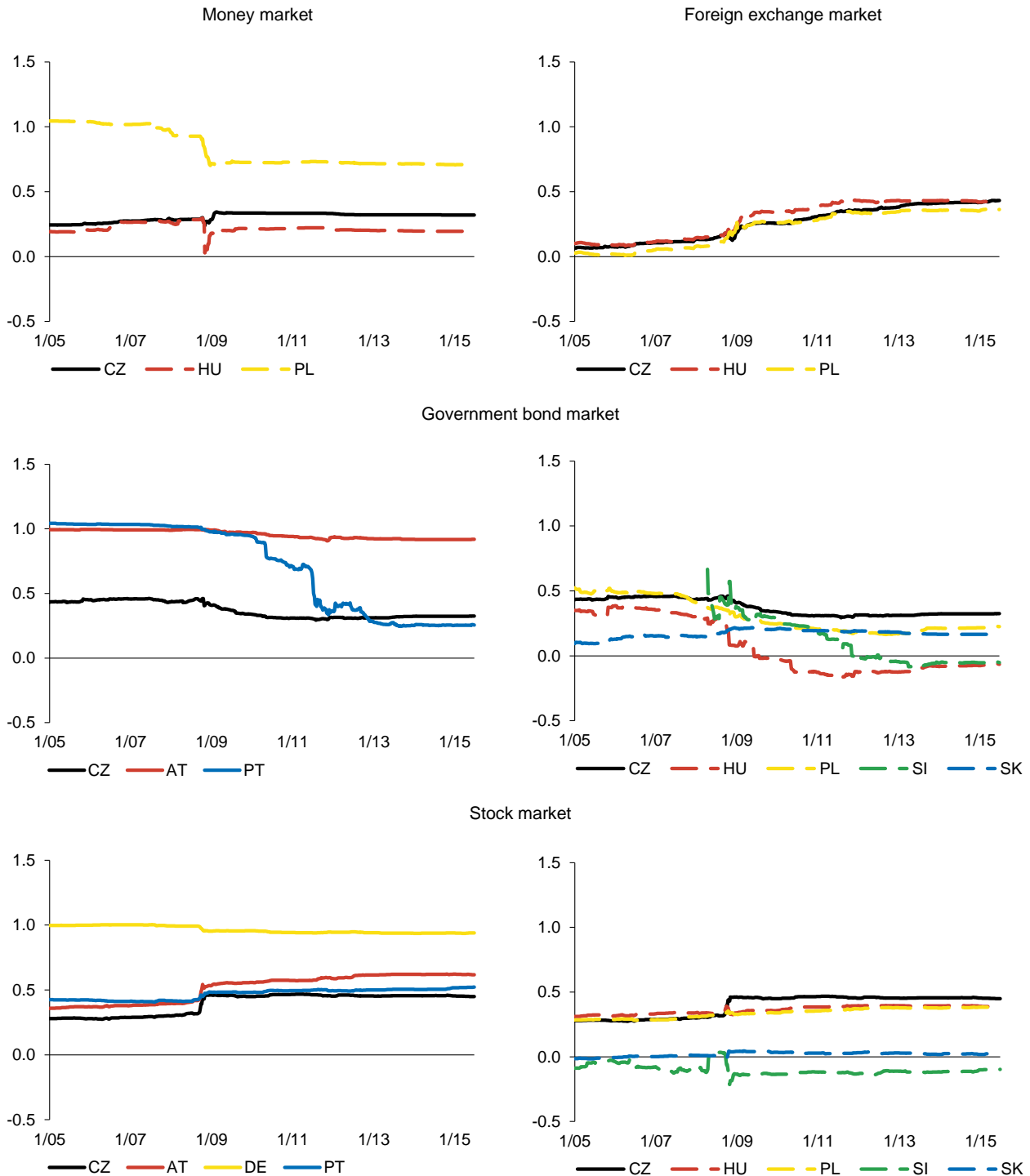
Note: Positive (negative) gamma values close to one express same (opposite) directional and similarly strong sensitivity to news and therefore a higher degree of integration; values close to zero express low integration.

Source: Thomson Datastream, CNB calculations.

Both methods signal a visible stabilisation and a renewed process of alignment of financial markets in all the monitored countries with the euro area after the escalation of the **euro area**

financial and debt crisis, which, however, remains conditional on active central bank policy and actions, including unconventional measures. The start of the debt crisis brought about divergent movements in financial markets and increased price volatility (see Chart 39).[108] This was particularly observable in the Portuguese government bond market owing to domestic factors (see Chart 40). Convergence can be seen again for most markets and countries, with asset prices being greatly affected by the unconventional monetary policies of the ECB and other G4 central banks[109] issuing reserve currencies. These central bank measures reduced the short-term risks associated with financial assets and hence the market volatility of their prices (e.g. on the Portuguese government bond market). Despite this calm-down and apparent convergence, visible fragmentation prevails on European markets. This is due to the behaviour of investors, who on the one hand are seeking highly demanded and overvalued "safe" assets owing to the persisting uncertainty, and on the other hand are trying to find financial returns on assets in an environment of sustained low rates.

Overall, the analysis of alignment of financial markets (the money, foreign exchange, bond and stock markets) with the euro area reveals that synchronisation in the individual segments of the Czech financial market has long been mostly high and comparable with the euro area countries. A natural exception is still the money market, which was already showing a lower degree and speed of integration in the pre-crisis period. In 2009, the situation in the Czech financial markets started to improve and then returned gradually to the pre-crisis degree of alignment on all the markets under review. Thus, the temporarily suspended process of financial alignment with the euro area has renewed and stabilised in individual segments of the Czech financial market. However, this trend continues to be conditional on active central bank policy and measures, including those of an unconventional nature.

1.2.6 Spontaneous euroisation

A high degree of spontaneous euroisation limits the conduct of independent monetary policy and poses a risk to financial stability in the event of a sharp depreciation of the domestic currency. The adoption of the single currency may be a natural solution, and the costs of entering the monetary union may be lower for an economy with a high degree of spontaneous euroisation.

The **degree of spontaneous euroisation** in the Czech Republic remains relatively low, although it has been rising gradually in the recent period. Foreign currency is used in financial transactions mainly by corporations, naturally as a result of their high trade integration with the euro area. The share of total foreign currency loans and deposits at banks is still the lowest in the Central European region.

The shares of foreign currency deposits and loans of **non-financial corporations** with domestic banks in the Czech Republic are continuing to rise gradually and are fluctuating above their long-term average at 27% and 22% respectively (see Chart 41). Foreign currency is used in financial transactions most of all by industrial corporations. The share of foreign currency deposits in total deposits is 43% in manufacturing, almost one-third in trade and slightly lower in branches such as transport, accommodation and food services and real estate activities.

The interest of Czech **corporations in foreign currency loans**, recorded mainly in reaction to the weakening of the koruna at the close of 2013, persists. These loans are generally used by corporations as a form of natural hedging against exchange rate risk. Growth in euro loans is connected with a rise in investment activity of export-oriented corporations (corporations

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[108] Only the Slovak forex market recorded "artificial" convergence at the beginning of the crisis, owing to euro adoption.
[109] The G4 comprises the Bank of England, the Bank of Japan, the European Central Bank and the Federal Reserve System.

currently use this natural hedging against exchange rate risk for about 40% of exports). Industrial firms have recently shown the strongest interest in foreign currency loans. Foreign currency loans to developers have also increased, since the construction of commercial development projects is usually funded by euro-denominated loans so that exchange rate risk is hedged and rents can be set in euro. Greater interest in foreign currency loans is currently also apparent in insurance and financial intermediation. In addition, exporting corporations use natural hedging through foreign currency loans and other liabilities directly with their parent companies abroad (as part of direct investment). The share of foreign currency payments and receipts in total domestic payments and receipts of corporations is on a gradual upward trend and is currently close to 15%. While the shares of foreign currency deposits and loans of non-financial corporations with domestic banks in Poland remain similar to those in the Czech Republic, they are higher in Hungary, at around 36% for deposits and 49% for loans.

Chart 41: Foreign currency loans and overnight deposits of non-financial corporations
(shares in total loans and overnight deposits of non-financial corporations with domestic banks, %)
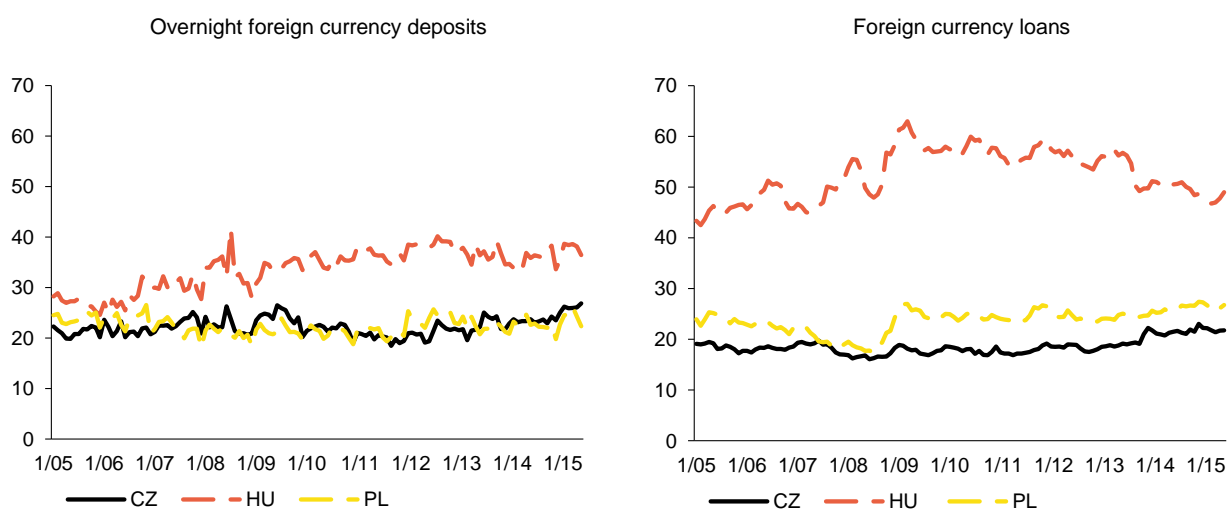
Source: Central banks, CNB calculations.

The demand of **households** for foreign currency deposits and loans has long been very low in the Czech Republic. Foreign currency overnight deposits account for about 5% of total overnight deposits of households with banks, although this ratio has recently risen modestly, mainly due to the weakening of the koruna in late 2013 (see Chart 42). The share of foreign currency time deposits has long been negligible thanks to households' confidence in the domestic currency and the macroeconomic and institutional environment. Households' demand for foreign currency loans is virtually zero in the Czech Republic, whereas in Poland such loans have share of more than 30% despite a gradual decrease. In Hungary, the share of foreign currency loans to households has fallen dramatically, from around 54% in February 2015 to roughly 4% in June 2015, due to their conversion into the domestic currency.[110]

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[110] The high share of foreign currency loans in these economies in the past was due chiefly to a high interest rate differential against the euro and the Swiss franc. In Hungary, this share used to be the highest in the whole of Central and Eastern Europe and was associated mainly with loans to households denominated in Swiss francs. In the loan conversion, carried out under an agreement between the Hungarian government and banks in early 2015, household debt principal was reduced as a result of refinancing (on the basis of an exchange rate spread) while the interest rate was unilaterally increased.

Chart 42: Foreign currency loans and overnight deposits of households
(shares in total loans and overnight deposits of households with domestic banks, %)

Overnight foreign currency deposits

Foreign currency loans
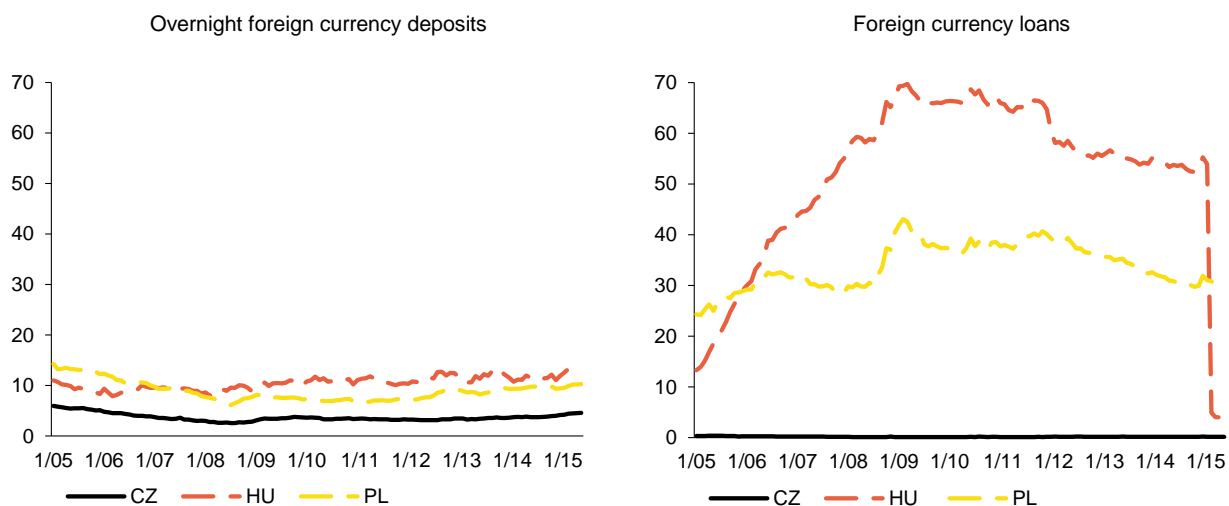
Source: Central banks, CNB calculations.

To sum up, despite a gradual increase, the degree of euroisation remains relatively low. Demand for foreign currency is associated mainly with the natural export orientation of Czech corporations and is in line with the high openness of the economy. Czech households make only limited use of the euro.

2   ADJUSTMENT MECHANISMS

The adoption of the single currency and the related loss of independent monetary policy will place higher demands on other adjustment mechanisms, by means of which the economy will be able to adjust to asymmetric shocks. The optimum currency area theory points mainly to the importance of the stabilising function of public budgets and labour market flexibility.

2.1   FISCAL POLICY

In the absence of independent monetary policy, the stabilising effect of fiscal policy can to some extent substitute for the missing monetary adjustment mechanisms in the event of asymmetric shocks. Nevertheless, as the European debt crisis has shown, inappropriate fiscal policy itself may become a source of asymmetric shocks. The current condition of, and in particular the outlook for, Czech public finances are therefore important measures of the preparedness of the Czech economy to join the euro area.

2.1.1   Stabilising function of public budgets

Fiscal policy can affect the economy either directly, i.e. via discretionary measures on the revenue or the expenditure side of the public budgets, or indirectly, by creating conditions for optimal functioning of automatic fiscal stabilisers. The negative experience with activist fiscal policy in the advanced countries in the 1970s is an argument against the wider application of discretionary fiscal measures, since such policy failed to produce the desired results or was even counterproductive.[111] This was also reflected in a paradigm shift in economic theory, with belief in the effectiveness of discretionary measures being replaced by a hypothesis that adherence to pre-defined rules is more effective. In the fiscal area, such rules consist primarily in a simple and stable tax system, consolidated and sustainable public finance and predictable government expenditure based on fiscal discipline. However, numerous discretionary measures of a fiscal nature were adopted during the financial and economic crisis in 2008–2010, since the economic decline was so large that the political representation considered automatic stabilisers to be insufficient on their own.[112] In addition to positive impacts of discretionary measures, the related sizeable increase in fiscal deficits entails costs and risks, especially in countries with a high initial level of government debt, which was subsequently reflected in the response of the financial markets. Stabilisation of public budgets therefore became a fiscal policy priority in 2011–2012. This, however, led to procyclically restrictive fiscal policy, which magnified the economic contraction. In response to the fall of the economy into recession in 2012–2013, therefore, this objective was reassessed, with support for economic growth through easier fiscal policy being prioritised at the cost of a temporary slowdown in fiscal consolidation in the period ahead.

The EU fiscal rules recommend a broadly balanced government budget policy over the business cycle. This should allow automatic fiscal stabilisers, which can absorb shocks without the need for ad hoc discretionary fiscal measures, to operate freely. In a period of recession, public finances should thus stimulate aggregate demand by means of lower collection of taxes and higher transfers (deficits), while in a period of expansion they should subdue demand by

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[111] The long lags that arise between the identification of shocks, the implementation of fiscal measures and the effects of those measures, the existence of institutional constraints and the inertia of fiscal decisions are generally regarded as the main causes. A typical example of this problem is the risk of "procyclical fiscal policy", i.e. fiscal policy that tries to smooth the business cycle but in reality – owing to the aforementioned lags – may amplify it.
[112] For details on the assessment of the impact of discretionary measures and the operation of automatic stabilisers in the Czech Republic in 2001–2011, see Ambriško et al. (2012).

creating fiscal surpluses. In order for the automatic function of public budgets to work, while avoiding – except in very exceptional cases – breaches of the maximum agreed deficits, public finance must be balanced or, preferably, in surplus during a growth phase of the business cycle. This reasoning serves as the basis for the convergence criterion for the general government deficit as a percentage of GDP, where the 3% limit is considered sufficient to allow automatic stabilisers to function freely in the event of a minor economic downswing.

The influences of the macroeconomic environment and of interventions by the government on public budgets can be differentiated by decomposing the general government balance into the cyclical component, i.e. the part that results from the business cycle, and the "cyclically adjusted balance", which yields information on how government fiscal policy contributed to fiscal performance. Moreover, for a more precise assessment of the nature of the government's fiscal policy in a given period, the "structural balance" is used. In addition to fluctuations caused by the economic cycle, this is adjusted for temporary or one-off fiscal measures.

Chart 43 shows the current estimates of the cyclical and structural components of the Czech Republic's general government balance based on the CNB's analyses.

Chart 43: General government balance and its cyclical and structural components
(% of GDP)

Cyclical balance according to EC
Cyclical balance according to ESCB
Structural balance according to EC
Structural balance according to ESCB
Total balance
Real GDP (y-o-y, %)
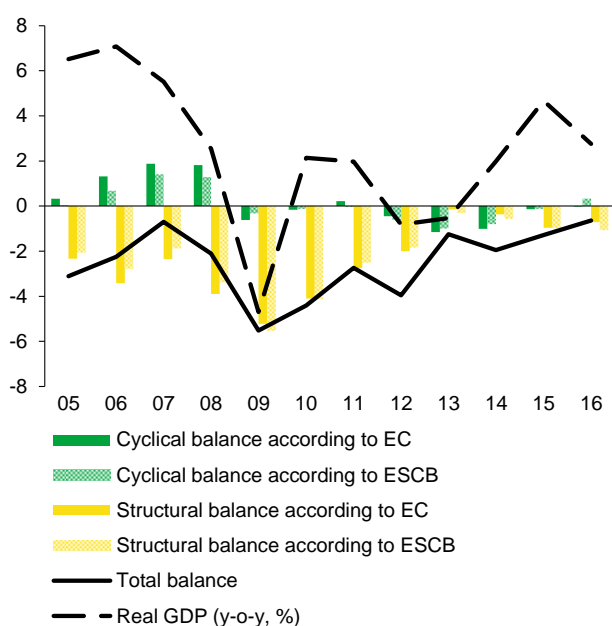
Note: Positive values represent a public budget surplus and negative values a public budget deficit. The sum of the cyclical and structural balances does not equal the total balance since the structural balance is adjusted for extraordinary one-off fiscal measures in addition to the effect of the cycle. The estimates are carried out using both the European Commission method and the ESCB approach (see the *Methodological Part*).

Source: CZSO, CNB calculations (the 2015 and 2016 figures come from the CNB's forecast published in Inflation Report IV/2015).

The **structural balance**[113] indicates that the government's fiscal policy was persistently in deficit and procyclical for most of the period under review. Fiscal policy was countercyclical in 2009, when government anti-crisis measures leading to a widening of the structural deficit were adopted. In the following period, fiscal policy turned procyclical again, with fiscal

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[113] The quantification of the structural and cyclical components of the public finance balance depends on the value of potential GDP (EC method) or on the trend values of macroeconomic tax bases (ESCB method), which are unobserved variables whose estimation is usually subject to a relatively high level of uncertainty.

consolidation (of around 1–2% of GDP year on year depending on the methodology selected) being one of the reasons for the economic downturn in 2012 and 2013. In 2014–2015, a fiscal policy easing, including accelerated drawdown of EU funds, contributed to a recovery from the previous protracted recession and a closing of the negative output gap, and fiscal policy was therefore slightly procyclical. According to the CNB's current forecast in Inflation Report IV/2015, the general government structural deficit will decrease only slowly despite relatively buoyant economic growth.

The **cyclical component** of the total budget balance for the most part played a less important role in the period under review. The action of automatic stabilisers, which smooth the business cycle, was limited, so the total balance was made mainly up of its structural component. Economic growth had a stronger effect on the cyclical balance in 2006–2008, when favourable economic growth gave rise to extraordinary tax revenues. In 2009 the cyclical component returned to levels close to zero. It was negative in 2012–2014, when the contribution of the cyclical component to the overall general government deficit was apparent again as a result of the renewed recession in the Czech economy. According to the CNB's forecast, however, the cyclical component will return to neutral levels in 2015–2016.

The fall of the economy into recession in 2012–2013 resulted in a reassessment of the pace of previous fiscal consolidation and a withdrawal from the previously declared fulfilment of the **medium-term objective (MTO)**[114] in the form of a structural deficit of 1% of GDP in 2015.[115] This objective was initially postponed until the confidence of economic agents is restored and sustainable growth has been started up again.[116] The current Convergence Programme then declared convergence to the medium-term objective at the end of its horizon, i.e. in 2018.[117] According to the Czech Republic's Updated Euro-area Accession Strategy of 2007, fulfilment of the MTO is a condition for fiscal policy to be able to effectively perform its macroeconomic stabilising role following the loss of independent monetary policy. It can thus be stated that due to consolidation efforts in past years, the preparedness of fiscal policy to take over the stabilising function of monetary policy has improved visibly, but the plan to fulfil the MTO has been postponed by several years in an effort to support the recovery of the Czech economy.

2.1.2 Government deficit and debt and the scope for stabilising fiscal policy

Ensuring long-term sustainability of public budgets is a precondition for effective use of their stabilising function and an important condition for the ability of the Czech Republic to fulfil its commitments under the Stability and Growth Pact in the long term. The fiscal policy objective in the run-up to euro area accession should be to take the public budgets close to a zero balance (or to the MTO) so that sufficient room is left for stabilising fiscal policy in bad times.

Table 16 summarises the forecast for the **general government balance** of the countries under review as published by the European Commission in spring 2015. The left-hand side of the table shows the total general government balance, while the right-hand side contains the structural balance calculated under EC methodology. The last line in the table gives the current estimate of the total and structural balance according to the CNB forecast. The forecast for the overall general government balance in 2015 and 2016 is below the reference value of 3% in all

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[114] The originally uniform requirement of balanced finances has been replaced under the amended European fiscal rules (Council Regulation No. 1055/2005 of 27 June 2005) by country-specific medium-term objectives, which differ from economy to economy depending on the existing level of public government debt, future population ageing costs and the prospects for economic growth. Fast growing economies with a low general government public debt level may, instead of maintaining balanced public sector accounts, reach a deficit of up to 1% of GDP. The MTO was set at this level for the Czech Republic as well.

[115] Convergence Programme of the Czech Republic, April 2012.

[116] Convergence Programme of the Czech Republic, April 2013.

[117] According to the Convergence Programme of the Czech Republic of April 2015, the general government structural balance should reach 1.1% of GDP, i.e. close to the MTO, in 2018.

the countries under review (except Portugal in 2015). However, the structural balances of most of the countries (except Germany) remain relatively high and exceed the MTO, which is set at 1% of GDP in the case of the Czech Republic.[118]

Table 16: General government balance, European Commission estimate
(% of GDP)

	Total balance						Structural balance					
	2005	**2012**	**2013**	**2014**	**2015**	**2016**	**2005**	**2012**	**2013**	**2014**	**2015**	**2016**
CZ	-3.1	-4.0	-1.3	-1.9	-1.9	-1.3	-4.1	-3.2	0.0	-1.0	-2.0	-1.5
AT	-2.5	-2.2	-1.3	-2.7	-1.9	-1.6	-2.0	-2.2	-1.0	-2.2	-1.2	-1.2
DE	-3.4	-0.1	-0.1	0.3	0.9	0.5	-2.1	-0.2	0.2	0.5	1.1	0.7
PT	-6.2	-5.7	-4.8	-7.2	-3.0	-2.9	-5.6	-3.2	-2.2	-5.2	-1.8	-2.3
HU	-7.8	-2.3	-2.5	-2.5	-2.3	-2.1	-9.4	-0.7	-1.4	-2.2	-2.4	-2.3
PL	-4.0	-3.7	-4.0	-3.3	-2.8	-2.8	-2.7	-3.9	-3.4	-2.9	-2.6	-2.8
SI	-1.3	-4.1	-15.0	-5.0	-2.9	-2.4	-2.1	-2.2	-12.7	-3.9	-2.7	-2.6
SK	-2.9	-4.2	-2.6	-2.8	-2.7	-2.4	-2.8	-3.5	-1.7	-2.0	-2.3	-2.1
EA	-	-3.7	-3.0	-2.6	-2.0	-1.8	-	-2.5	-1.4	-1.2	-1.0	-1.2
CZ[a]	*-3.1*	*-4.0*	*-1.3*	*-1.9*	*-1.3*	*-0.6*	*-2.3*	*-2.0*	*-0.1*	*-0.4*	*-1.0*	*-0.7*

Note: The general government deficit is calculated according to ESA 2010 methodology and the "Excessive Deficit Procedure" definition. [a] Total balance: data according to the CZSO's statistics and notifications (autumn 2015) for 2005 and 2012–2014, and the CNB's forecast for 2015 and 2016 in Inflation Report IV/2015. The structural balance is calculated under EC methodology. The difference from the European Commission's data for the Czech Republic stems mainly from differences in the GDP forecast and related public budget revenues and expenditures.

Source: European Commission (2015c), CNB.

In addition to other factors, the government's room for manoeuvre for the application of discretionary budgetary policy measures is determined by the nature of fiscal expenditure, with **mandatory expenditures** being the least flexible.[119] On the one hand, high mandatory expenditures can restrict the room for discretionary measures; on the other hand, they can have a countercyclical effect as automatic stabilisers. However, in a phase of economic contraction, a large share of mandatory expenditures implies a risk for public finances, especially when tax revenues are very sensitive to changes in GDP growth and the initial state of the public budgets does not provide enough room for problem-free operation of automatic stabilisers.[120]

The share of mandatory expenditures in total expenditures and total revenues of the state budget has long been rising in the Czech Republic. Following a short-term decline in 2007, this share rose again in connection with the adverse cyclical developments in 2008–2009 (see Table 17). Thereafter, the share of mandatory expenditures increased further as a result of the impact of the government's austerity measures on non-mandatory expenditures. Moreover, its more pronounced pick-up in 2015 reflected a one-off increase in pensions going beyond the restoration of the policy to increase them fully in line with inflation.

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[118] According to the current CNB forecast published in Inflation Report IV/2015, the general government structural deficit will remain below 1% of GDP in 2016, so the medium-term objective for the Czech Republic will be met for the fourth consecutive year.

[119] While the adoption of a government resolution or a change to a statutory instrument is sufficient to allow a change in some expenditures, changes to other expenditures require time-consuming and politically difficult amendments to laws or international treaties. The classification into mandatory, quasi-mandatory and non-mandatory expenditures is thus a measure of the speed at which the government is able to alter such expenditures if the need arises. The definition of mandatory expenditures used in this analysis is given in the Methodological Part.

[120] This risk materialised fully in the Czech Republic after the outbreak of the financial crisis, when the high share of mandatory expenditures was reflected in a sharp rise in the public finance deficit.

Table 17: Shares of mandatory state budget expenditure

(%)

	2005	2009	2010	2011	2012	2013	2014	2015	2016
Shares of mandatory expenditure in total SB expenditure	53.0	53.3	54.3	56.5	56.7	57.2	56.5	58.5	57.0
Shares of mandatory expenditure in total SB revenue	59.0	63.8	62.8	64.4	62.1	61.5	60.4	63.7	60.4

Note: Data for 2005-2014 are actual figures; data for 2015 and 2016 are based on the government's September 2015 draft state budget (state budget compilation methodology).
Source: Ministry of Finance of the Czech Republic (2006, 2015c), CNB calculations.

The mandatory expenditures of individual countries are not directly comparable, as there is no harmonised definition of the term. However, the **structure of general government revenue and expenditure** provides some insight (see Table 18).[121] For all indicators as a percentage of GDP, the Czech Republic ranked among the countries with lower figures in 2014, below the euro area average to a larger or smaller extent, with the exception of gross capital formation. This overall assessment of the Czech Republic's position in also in line with the share of social expenditure payments, which are the main component of mandatory expenditures (as in the other countries under review). The Czech Republic's low debt service expenditure ratio is a consequence of its still relatively low government debt in an environment of exceptionally low interest rates. The ratio of compensation of employees (salaries in budgetary and subsidised organisations) to GDP is comparable with that in Germany and Slovakia and lower than in the other countries and the euro area average.

Table 18: Public revenues and expenditures relative to GDP in 2014

(%)

	CZ	AT	DE	PT	HU	PL	SI	SK	EA
Total revenues	40.6	50.0	44.6	44.5	47.4	38.8	44.8	38.9	46.8
- taxes	19.2	28.1	22.7	25.1	25.2	19.7	22.2	17.4	25.6
- social contributions	14.8	15.4	16.5	11.7	13.1	13.2	14.6	13.6	15.5
Total expenditures	42.6	52.7	44.3	51.7	49.9	42.1	49.8	41.6	49.4
- compensation of employees	8.8	10.6	7.7	11.8	10.4	10.4	11.8	8.7	10.3
- intermediate consumption	6.3	6.4	4.8	5.8	7.9	6.1	6.7	5.3	5.3
- social payments	16.3	23.3	23.7	19.7	16.1	16.2	18.4	19.0	23.1
- gross fixed capital formation	4.2	3.0	2.2	2.0	5.5	4.5	5.2	3.6	2.7
- interest expenditure	1.3	2.5	1.8	4.9	4.0	1.9	3.2	1.9	2.7

Source: European Commission (2015c).

The current stock of, and especially prospects for, **government debt** are other factors limiting the stabilising ability of fiscal policy. Changes thereto significantly affect both the level of debt service spending and the government's ability to finance budget deficits and to refinance maturing government debt. This may have serious macroeconomic impacts.[122] Moreover, fiscal policy will have to take into account the fact that in the recent reform of the Stability and

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[121] "Statutory" mandatory expenditures consist of social payments (social benefits – pension and sickness insurance benefits in particular – as well as government payments for health insurance) and debt service spending. Part of expenditure on intermediate consumption and investment in the government sector is also included in mandatory expenditures, but the available statistical data do not make it possible to quantify more precisely the share of the mandatory component in this category of expenditure.

[122] As debt crisis in the euro area – and most recently above all in Greece – has shown, if it is unable to finance its government debt, the state may be forced to take tough consolidation measures even in a strongly adverse macroeconomic situation. The absence of an independent currency and monetary policy is particularly costly in this situation.

Growth Pact the debt criterion gained much greater weight than before. Table 19 provides a comparison of the ratios of government debt to GDP

Table 19: General government debt, European Commission estimate
(% of GDP)

	2005	2009	2010	2011	2012	2013	2014	2015	2016
CZ	28.0	34.1	38.2	39.9	44.7	45.2	42.7	41.0	41.0
AT	68.3	79.7	82.4	82.2	81.6	80.8	84.2	86.6	85.7
DE	66.9	72.5	81.0	78.4	79.7	77.4	74.9	71.4	68.5
PT	67.4	83.6	96.2	111.4	126.2	129.0	130.2	128.2	124.7
HU	60.5	78.0	80.6	80.8	78.3	76.8	76.2	75.8	74.5
PL	46.7	49.8	53.3	54.4	54.0	55.9	50.4	51.4	52.4
SI	26.3	34.5	38.2	46.4	53.7	70.8	80.8	84.2	80.9
SK	33.9	36.0	40.8	43.3	51.9	54.6	53.5	52.7	52.6
EA	69.1	78.3	84.0	86.7	91.3	93.4	94.5	94.0	92.9
CZ[a)]	*28.0*	*34.1*	*38.2*	*39.9*	*44.7*	*45.2*	*42.7*	*40.9*	*39.5*

Note: [a)] Data according to the CZSO's statistics and notifications (autumn 2015) for 2005 and 2009–2014, and the CNB's estimate in Inflation Report IV/2015 for 2015 and 2016. The creation of a government debt financing reserve (issuance of bonds going beyond the need to cover budget deficits) contributed to the increase of several percentage points in the debt-to-GDP ratio in 2011–2013. A decrease in this reserve then contributed to a decline in the debt-to-GDP ratio in 2014–2015.

Source: European Commission (2015c), CZSO, CNB calculations.

Like the other fiscal indicators, debt was affected by dramatic changes in the economic situation in 2008–2010. In the countries under review, the slightly declining government debt path as a percentage of GDP observed in the pre-crisis years was replaced by a more or less sharp increase in line with the growth in deficits and other extraordinary fiscal measures taken by individual countries to dampen the impacts of the financial and economic crisis. Although Czech government debt has long been well below the reference value of 60% of GDP, and has even shown a slight downward trend since 2014, its sustainability remains a major risk due to unresolved structural problems in the Czech economy and the impacts of population ageing.

Table 20: Debt service, European Commission estimate
(% of GDP)

	2005	2009	2010	2011	2012	2013	2014	2015	2016
CZ	1.1	1.2	1.3	1.3	1.4	1.3	1.3	1.2	1.2
AT	3.2	3.2	2.9	2.8	2.7	2.6	2.5	2.4	2.2
DE	2.7	2.6	2.5	2.5	2.3	2.0	1.8	1.5	1.4
PT	2.6	3.0	2.9	4.3	4.9	4.9	4.9	4.9	4.5
HU	4.1	4.5	4.1	4.2	4.6	4.5	4.0	3.5	3.3
PL	2.5	2.5	2.5	2.5	2.7	2.5	1.9	1.8	1.7
SI	1.5	1.3	1.6	1.9	2.0	2.6	3.2	3.0	2.9
SK	1.7	1.4	1.3	1.5	1.8	1.9	1.9	1.6	1.6
EA	-	2.8	2.7	3.0	3.0	2.8	2.7	2.4	2.3

Source: European Commission (2015c).

At the same time, it should be taken into account that the level of debt is being reflected in mandatory expenditure connected with **debt service**, although in many countries it has not increased yet owing to the exceptionally low interest rates, which are, however, a temporary factor. The Czech Republic is succeeding in maintaining a low debt service expenditure level

compared to the other countries under review, well below the euro area average, in the outlook up to 2015 (see Table 20).

2.1.3 Government finance sustainability

Sustainability of government finance, i.e. controlled ("financeable") government deficits and debt in the long term, is a key prerequisite for those finances to have a stabilising effect on the economy. In the long run, virtually all EU countries are exposed to the problem of population ageing and the related rise in pension, social and health expenditure, which may generate instability in the future.

Table 21: Age-related government expenditures
(% of GDP)

	Pensions		Health care		Long-term care		Total	
	2013	2060	2013	2060	2013	2060	2013	2060
CZ	9.0	9.7	5.7	6.7	0.7	1.4	15.4	17.8
AT	13.6	13.9	6.9	8.2	1.4	2.7	21.9	24.8
DE	10.0	12.7	7.6	8.2	1.4	2.9	19.0	23.8
PT	12.1	11.1	6.0	8.5	0.5	0.9	18.6	20.5
HU	11.5	11.4	4.7	5.4	0.8	1.2	17.0	18.0
PL	10.4	10.5	4.2	5.5	0.8	1.7	15.4	17.7
SI	11.8	15.3	5.7	6.8	1.4	2.9	18.9	25.0
SK	8.0	10.0	5.7	7.7	0.2	0.6	13.9	18.3
EA	12.0	11.9	7.0	7.7	1.7	3.0	20.7	22.6
CZ[a]	*9.0*	*8.4*	*6.7*	*8.2*	*-*	*-*	*15.7*	*16.6*

Note: [a] CNB calculations. Under Czech law, long-term care is partly included under health care, while the rest is included under social care expenditure. The decline in pension expenditure in 2060 is due to expected increases in the retirement age.

Source: European Commission (2015d).

Among the countries under comparison, the Czech Republic (together with Slovakia) had the lowest initial level of age-related expenditure in 2013 (see Table 21). It maintains this relative position in international comparison at the long-term forecast horizon as well. However, the expected rise in age-related expenditures is still marked.

Ensuring public finance sustainability therefore remains a key condition for the future smooth functioning of the Czech economy within the euro area. Limiting growth in age-related expenditure was one of the major objectives of the reforms of the pension system prepared by the previous government and approved by the parliament. The "small" pension reform in effect since 2011, which introduced several parametric changes, the most significant being a gradual increase in the retirement age, had an immediate and positive long-term effect on public finances. However, this reform cannot be considered a sufficient systemic solution. The solution was meant to be the introduction of another pillar of the pension system in the form of retirement savings. However, this "second pillar" met with little interest from the general public, not least because it was not communicated consensually by the political representation, and it was subsequently abolished at the end of 2015.

To sum up, fiscal policy in the Czech Republic grappled with elevated structural deficits until 2012, despite a relatively low level of general government debt. Following a period of decline associated with (mostly procyclical) fiscal consolidation, the structural deficit returns to a slightly rising path in the outlook. The relatively high share of mandatory expenditures, which are time-consuming and politically challenging to change, is a limiting factor for fiscal policy. Coping with population ageing by reforming the pension and health systems will also be

of key importance for sustainability. Although compliance with the fiscal convergence criteria can thus be expected in the years ahead and the preparedness to enter the euro area has improved in this respect, the effectiveness of fiscal adjustment mechanisms remains a limiting area in the assessment of the Czech Republic's ability to adopt the euro.

2.2 LABOUR MARKET FLEXIBILITY

According to the optimum currency area theory, labour market flexibility is one of the most important adjustment mechanisms. Adjustment through wages, employment or employment structure can significantly aid in absorbing the negative impacts of asymmetric shocks in a currency area. Labour market flexibility is defined by both labour force flexibility and institutional factors. In addition to the analyses in this section, the labour market is dealt with from the perspective of international competitiveness using the Global Competitiveness Index (GCI) in the pillar assessing labour market efficiency (see section 2.3.1 for details).

2.2.1 Unemployment and internal labour market flexibility

As regards labour market flexibility, it is particularly important to track long-term unemployment and regional differences and skills mismatches in the supply of and demand for labour. High long-term unemployment is one of the indicators of high structural unemployment, and a low participation rate indicates that the economy has unused potential. Regional differences in unemployment may be related to low labour mobility, and professional and skills mismatches may point to inappropriate configuration of the education system.

The **long-term unemployment** rate increased in most countries in 2010 as the impacts of the recession hit the labour market with the usual lag (see Table 22). The exception is Germany, where the long-term unemployment rate decreased gradually over the entire period under review. The long-term unemployment rate in the Czech Republic is one of the lowest among the countries under comparison despite increasing in 2010 and then stagnating at around 3%. Only Austria and Germany have lower rates. By contrast, much higher levels are recorded in Slovakia, Portugal and Slovenia.

Table 22: Long-term unemployment rate

(%)

	2005	2009	2010	2011	2012	2013	2014
CZ	4.2	2.0	3.0	2.7	3.0	3.0	2.7
AT	1.4	1.2	1.2	1.2	1.2	1.3	1.5
DE	5.9	3.5	3.3	2.8	2.4	2.3	2.2
PT	4.2	4.7	6.3	6.2	7.7	9.3	8.4
HU	3.2	4.2	5.5	5.2	5.0	4.9	3.7
PL	10.3	2.5	3.0	3.6	4.1	4.4	3.8
SI	3.1	1.8	3.2	3.6	4.3	5.2	5.3
SK	11.8	6.5	9.3	9.3	9.4	10.0	9.3

Note: Shares of persons unemployed for 12 months or more in the labour force (under ILO methodology).
Source: Eurostat.

Cyclical and structural unemployment can be analysed by means of the Beveridge curve,[123] which plots the number of vacancies against the number of unemployed persons (see Chart 44). Decreasing (increasing) unemployment amid a rising (falling) number of vacancies is associated with cyclical changes on the labour market, i.e. with movements along the Beveridge curve, whereas movements of unemployment and vacancies in the same direction signal changes in structural unemployment, i.e. movements of the curve itself.[124] There was a cyclical decline in unemployment from 2005 until mid-2008 amid strong demand for labour stemming from robust growth in economic activity. Amid a decline in vacancies, the number of unemployed persons then started to record a cyclical rise in approximately mid-2008 as the economy cooled. This was reflected in a shift along the Beveridge curve in the south-easterly direction. A gradual shift in the westerly direction was observed from 2010 Q2 onwards in line with the weak economic recovery in 2010 and 2011. A renewed decline in economic activity at the start of 2012 led to a resumed gradual increase in the number of job applicants, which reached a historical high at the end of 2013. An opposite shift, i.e. a fall in the number of unemployed persons amid a rise in job vacancies, has been occurring in the last two years as the economy has expanded. Overall, cyclical effects have thus dominated structural ones in the Beveridge curve in recent years, so labour market flexibility is not likely to have changed significantly.

Chart 44: Beveridge curve
(thousands)
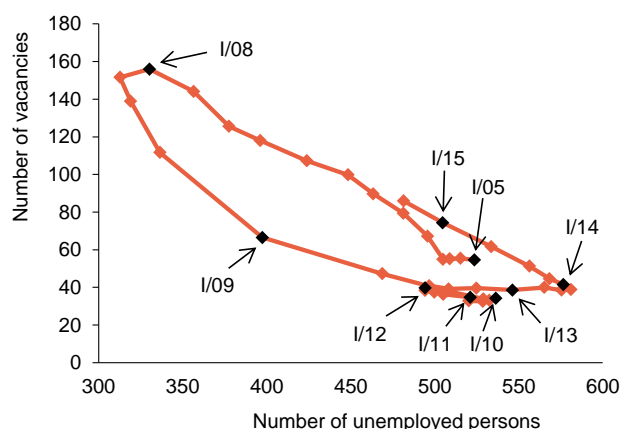
Note: Seasonally adjusted quarterly data.
Source: Ministry of Labour and Social Affairs, CNB calculations.

The evolution of employment in recent years has been significantly influenced by the use of alternative forms of employment, especially **shorter working hours**, i.e. a lower number of hours worked per employee. By cutting hours worked, employers addressed the issue of adjusting employment in the face of falling demand and uncertainty about its future evolution, and streamlined their labour costs. This is well illustrated by the situation in 2013 (and before

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[123] In this section, structural unemployment means the sum of structural and frictional unemployment. Classical structural unemployment refers to the case where it would be possible with a given of supply vacancies to reduce unemployment by transferring the unemployed between industries, professions or regions (Jackman and Roper, 1987). On the other hand, frictional unemployment reflects the duration of job seeking (the unemployed find a job in the end, so this is not structural unemployment). As the duration of job seeking may change depending on the phase of the business cycle, the presented indicators of structural unemployment may be cyclically conditional.
[124] Horizontal or vertical shifts of the Beveridge curve reflect not only changes in structural unemployment, but often also administrative effects on the number of unemployed persons and vacancies. Such shifts occurred probably at the end of 2004 and 2005 in connection with an amendment of the Employment Act and at the start of 2006 in response to tighter conditions for reporting vacancies to labour offices (CNB, 2006). The duty of firms to report vacancies to labour offices was terminated at the start of 2012 (although this change did not visibly affect the Beveridge curve).

that in 2009), when average hours worked per employee declined substantially amid falling GDP. The decrease in hours worked per employee halted as year-on-year growth in economic activity was renewed in 2014 H1 (see Chart 45). In addition to these cyclical causes, the rising occurrence of shorter working hours and part-time employment is due to structural factors, reflecting convergence towards standards in more advanced countries in this area (greater use of part-time employment by women after returning to work from parental leave and by employees of retirement age, etc.).

Chart 45: Average hours worked per employee

Hours worked per employee
Number of employees
Number of employees (full-time equivalent)
GDP
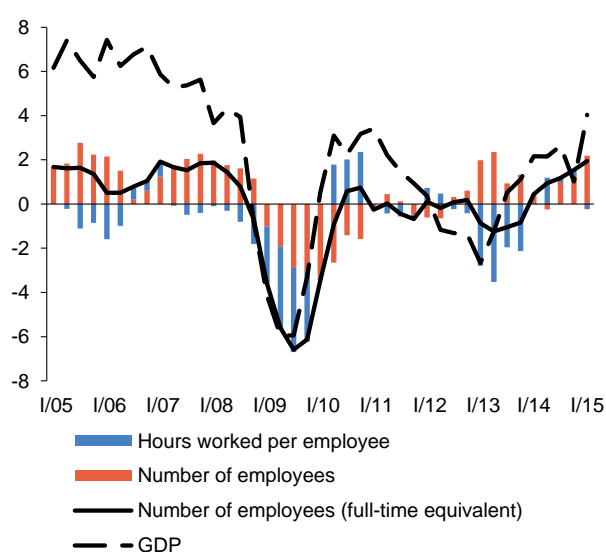
Note: Annual percentage changes, contributions in percentage points.
Source: LFS, CNB calculations.

The **rate of economic activity** rose noticeably in most countries, including the Czech Republic. The largest increases – almost 5 pp over the last ten years – were recorded in Austria and Germany (see Table 23). The rise was due, among other things, to increases in the retirement age and to greater use of shorter working hours. By contrast, the rates of economic activity in Portugal and Slovenia were flat over the last ten years.

Table 23: Rate of economic activity in the 15–64 age category

	2005	2009	2010	2011	2012	2013	2014
CZ	70.4	70.1	70.2	70.5	71.6	72.9	73.5
AT	71.4	74.3	74.4	74.6	75.1	75.5	75.4
DE	73.8	76.3	76.6	77.3	77.2	77.6	77.7
PT	73.2	73.4	73.7	73.6	73.4	73.0	73.2
HU	61.3	61.2	61.9	62.4	63.7	64.7	67.0
PL	64.4	64.7	65.3	65.7	66.5	67.0	67.9
SI	70.7	71.8	71.5	70.3	70.4	70.5	70.9
SK	68.9	68.4	68.7	68.7	69.4	69.9	70.3

Note: The rate of economic activity is the share of economically active persons (employed and unemployed) in the population.
Source: Eurostat (LFS).

Regional differences in unemployment can be quantified using the coefficient of variation of the unemployment rate for areas (NUTS II) and regions (NUTS III). The coefficient of

variation of the unemployment rate in the Czech Republic had been gradually decreasing since 2009 (see Table 24). The 2012 rebound suggests a slight increase in the mismatch between the regional supply of and demand for labour, with growth in unemployment having been recorded in regions with a traditionally unfavourable labour market situation. The coefficient of variation also increased in Austria in 2012, while remaining broadly flat in the other countries. The Czech Republic generally displays medium-high regional differences in unemployment rates compared to the countries under review. Since 2013, the coefficient of variation of the unemployment rate in the Czech Republic has been falling gradually owing to the improving labour market situation. In Hungary, by contrast, the coefficient of variation has recently risen significantly, exceeding the level recorded for the Czech Republic (the core countries of the euro area, i.e. Germany and Austria, are also traditionally also above this level).

Table 24: Coefficient of variation of the unemployment rate

(%)

	NUTS II regions							NUTS III regions						
	2005	2009	2010	2011	2012	2013	2014	2005	2009	2010	2011	2012	2013	2014
CZ	46	34	31	28	33	31	30	47	35	32	28	34	32	30
AT	39	34	37	40	43	39	43	40	36	39	42	45	41	45
DE	41	37	38	44	40	39	39	44	43	44	50	48	46	-
PT	23	18	20	13	14	16	13	31	-	-	-	-	-	-
HU	27	31	23	26	23	21	31	30	36	28	30	27	25	36
PL	15	20	14	14	15	16	18	25	32	28	27	27	26	27
SK	37	32	27	32	31	29	28	42	38	29	33	33	31	30

Note: The coefficient of variation is the ratio of the standard deviation weighted by region size to the average unemployment rate in per cent.

Source: Eurostat (LFS).

Labour market flexibility is also affected by the regional mobility of the population, as described by the **internal migration** indicator (see Table 25). This indicator has long been higher in the Czech Republic than in Poland and Slovakia and is more or less constant over time. By contrast, mobility in Austria, Germany and Slovenia is higher.

Table 25: Internal migration

(per 1,000 inhabitants)

	2005	2009	2010	2011	2012	2013	2014
CZ	21	22	23	22	22	22	23
AT	36	37	37	38	39	39	40
DE	44	44	44	46	46	47	-
HU	22	21	20	20	19	19	22
PL	11	11	11	11	10	11	11
SI	16	48	52	53	55	55	55
SK	16	15	16	16	15	16	17

Note: Migration between municipalities (HU, PL and SI – all changes in permanent residence); SI – only Slovenian nationals until 2007. The calculations do not take into account differences in municipalities' sizes.

Source: Statistical yearbooks, Eurostat, CNB calculations.

To sum up, structural problems persist in unemployment and internal labour market flexibility. In particular, internal geographical labour mobility remains low by comparison with advanced European countries, so the lower ability to adjust to asymmetric shocks persists. On the other hand, the labour market has also been showing signs of greater flexibility in recent years in

response to the economic crisis, particularly through stronger growth in the number of employees working shorter hours during the economic recession. The rate of economic activity among the working age population has also gone up. The Czech Republic displays medium-high regional differences in unemployment rates. In recent years, the long-term unemployment trends in the Czech Republic have been qualitatively similar to those in the other countries under comparison, although its rate is among the lowest.

Box 2: Adjustment in the employment area: Firm-level survey evidence

This box presents the results of a survey of firms about changes in the economic environment, adjustment in the employment area, and wage and price setting. The aim of the survey, conducted in 25 EU Member States in 2014,[125] was to gather information about how firms were reacting to changes in the economic environment following the crisis.

In the Czech Republic, 38% of firms stated that they had had to significantly reduce their labour costs in 2010–2013 (see Table B1). The need to reduce labour costs was slightly lower in Poland (35% of firms) and substantially lower in other countries (between 17% and 26% of firms). Czech firms cut labour costs mostly by freezing or reducing new hires (61% of firms), making individual layoffs (53% of firms) and not renewing temporary contracts (40% of firms). By contrast, the least used methods were reduction of working hours, early retirement and collective layoffs. On average, firms in the other countries under comparison took a similar approach. They mostly cut costs through changing the number of employees rather than changing working hours per employee. Firms in Germany, Austria and Portugal were the most flexible in changing working hours.[126]

Table B1: Changes in labour costs
(% of firms)

	CZ	AT	DE	PT	HU	PL	SI	SK	Average
During 2010–2013 did you need to significantly reduce your labour input or to alter its composition?	38	21	23	25	17	35	26	26	26
If yes, which of the following measures did you use?									
Collective layoffs	14	17	7	18	13	5	9	16	12
Individual layoffs	53	25	34	37	33	55	39	77	44
Temporary layoffs	-	16	-	6	12	16	6	20	13
Subsidised reduction of working hours*	9	9	44	-	10	11	8	8	14
Non-subsidised reduction of working hours (including reduction of overtime, working time accounts, etc.)	18	25	24	31	15	22	6	12	19
Non-renewal of temporary contracts at expiration	40	6	20	63	21	46	34	41	34
Early retirement schemes	14	5	8	14	17	13	12	18	12
Freeze or reduction of new hires	61	52	34	78	33	62	46	68	54
Reduction of agency workers and others	24	31	12	40	13	26	13	26	23

Note: The measures are given in per cent of firms which significantly decreased their labour input or altered its composition (the share of the answers "moderately" or "strongly"). * CZ: pursuant to Article 209 of the Labour Code.

Another question concerned obstacles to hiring (see Table B2). In the Czech Republic, the most often cited relevant obstacles included uncertainty about economic conditions (68% of firms), high payroll taxes (66% of firms), insufficient availability of employees with the required skills (60% of firms) and firing costs (57% of firms). Uncertainty about economic conditions was also a very frequent factor in Portugal, Poland, Slovenia and Slovakia. Firing

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[125] The survey was coordinated by the ESCB Wage Dynamics Network. In the Czech Republic, a total of 1,011 firms in manufacturing, construction and market services except financial intermediation took part in the survey. This box discusses their answers to selected questions in the area of employment adjustment.
[126] Subsidised reduction of working hours (Kurzarbeit) was used more often in Germany (44% of firms) than in other countries.

costs often tend to be cited as an argument against hiring new employees in countries with a high Employment Protection Legislation index.[127]

Table B2: Obstacles to hiring on permanent contracts
(share of the answers "relevant" and "very relevant", % of firms)

	CZ	AT	DE	PT	HU	PL	SI	SK	Average
Uncertainty about economic conditions	68	20	43	81	43	88	75	75	62
Insufficient availability of labour with the required skills	60	29	61	41	18	71	48	75	50
Access to finance	41	6	13	37	14	52	51	50	33
Firing costs	57	15	26	64	15	68	51	63	45
Hiring costs	30	10	19	46	14	74	50	31	34
High payroll taxes	66	26	40	67	35	89	76	76	59
High wages	43	24	44	45	26	79	44	63	46
Risks that labour laws are changed	39	13	28	54	21	73	51	66	43
Costs of other inputs complementary to labour	33	8	11	49	19	63	39	46	34
Other	26	2	17	-	2	-	-	26	15

2.2.2   Estimate of structural unemployment using the NAIRU

High structural unemployment in the economy is a sign of labour market inflexibility. Changes in structural unemployment are usually estimated by means of changes in the NAIRU, i.e. the unemployment rate consistent with stable inflation, which abstracts from unemployment due to cyclical effects. However, structural unemployment is not directly observable and is estimated by filtering time series using an economic model.[128]

There are sizeable differences in the evolution and level of the NAIRU between the countries under comparison (see Chart 46). The NAIRU is high in Slovakia and Poland, i.e. countries with traditionally higher unemployment rates, and also in Portugal, where structural unemployment increased mainly during the crisis. In the Czech Republic, the NAIRU has long followed a downward trend, with temporary upward swings during the two recessions of recent years. It is reasonable to assume that its downward trend in recent years is partly due to the increased use of shorter working hours (see above), especially during the economic downturn, which increases labour market flexibility. The current estimate of the NAIRU in the Czech Republic is just below 5%, similar as in Austria and Germany. Austria traditionally has a low NAIRU, while Germany has benefited over the last ten years from labour market reforms, which have helped to significantly reduce German structural unemployment.

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[127] For details on the Employment Protection Legislation (EPL) index, see section 2.2.4.
[128] For details, see the *Methodological Part*.

Chart 46: NAIRU

(%)
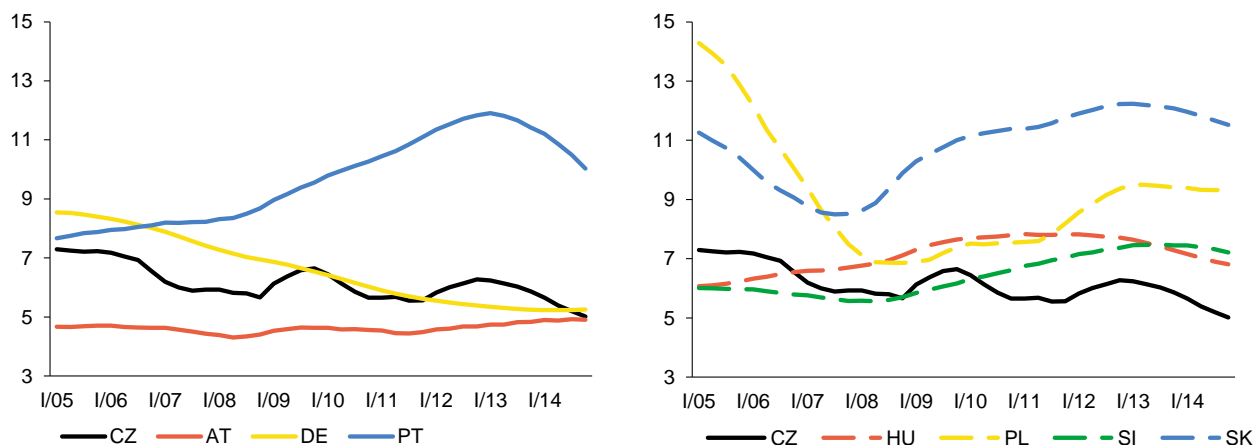
Source: Eurostat, CNB calculations.

2.2.3 International labour mobility

International labour mobility within a currency area is one of the most important mechanisms through which individual member economies can absorb asymmetric shocks, in particular those of a long-term nature, thanks to changes in labour supply.

The share of foreign nationals in the population (see Table 26) is one of the important indicators of international labour mobility.[129] The share of foreigners in the Czech population roughly doubled compared to the period before and shortly after accession to the EU, but has been flat around 4% in recent years.[130] This is less than one-half of the ratio in Germany and only one-third of that in Austria. Moreover, the share of foreign nationals in Austria continues to rise steadily. Of the other EU countries under comparison, only Slovenia recorded a similar trend as the Czech Republic, but its share of foreigners has also been rising in recent years. The share of foreign nationals in the population has long been significantly lower in Hungary, Slovakia and Poland.[131]

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[129] The EU has recently been experiencing a massive wave of immigration caused above all by the poor security situation in some non-European areas. This is, of course, a different sort of immigration compared to the economically motivated labour mobility within the monetary union and its neighbours.

[130] The share of foreign nationals from non-EU countries in the Czech population was 2.5% in 2014. A higher proportion of non-EU foreign nationals compared to EU foreign nationals is observed in most of the countries under comparison. The share of Slovak nationals in the Czech population was 0.9% in 2014.

[131] The above data are also in line with OECD (2012), according to which the Czech Republic recorded the highest level of immigration from non-EU countries of all the countries that joined the EU in 2004.

Table 26: Share of foreign nationals in the population

(%)

	2005	2009	2010	2011	2012	2013	2014
CZ	1.9	3.9	4.0	4.0	4.0	4.0	4.1
AT	9.4	10.2	10.5	10.8	11.2	11.8	12.4
DE	8.8	8.8	8.7	8.8	9.1	9.4	8.7
PT	-	4.2	4.3	4.2	4.1	4.0	3.8
HU	1.4	1.9	2.0	2.1	1.4	1.4	1.4
PL	0.1	0.1	0.2	0.2	0.2	0.2	0.3
SI	2.2	3.5	4.0	4.0	4.2	4.4	4.7
SK	0.4	1.0	1.2	1.3	1.3	1.3	1.1

Source: Eurostat, CNB calculations.

At the same time, the Czech population has long been characterised by a low willingness to move abroad in search of work. Cross-border migration of Czech nationals is several times lower compared to other EU countries, and especially compared to Poland among the countries under comparison.

2.2.4 Institutional environment

The institutional set-up of the labour market has a fundamental influence on its functioning as an adjustment mechanism. Economic adjustment in the event of a shock may be limited by a distorted relationship between wages and labour productivity, overly strict employment protection measures, or a social system which fails to sufficiently motivate unemployed people to seek jobs.

Minimum wage

The administrative setting of a minimum wage reduces wage differentiation and wage flexibility for low-wage employees. If the minimum wage is too high, it may reduce demand for less skilled labour and for graduates and thereby increase the total and long-term unemployment of people with low skills and unemployment among graduates and school-leavers.[132]

The ratio of the **minimum wage** to the average wage in the Czech Republic decreased gradually in 2005–2012, owing to a stagnation of the minimum wage (see Table 27). In 2013, the ratio rose modestly on account of an increase in the minimum wage from CZK 8,000 to CZK 8,500 valid from August 2013. Throughout 2014, the minimum wage remained at CZK 8,500.[133] Together with Austria, the ratio of the minimum wage to the average wage in the Czech Republic is the lowest among the countries under review. By contrast, Slovenia has the highest ratio, exceeding 50% in recent years. From this perspective, therefore, the minimum wage in the Czech Republic probably does not have a stronger negative impact on the labour market than in the other countries.

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[132] OECD (1998) and Gregg (2000).

[133] The whole-year average of the minimum wage was therefore higher in 2014 than in 2013. In 2015 the minimum wage rose by a further CZK 700 to CZK 9,200. From January 2016, the minimum wage will rise to CZK 9,900. The current government plans to gradually raise the ratio of the minimum wage to the average wage to 40%.

Table 27: Minimum wage
(% of the average wage)

	2005	2009	2010	2011	2012	2013	2014
CZ	39.1	34.3	33.3	32.4	31.6	32.6	33.0
PT	40.5	42.8	42.4	42.2	42.9	42.9	44.1
HU	41.3	38.3	38.0	38.6	42.5	43.3	43.3
PL	33.7	42.2	42.0	41.7	43.5	44.6	45.4
SI	46.2	44.2	50.5	51.7	52.2	53.2	52.9
SK	34.4	35.7	36.0	36.1	35.6	36.0	35.4

Note: Until 2008, the minimum wage as a percentage of the average wage in industry and services (excluding public administration). After 2008, the same ratio in industry, construction and services. No minimum wage was defined at the national level in Germany until 2014; a minimum wage was introduced in January 2015 and is around 40% of the average wage. In Austria the minimum wage is only defined for some specific occupations and represents around 30% of the average wage.

Source: Eurostat

However, the minimum wage may have a negative impact on wage flexibility in sectors and professions where the wage is well below the national average. The minimum wage as a percentage of the wage in the first (lowest) decile of the wage distribution is traditionally high in low-skilled occupations (see Table 28). For example, for the 10% of lowest-income persons employed in elementary occupations, the minimum wage made up just over 90% of their average earnings in 2014. The ratio of the minimum wage to the wage in the first decile increased on average in the business sector in 2014, owing chiefly to a rise in the minimum wage valid from August 2013.

Table 28: Ratio of the minimum wage to the gross monthly wage in selected professions
(%)

Main employment class	Minimum wage / 1st decile						
	2005	2009	2010	2011	2012	2013	2014
Total for the Czech Republic (business sector)	68.0	63.9	63.5	72.9	69.9	70.5	71.6
- services and shop workers	90.1	85.9	86.5	91.4	85.2	84.1	86.3
- lower administrative workers	67.0	60.4	60.2	68.6	65.3	68.1	69.3
- elementary occupations	89.1	88.1	89.1	91.7	89.4	89.5	90.3

Note: The table lists data for the Czech Republic as a whole and for the three professions with the highest figures in 2014.

Source: Average Earnings Information System (Ministry of Labour and Social Affairs), CNB calculations.

Employment protection

Strict legislative **conditions for the recruitment and dismissal of employees** tend to reduce labour market flexibility and increase long-term unemployment.[134] It is also appropriate to monitor the relative strictness of the legal framework for temporary and regular employment, as the combination of high costs of dismissing employees with permanent contracts and low regulation of temporary jobs discourages employers from creating permanent jobs.

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[134] OECD (2004) and OECD (2010). By contrast, Bassanini and Duval (2006) confirm the conclusions of other papers that employment protection, as measured by the EPL index (Employment Protection Legislation), has no clear impact on the overall unemployment rate. Higher EPL values, however, adversely affect the entry of young people onto the labour market. A higher EPL index, according to these authors, is also associated with substitution of part-time contracts with full-time contracts for women.

According to recent OECD data on the **EPL index**, protection of regular employment continued to decrease and protection of temporary employment continued to increase in the Czech Republic in 2013 (see Table 29). Protection against collective dismissal has long been stable. By international comparison, however, protection of regular employment was still among the highest, while temporary jobs were generally still protected less than in the other countries. As regards collective dismissal, the conditions in the Czech Republic are among the weakest of the countries under comparison, while in Hungary and Germany they are not sufficiently flexible. Overall, labour market regulation in the Czech Republic is roughly at the same level as in the other countries except for Hungary, where it is lower owing to relatively weak protection of permanent jobs. However, European labour markets are generally rather inflexible and as a benchmark they offer a rather low standard in this case.

Table 29: Employment protection legislation (EPL) index[a]

	Regular employment[b]			Temporary employment[c]			Collective dismissals[d]		
	2005	2010	2013	2005	2010	2013	2004	2009	2013
CZ	3.3	3.1	2.9	1.1	1.3	1.4	2.1	2.1	2.1
AT	2.4	2.4	2.4	1.3	1.3	1.3	3.3	3.3	3.3
DE	2.9	2.9	2.9	1.0	1.0	1.1	3.6	3.6	3.6
PT	4.4	4.1	3.2	2.6	1.9	1.8	2.9	1.9	1.9
HU	2.0	2.0	1.6	1.1	1.1	1.3	3.4	3.4	3.6
PL	2.2	2.2	2.2	1.8	1.8	1.8	2.9	2.9	2.9
SI	-	2.7	2.6	-	1.8	1.8	-	3.4	3.4
SK	2.2	2.2	1.8	0.6	1.6	1.8	3.8	3.8	3.4

Note: [a] The indices take values ranging from 1 to 6, a higher value meaning greater employment protection. [b] Protection against individual dismissal. [c] Fixed-term contracts, temporary work agencies. [d] Over and above individual dismissals.

Source: OECD. For a description of the methodology, see Venn (2009).

A major revision to the Labour Code implemented in 2012 (see the 2012 Alignment Analyses) was followed up with an amendment effective from August 2013 which allows repetition of fixed-term contracts in selected seasonal jobs (agriculture, construction and culture), thereby slightly increasing the flexibility of the Czech labour market.

Labour taxation

Labour taxation inclusive of relevant contributions directly affects labour costs, which are an important determinant of job creation. Thus, higher taxation may reduce the ability of the labour market to respond flexibly to asymmetric shocks. Moreover, high labour taxation increases the share of the grey economy[135] and can significantly increase unemployment if the minimum wage is high.[136] The taxation of high earners is also important from the perspective of international competition and labour mobility, as persons with high skills and high incomes are more willing to migrate in search of work.

Overall labour taxation in the Czech Republic in 2014 and throughout the period under review was higher than in Portugal, Poland and Slovakia both at the average wage level and for low earners (see Table 30). By contrast, labour taxation is markedly lower in the Czech Republic than in its advanced neighbouring countries – Germany and Austria – and also Hungary. Compared to 2013, overall labour taxation increased slightly in the Czech Republic last year, as it did in Austria, Portugal and Slovakia.

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[135] Brandt et al. (2005).
[136] See the section on the minimum wage above, and Bassanini and Duval (2006).

Table 30: Overall labour taxation

	100% of average wage					67% of average wage				
	2005	**2011**	**2012**	**2013**	**2014**	**2005**	**2011**	**2012**	**2013**	**2014**
CZ	43.8	42.5	42.4	42.4	42.6	42.1	39.5	39.3	39.3	39.7
AT	47.4	48.4	48.9	49.1	49.4	42.5	43.7	44.2	44.5	44.8
DE	51.8	49.8	49.8	49.3	49.3	46.7	45.6	45.6	45.1	45.1
PT	36.2	39.0	36.7	41.1	41.2	31.7	33.1	32.0	34.7	35.0
HU	50.5	49.4	49.4	49.0	49.0	42.9	45.2	47.6	49.0	49.0
PL	43.6	34.3	35.5	35.6	35.6	42.4	33.4	34.6	34.7	34.8
SK	38.3	38.9	39.6	41.1	41.2	35.3	36.1	36.9	38.4	38.6

Note: Income tax and contributions paid by employees and employers as a percentage of total labour costs. Data for employees
    (individuals without children) earning 100 % (left-hand part of the table) and 67 % (right-hand part of the table) of the average
    wage.

Source: OECD (2015).

The data on the **components of labour taxation** (see Chart 47) show that in all the selected
countries health and social insurance affects overall labour taxation to a considerably greater
extent than income tax. Compared to the other countries, the level of insurance in the Czech
Republic is similar to that in Germany and lower than in Hungary and Austria. By contrast,
Portugal and Poland have the lowest insurance burden. Since 2006, overall taxation has risen
in all the countries under review. The rise in overall taxation in all the countries was mostly
due to contributions paid, while the rise in income tax was only moderate (except in Poland,
where income tax fell).

Chart 47: Components of labour taxation in 2014
(% of the average wage)
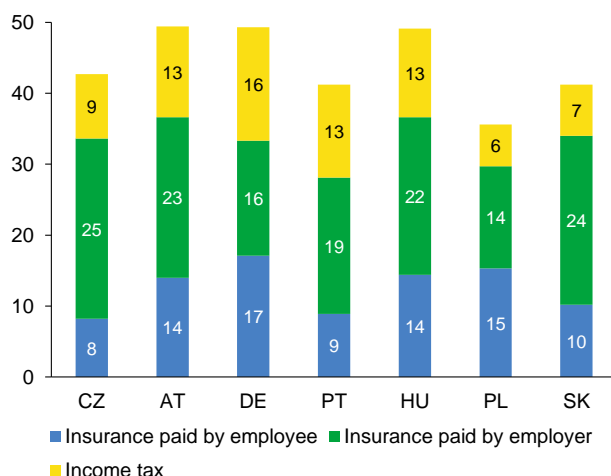
Source: OECD (2015).

The real tax burden, i.e. aggregate tax revenues as a percentage of total compensation of
employees, is described by **implicit tax rates** (see Chart 48). Until 2007 the implicit labour
taxation rate in the Czech Republic had been the highest of all the countries under review, but
in 2008 and 2009 it decreased substantially. This decrease was due to a change in the tax
system (a shift to a flat income tax rate calculated from the "super-gross wage") in 2008 and
to a reduction in health and social insurance rates and the introduction of a maximum
assessment base for both types of insurance in 2009. Since 2010, however, the implicit tax
burden has been edging up again, reaching about 39% in 2012. While lower than in Austria,

taxation in the Czech Republic is still considerably higher than in Portugal, Poland, Slovenia and Slovakia and slightly higher than in Germany. In 2012 the implicit tax rate increased in Hungary, where implicit labour taxation thus became slightly higher than that in the Czech Republic.

Chart 48: Implicit labour taxation rates

(%)
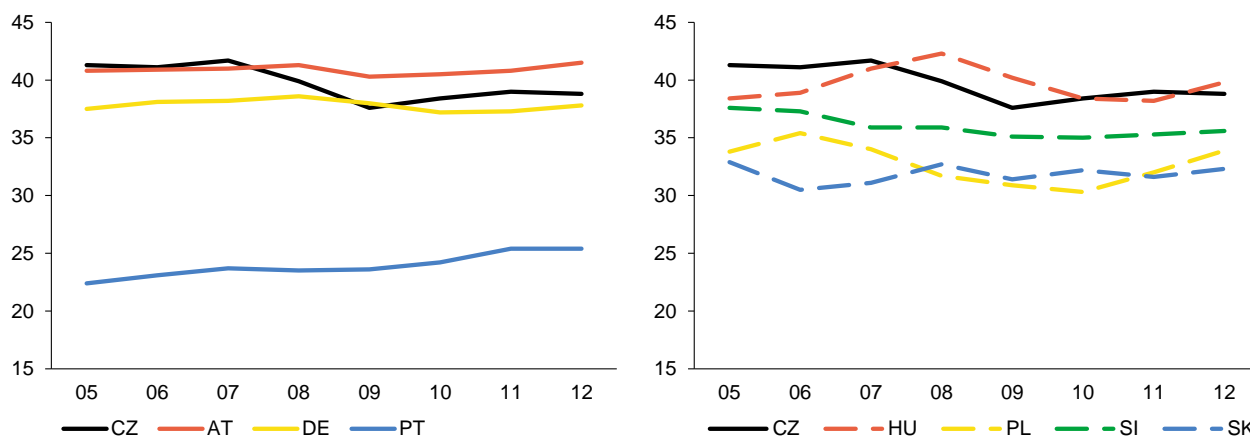
Note: The implicit taxation rate expresses aggregate tax revenues (related to the costs of the production factor of labour) as a percentage of total compensation of employees. More recent data are not available.

Source: Eurostat (2014).

Work-incentive indicators

Taxes affect not only labour demand, but also labour supply. This is because they influence, in combination with social benefits, the net income of households and thereby the motivation of unemployed or inactive persons to enter employment. This motivation is measured using the net replacement rate. This is defined as the ratio of net household income when the person under consideration is jobless to that when the same person has a job, and it thus indirectly measures the financial incentive for the unemployed to seek work. **Net replacement rates** can be compared for short-term and long-term unemployment and for different types of households (see Table 31).

As in previous years, the financial incentives to accept a job in the initial phase of unemployment among childless individuals in 2013 were highest in Austria (the lowest replacement rate), followed by Germany and Slovakia. In the Czech Republic, by contrast, the incentive to seek work was again the lowest, with the net replacement rate being unchanged from previous years. In the case of long-term unemployment of childless individuals, the settings of benefits and taxes in Austria, the Czech Republic and Germany continue to provide the lowest incentive to work, whereas the highest incentive is in Portugal, where a long-term unemployed childless individual receives only 23% of their potential employment income, less than one-half compared to the Czech Republic. The net replacement rates for long-term unemployed childless individuals in Slovakia, Poland and Hungary were only slightly higher than in Portugal.

There are also marked differences in the support provided to families with small children in the event of long-term unemployment. As in the initial phase of unemployment, the support provided to families with children is highest in Austria, where the net replacement rate has been close to 100% for several years. In the Czech Republic, the net replacement rate for this

category of families was about 75% in 2013, slightly lower than in Germany and Poland, but markedly higher than in Portugal, Hungary and Slovakia.

Table 31: Net replacement rates

	Initial phase of unemployment[a]								Long-term unemployment[b]							
	Individuals without children				Family (2 children)[c]				Individuals without children				Family (2 children)[c]			
	2005	2011	2012	2013	2005	2011	2012	2013	2005	2011	2012	2013	2005	2011	2012	2013
CZ	56	77	77	77	78	75	74	74	45	48	49	49	78	74	76	76
AT	55	55	55	55	82	97	98	97	53	53	54	53	82	97	98	97
DE	60	59	59	59	92	91	92	92	51	47	48	49	81	77	79	80
PT	77	75	75	75	85	76	76	78	25	25	24	23	74	68	52	49
HU	52	71	69	68	68	78	76	78	27	31	26	25	63	44	39	38
PL	76	73	74	72	70	70	70	68	43	32	32	33	92	67	65	81
SK	61	62	62	62	57	58	57	57	27	27	27	26	54	58	56	56

Note: The ratio of net household income when the breadwinner is unemployed and employed (data in %). Income from employment of the breadwinner at 67% of the average wage. [a] Unemployed persons entitled to unemployment benefits. [b] Unemployed persons after five years. [c] The other adult is economically inactive, children of 4 and 6 years of age.

Source: OECD tax benefit models.

No major legislative changes affecting the incentive to work were made in the Czech Republic in 2014. In the event of termination of an employment contract by the employee or by agreement with the employer, the unemployment benefit stayed at 45% of the previous net wage over the entire support period.[137] Additional income, even from "non-clashing" employment, is still prohibited. This is aimed at increasing the incentive to seek "proper" work.[138] No changes were made in 2014 to the tax discount for children, the minimum living level and the minimum subsistence level affecting claims for some other social benefits (child allowance, maternity allowance and social assistance benefits).

An analysis of individual data from the household budget surveys in 2013 and 2014 revealed a marked difference in the change in the nominal income of a household with an unemployed person or a caregiver compared to a household with economically active persons. In the case of households with economically active members, nominal income increased between 2013 and 2014, mainly on account of higher nominal wages. This was true across the entire wage distribution with the exception of the lowest-income households (see Chart 49). In the case of households with an unemployed person, a person receiving parental allowance or a person caring for a disabled person, nominal income increased mainly in the right-hand part of the wage distribution calculated per economically active person. The stronger wage growth in this segment was partly offset by a drop in both allowances (parental allowance and child allowances) and benefits. By contrast, the increase in wages was very muted for this type of household with below-average income.

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[137] The support period depends on the employee's age: five months up to 50 years of age, eight months between 50 and 55 years of age, and eleven months over 55 years of age.
[138] In the case of "non-clashing" employment, unemployed people were allowed to earn up to 50% of the minimum wage (i.e. CZK 4,000) on top of their unemployment benefit. However, since 2011 it has not been possible to combine unemployment benefits with "non-clashing" employment.

Chart 49: Change in household income by type of household and total income per economically active household member

(2014 compared to 2013, CZK)

Households with economically active members

Households with an unemployed member or caregiver
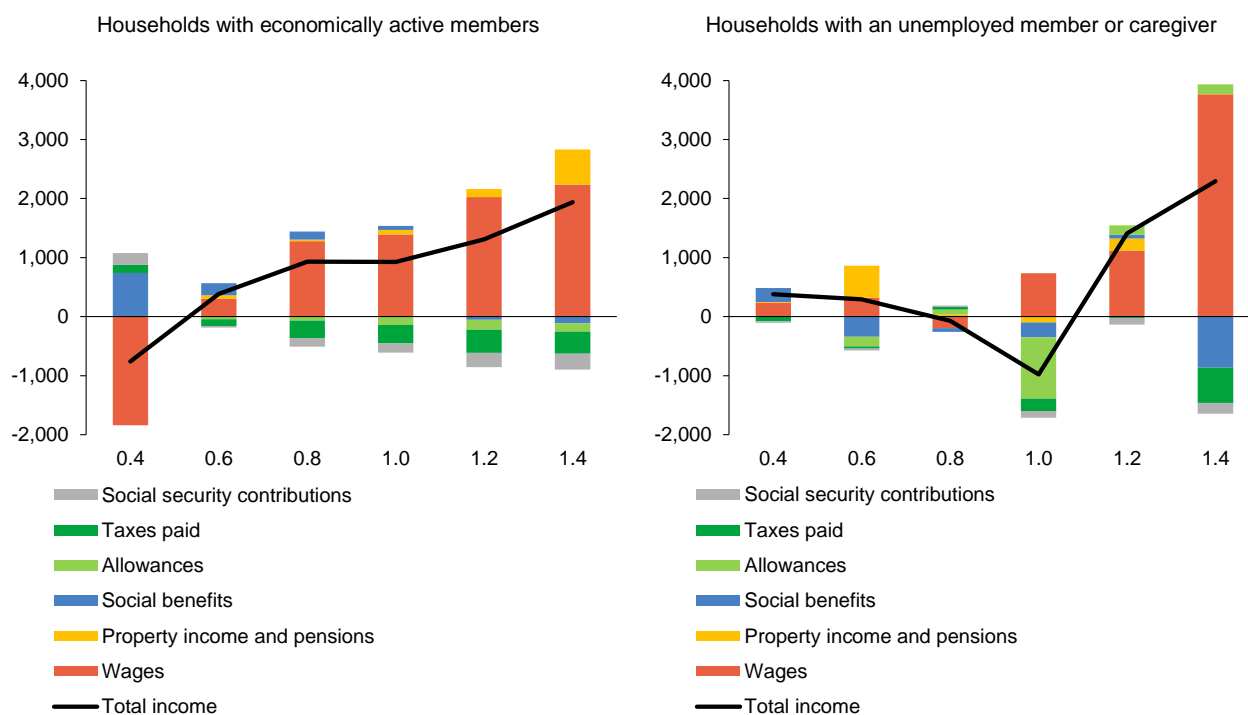
Note: The horizontal axis consists of the wage distribution calculated as the ratio of total household income per economically active member of the household to the gross average wage in 2014. The vertical axis shows the absolute change in household income from 2014 to 2013.

Source: Household budget survey, CNB calculations.

The positive income growth for the lowest-income households with an unemployed member or a caregiver (in the right-hand part of the chart) by comparison with households with economically active members (in the left-hand part of the chart) does not increase the incentive to work, i.e. to move into the category of households with economically active members. By contrast, in the case of average-income households with an unemployed member or a caregiver, the decline in total income due to a marked negative annual contribution of benefits may increase this incentive compared to the increase in income in households with economically active members. As for high-income households, the observed rise in income is roughly the same for both groups, so it has a negligible effect on the incentive to work.

To sum up, the ratio of the minimum wage to the average wage increased slightly, but it is one of the lowest among the countries under comparison and probably has not had a significant negative impact on the labour market so far. Labour market regulation in the Czech Republic is comparable to that in European countries, which are, however, among the least flexible by international comparison. Protection of regular employment is still relatively high, while temporary jobs are protected slightly less than in the other countries. Labour taxation rose slightly in the Czech Republic and its implicit rate is the third highest among the monitored countries behind Austria and Hungary. The incentives to work arising from the configuration of taxes and benefits remain relatively low, especially for the initial phase of unemployment of childless individuals, and compared to some countries also for long-term unemployed families with children.

2.2.5 Rate of adjustment of real wage growth to the business cycle

The flexibility with which wages respond to the business cycle is an indicator of an economy's ability to adjust to asymmetric shocks. In countries with weaker or slower wage adjustment, asymmetric shocks have a stronger impact on the real economy in the absence of independent monetary policy. On the other hand, the effects of real shocks on wage inflation are weaker in economies with such inflexible labour markets.

The following analysis examines the relationships (correlations) between the business cycle (as measured by the output gap), the unemployment rate and cyclical wage developments. The results (see Table 32) indicate significant and robust correlations between the cyclical components of output and unemployment, as well as a robust correlation between the cyclical components of output and wages. On the other hand, the hypothesis that a higher correlation between wages and the business cycle leads to a lower correlation between unemployment and the business cycle, is not proven: instead, it seems that there is no systematic relationship between the two correlations.

The results show that there are no significant differences between the countries under comparison in the sensitivity of the analysed variables to the business cycle. Although we cannot say that the countries under comparison are fully aligned in these characteristics, the analysis does not find a systemic difference between old euro area members, new members and non-euro area countries.[139]

The Czech Republic is around the average among the countries under review in terms of the strength of the negative correlation between output and unemployment and that of the positive correlation between output and wages.

Table 32: Correlations of the cyclical components of output, unemployment and wages

	Output and wages	Output and unemployment
CZ	0.63 **	-0.76 ***
AT	0.69 ***	-0.77 ***
DE	0.64 **	-0.73 ***
PT	0.75 ***	-0.79 ***
HU	0.67 ***	-0.62 ***
PL	0.61 *	-0.60 ***
SI	0.52 *	-0.84 ***
SK	0.70 ***	-0.82 ***
EA	0.73 ***	-0.91 ***

Note: Statistical significance: *** significance at 1%, ** significance at 5%, * significance at 10%.

Source: Eurostat, CNB calculations.

2.3 PRODUCT MARKET FLEXIBILITY

2.3.1 Administrative barriers to entrepreneurship

High **business start-up costs and barriers** and **complicated administrative regulations** governing entrepreneurship reduce competitive pressures, productivity and thus flexibility on

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[139] These conclusions are qualitatively robust to the method used to estimate the cyclical components (the Hodrick-Prescott filter instead of the Christiano-Fitzgerald filter) and remain valid even if we use sensitivity (elasticity) instead of correlation.

product markets. In the long run, this also has a negative impact on job creation and employment.[140] Lower product market flexibility limits adjustment mechanisms in the event of an asymmetric shock.

In a World Bank assessment forming part of a regular survey of conditions for doing business, the Czech Republic ranked 36th out of the total of 189 countries assessed according to data for 2015. This means a deterioration of three places compared to 2014. The World Bank data indicate that the Czech Republic saw only a slight improvement in the area of paying taxes, although this has long been a weakness in the Czech economy.[141] The scores for trading across borders and enforcing contracts were unchanged, but for most of the other areas under assessment the Czech Republic's ranking worsened by a few places. As regards the conditions for starting a business (see Table 33), the Czech Republic's ranking fell slightly compared to the previous year and is the weakest behind Germany and Austria among the countries under comparison. Starting a business involves a significantly higher number of procedures and hours (at the Trade Licensing Office and the Commercial Register) compared to most of the other countries listed. The cost of starting a business is also above average. The closing a business parameter worsened slightly as well, although the Czech Republic in a generally much better position in this case. The conditions for closing a business in the Czech Republic are less favourable than in Germany and Portugal, but much better than in the new EU Member States under comparison except for Slovenia.

Table 33: Conditions for starting and closing a business

	Starting a business					Closing a business				
	2011	**2012**	**2013**	**2014**	**2015**	**2011**	**2012**	**2013**	**2014**	**2015**
CZ	138	140	110	90	93	33	35	20	20	22
AT	134	133	113	101	106	21	12	16	16	18
DE	98	104	103	110	107	36	19	3	3	3
PT	26	25	10	10	13	22	22	11	9	8
HU	39	54	24	56	55	66	69	64	64	65
PL	126	124	80	80	85	87	37	30	31	32
SI	28	33	14	14	18	39	41	39	41	12
SK	76	80	83	71	68	35	38	28	30	33

Note: Country rankings for the conditions for starting and closing a business. Starting a business: number of procedures, time (days), cost and minimum capital requirements in % of income per capita. Closing a business: time (years), cost in % of total assets and recovery rate in cents on the dollar. The rankings for 2011 and 2012 are based on the Doing Business methodology valid until 2013 and the ranking for 2013 on the methodology valid since 2014. The figures for 2014 were recalculated to reflect methodological changes and revisions to the data and are consistent with 2015. More information can be found at http://www.doingbusiness.org/methodology/methodology-note.

Source: World Bank (2015).

Another view of **barriers to growth and competitiveness** is offered by the Global Competitiveness Report published by the World Economic Forum (WEF). It assesses competitiveness on a large sample of countries using the **Global Competitiveness Index** (GCI). The index is composed of 12 main pillars grouped into three main categories (factors, innovation and efficiency) that influence a country's competitiveness and hence also its productivity and economic levels. The Czech Republic ranks 31st out of 140 countries in the period 2015–2016.[142] As with the full GCI dataset, for the following sample of countries under comparison there is a marked correlation between a country's economic level (as measured by

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[140] Nicoletti and Scarpetta (2004).

[141] The Czech Republic ranked 122nd for paying taxes. This is the second most problematic area behind dealing with construction permits (127th place).

[142] In the period 2006–2007 the Czech Republic ranked 31st out of 122 countries.

GDP) and the index value (on a scale of 1 to 7, where a higher index value means higher competitiveness).[143]

Looking at the overall index and its categories and pillars for the sample of countries in the period 2015–2016 (see Chart 50), the Czech Republic is in a relatively good position in the growth factors category, especially in the health, macroeconomic environment and education pillars. Compared to the non-euro area countries under comparison, it also has a better infrastructure score. By contrast, its biggest weakness is the quality of institutions, which, however, is close to the average of the countries under comparison; worldwide, the Czech Republic ranked down in 57th place for this parameter. This, however, is a considerable improvement on previous years. Within this sub-pillar, the Czech Republic scored particularly low in government regulation, public trust in politicians, favouritism in decisions of government officials and diversion of public funds. As regards the pillars influencing economic efficiency, the Czech Republic has a relatively good position in technological readiness, financial market development and labour market efficiency. In contrast, it lags well behind Austria and especially Germany in innovation.[144] Compared to the period 2006–2007, the Czech Republic's ranking improved most of all in technological readiness and infrastructure, but worsened in innovation and labour market efficiency. However, similar changes were also recorded for other countries, so the Czech Republic's relative position was unchanged.

Chart 50: Global Competitiveness Index – scores by pillars and their categories
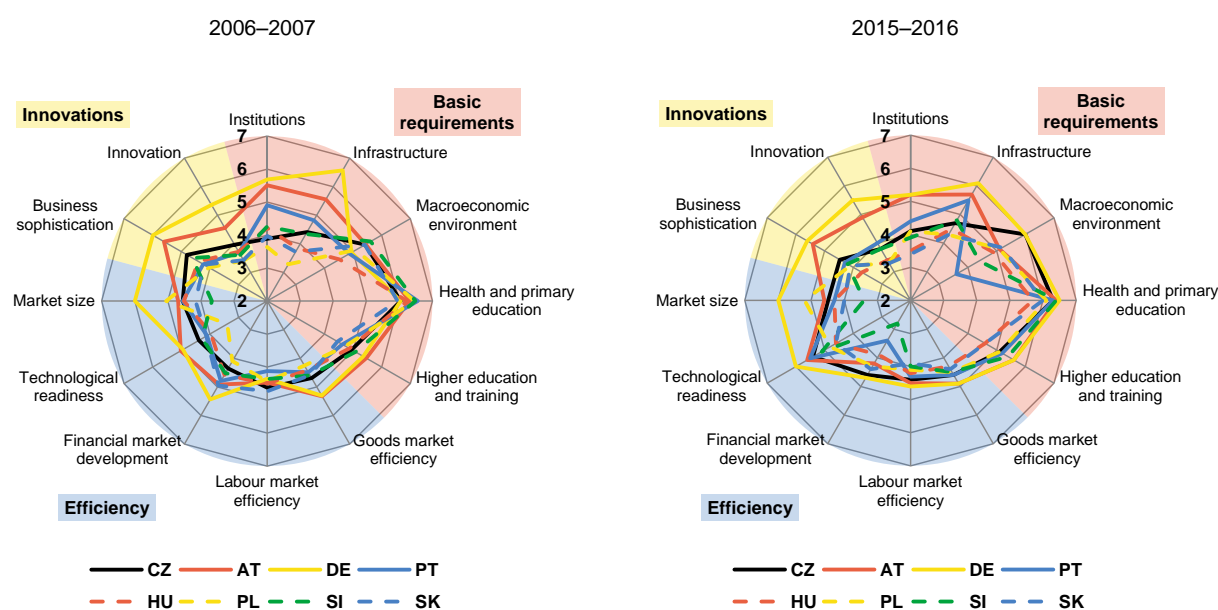
Source: World Economic Forum (2015).

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[143] The methodology is described at http://reports.weforum.org/global-competitiveness-report-2014-2015/methodology/.
[144] These two countries, however, are at the top of the world ranking for innovation, while the Czech Republic's innovation ranking is consistent with its position at the lower end of the top 40 as measured by the overall index. The remaining countries under review ranked similarly in terms of innovation and the overall index.

Chart 51: Global Competitiveness Index – labour market scores

2006–2007

2015–2016
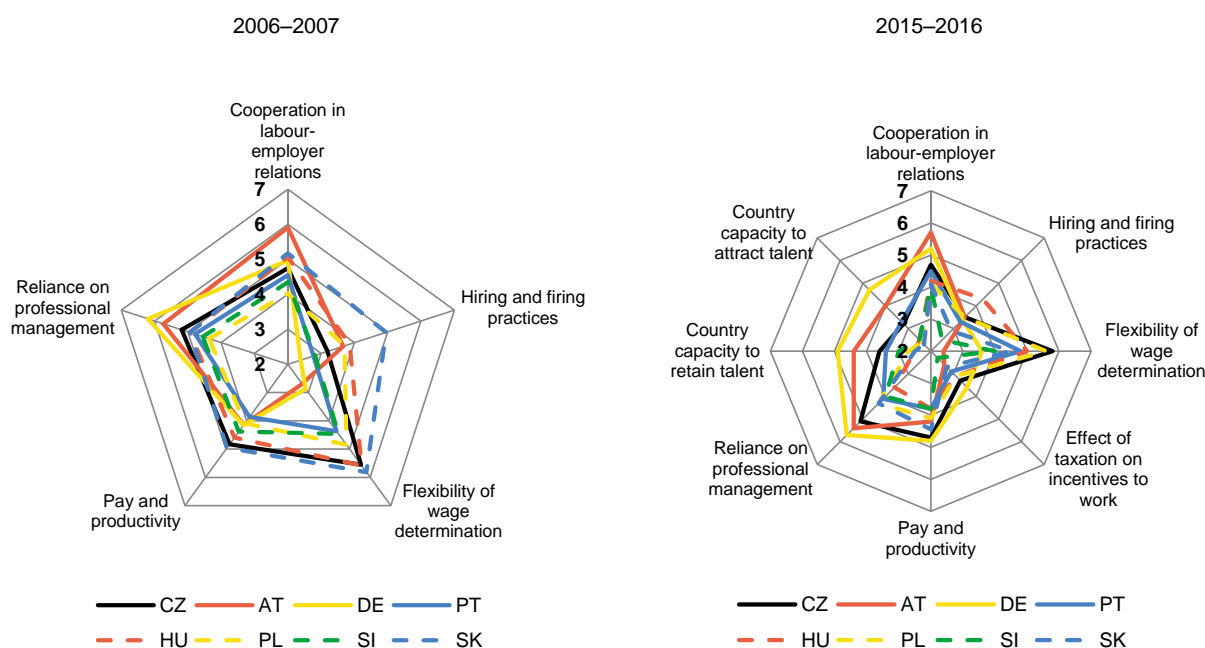
Source: World Economic Forum (2015).

International competitiveness on the labour market can be measured within the GCI by looking at the **structure of the labour market pillar** (Chart 51). Of the countries under comparison, the Czech Republic has long been among the most flexible in wage bargaining, pay and productivity and to a large extent also labour-employer relations. All those categories are crucial as regards inflationary pressures and monetary policy implementation. In these categories, the Czech Republic is on average more competitive than Germany, which is the largest and – for the Czech Republic – the most important euro area economy. By contrast, its weakness is its low scores for attracting and retaining talent, although the same goes for the other countries under comparison except Germany and Austria. Competitiveness is also hindered by relatively high redundancy costs and by the second lowest score for female participation in the labour force.[145]

2.3.2 Tax burden on businesses

The tax burden on businesses significantly affects product market flexibility, since, given the high international mobility of capital, the taxation rate can be one of the deciding factors for investment allocation. The corporate tax rate is assessed by means of the statutory corporate income tax rate and the implicit corporate tax rate.

The Czech Republic has been applying a **corporate income tax rate** of 19% since 2010. Together with Slovenia, Poland and, since 2015, Hungary, this is one of the lowest figures among the countries under comparison (see Table 34). The tax burden on businesses has been flat in most of the countries under comparison over the last six years. Germany and Portugal have the highest statutory corporate taxation among the countries under comparison. Taxes were increased sharply in Slovakia in 2013.

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[145] These two indicators are not included in Chart 51 because they use measurement units other than the 1–7 scale (redundancy costs are measured in weeks of salary and female participation is measured as the ratio of women to men in the labour force).

Table 34: Highest statutory corporate income tax rates

(%)

	2005	2009	2010	2011	2012	2013	2014	2015	Change (pp)
CZ	26.0	20.0	19.0	19.0	19.0	19.0	19.0	19.0	-7.0
AT	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	0.0
DE	38.7	30.2	30.2	30.2	30.2	30.2	30.2	30.2	-8.5
PT	27.5	26.5	29.0	29.0	31.5	31.5	31.5	29.5	2.0
HU	17.5	21.3	20.6	20.6	20.6	20.6	20.6	19.0	1.5
PL	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	0.0
SI	25.0	21.0	20.0	20.0	18.0	17.0	17.0	17.0	-8.0
SK	19.0	19.0	19.0	19.0	19.0	23.0	22.0	22.0	3.0

Note: Changes in pp for 2005–2015.

Source: Eurostat.

The level of tax rates is a simple indicator of the taxation rate. However, the tax burden is also determined by the tax base, which is affected by depreciation, amortisation and tax exemptions. **Implicit tax rates**, defined as aggregate corporate income tax revenues as a percentage of the potential tax base, are a complementary indicator of the tax rate (see Table 35). Following a decrease in the implicit tax rate in the Czech Republic in 2004–2010 and a stagnation in 2011, this rate rose by 1.2 pp in 2012. Implicit taxation in the Czech Republic is the second highest among the countries under review. In addition to the tax rate, implicit taxation is affected by the tax base and the system of tax exemptions. As a result, a low tax rate does not mean a low tax burden. Higher taxation and administrative costs can thus act as a barrier to flexible reaction of the goods and services market and to the potential absorption of asymmetric shocks in the event of euro adoption even when tax rates themselves are relatively low.

Table 35: Implicit corporate income taxation rate

(%)

	2004	2008	2009	2010	2011	2012	Change (pp)
CZ	27.5	22.0	20.5	19.8	20.2	21.4	-6.1
AT	26.1	25.2	24.1	21.9	22.6	23.9	-2.2
PT	20.1	36.0	21.8	18.2	22.6	20.9	0.8
HU	17.6	19.0	21.0	9.8	8.2	10.6	-7.0
PL	18.7	20.3	15.0	12.5	12.4	13.0	-5.7
SI	23.1	27.0	22.3	22.9	19.6	15.2	-7.9
SK	22.6	21.8	21.8	18.5	17.7	18.2	-4.4

Note: The implicit taxation rate expresses aggregate corporate tax revenues as a percentage of the potential tax base. Changes in pp for 2004–2012. Data on the implicit taxation of corporate income are not available for Germany.

Source: Eurostat.

2.4 THE BANKING SECTOR AND ITS SHOCK-ABSORBING CAPACITY

The condition of the financial sector plays an important role in the economy's ability to absorb economic shocks. This applies above all to its key segment, which in the Czech Republic is the banking sector. This segment accounts for almost 78% of the total assets of Czech financial institutions (excluding the CNB) and the assessment of its condition remains favourable. It displays high profitability and it has further strengthened its capital adequacy and liquidity and

hence also its overall resilience to potential adverse shocks. The banking sector could therefore perform its adjustment and stabilisation mechanism function in the event of euro adoption. Experience from the euro area, however, shows that the resilience of the banking sectors of some countries weakened rapidly following euro adoption. Risks are also linked with the implementation of the banking union project, which the Czech Republic would automatically join upon euro adoption. The reason for the mentioned risks is the transfer of some powers, especially direct supervision of key banks, to the EU level without the transfer of responsibility for the overall condition of the national financial sector. The Single Supervisory Mechanism (SSM) was introduced in November 2014. On entering the euro area, the Czech Republic would also join the Single Resolution Mechanism (SRM) and contribute to the Single Resolution Fund (SRF),[146] whose effectiveness and impacts will only be tested by a future financial crisis.

The Czech banking sector remains profitable even in the low interest rate environment. By international comparison,[147] its profitability, as measured by return on capital and return on assets, significantly exceeds the euro area average (see Chart 52 and Chart 53). The profit of the Czech banking sector consists mainly of stable components such as interest rate income and fee and commission income. The Polish and Slovak banking sectors are also showing good profitability. By contrast, the Hungarian and Portuguese banking sectors recorded the biggest year-on-year declines in profitability among the countries under comparison.

Chart 52: Return on equity (RoE)
(%)
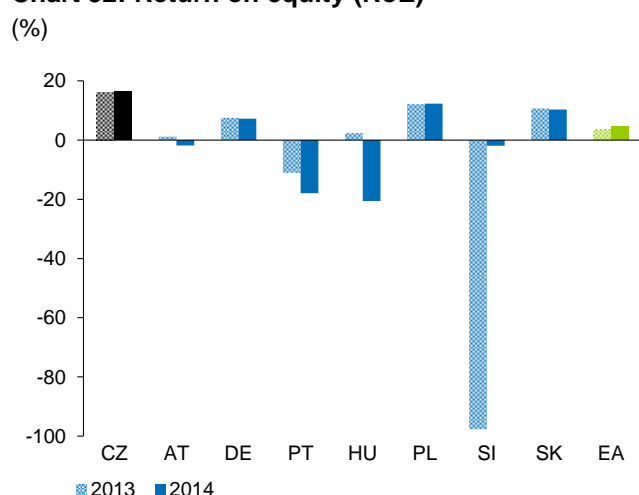
Note: EA represents the GDP-weighted average of the euro area member countries.
Source: IMF FSI.

Chart 53: Return on assets (RoA)
(%)
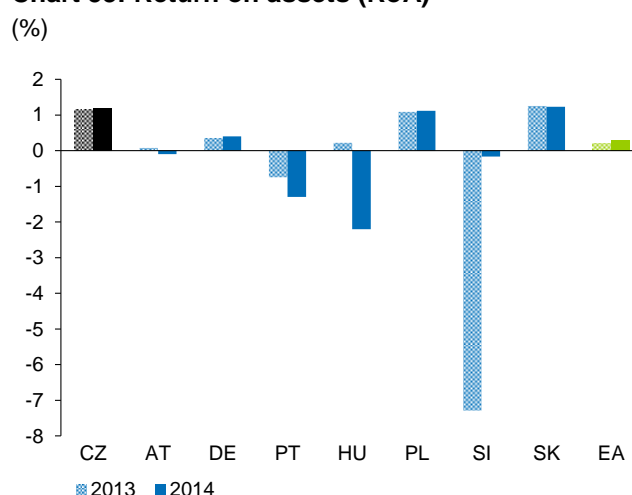
Note: EA represents the GDP-weighted average of the euro area member countries.
Source: IMF FSI.

Credit risk in the Czech banking sector, as expressed by the ratio of non-performing loans (NPLs) to total loans, has been fluctuating around 6% for the past several years (see Table 36) and is below the euro area average. The ongoing economic growth in the Czech Republic is expected to be positively reflected in the financial condition of individual economic agents and hence also in an improvement in credit risk indicators. A favourable change in trend can already be seen for NPLs to residents. The evolution of credit quality differs across the countries under comparison. While the NPL ratio has already started to decline in most

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[146] Before entering the euro area or voluntarily joining the SSM, Czech banks would contribute to the national resolution fund, and any problems in the banking sector would be resolved using a mechanism based on national legislation.
[147] Data presenting international comparisons are only indicative, as the methods for calculating individual indicators and consolidating can differ across countries (with the exception of non-performing loans, the IMF FSI data for the Czech Republic are always consolidated); moreover, data revisions occur in some cases.

countries, it is still rising in Portugal. Austria has also recorded year-on-year growth in the NPL ratio, but this indicator is relatively low there.

The resilience of the Czech banking sector to adverse shocks is based on strong capitalisation (see Chart 54), consisting mainly of retained earnings. The most significant year-on-year increase in the total capital ratio in 2014 – of 4.4 pp to 18.0% – was recorded by Slovenia. The capital ratio of the Czech banking sector increased by 0.5 pp to 17.0%, while the euro area capital ratio rose by 0.3 pp year on year to 16.5%. The Czech banking sector also displays higher capital quality than the euro area banking sector, as Czech banks hold a major part of their capital in the form of Common Equity Tier 1. Thanks to their sufficient capitalisation and operating profits, domestic banks should be able to withstand potential large credit losses, as also evidenced by the latest banking sector stress tests performed by the CNB and published in Financial Stability Report 2014/2015.

Table 36: Non-performing loans

(% of total bank loans)

	2012	2013	2014
CZ	6.0	5.9	6.0
AT	2.8	2.9	3.5
DE	2.9	2.7	2.3
PT	9.8	10.6	11.9
HU	16.0	16.8	15.6
PL	5.2	5.0	4.8
SI	15.2	13.3	11.7
SK	5.2	5.1	5.3
EA	6.4	7.3	7.1
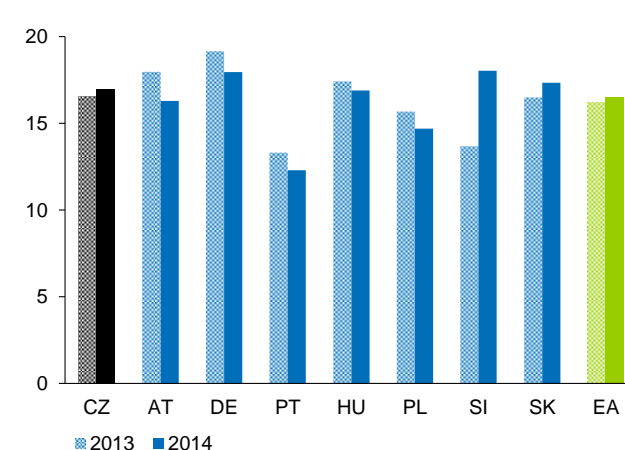
Note: EA represents the GDP-weighted average of the euro area member countries.

Source: IMF FSI, CNB.

Chart 54: Capital ratios

(%)

2013 2014

Note: The chart shows the ratio of bank capital to risk-weight assets. EA represents the GDP-weighted average of the euro area member countries.

Source: IMF FSI.

Most domestic banks focus on a conservative business model that involves accepting deposits and providing loans to households and non-financial corporations. The ratio of deposits to loans to residents in the Czech banking sector is 143%, which, despite a year-on-year drop of 3 pp, is the highest figure among all the countries under review (see Chart 55). Deposits by residents in the domestic currency account for almost 86% of total deposits, and roughly 80% of loans to residents are in the domestic currency.

The Czech banking sector is not dependent on funds from abroad and, despite a year-on-year decrease, its net external position remained positive, reaching 2.8% of GDP at the end of 2014 (see Chart 56). Of the countries under comparison, Austria and Germany have the highest positive net external banking sector positions. Czech banks' exposure to highly indebted euro area countries (not only to governments, but also to private sectors) is low.

Chart 55: Ratios of deposits to loans in selected EU countries

(%)
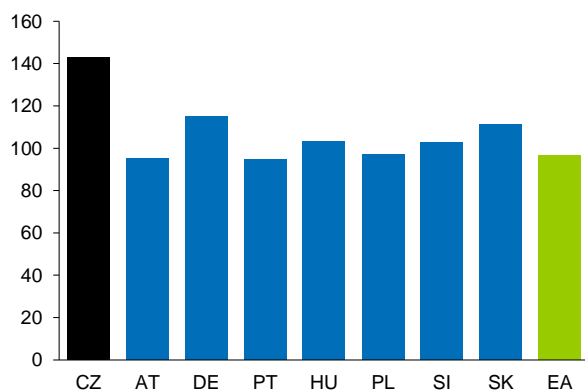
Note: Data as at the end of 2014; deposits/loans to residents. EA represents the euro area.

Source: ECB.

Chart 56: Net external position of banking sector

(net external assets in % of GDP, 2014)
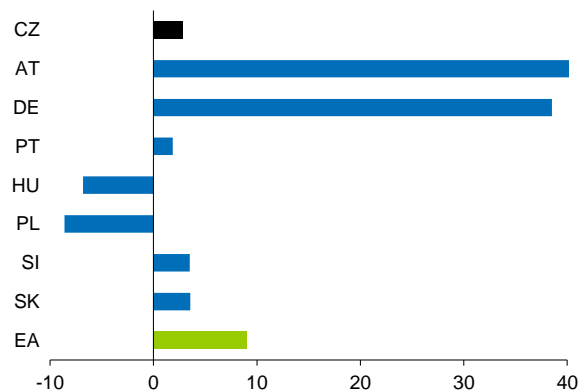
Source: IMF IFS, central banks.

To sum up, the resilience of the Czech banking sector to adverse shocks is high by international comparison and has further increased over the last year. The excess of loans over deposits and the low indebtedness of the private sector by international comparison preserve room for banks to further expand their lending while maintaining sufficiently high liquid assets. Thus, the link of domestic banks to the euro area banking sector is due mainly to the foreign ownership structure of the domestic banking sector.[148] The risks to the Czech banking sector include the low interest rate environment, easier credit standards and increased concentration of sovereign exposures. For the European banking sector, there are persisting risks related to weaker demand and, as in the Czech Republic, to the environment of very low interest rates.

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[148] At the end of 2014, foreign owners directly or indirectly controlled 91.8% of the Czech banking sector's assets.

3   SUMMARY OF RESULTS OF ANALYSES

Analysis Method / Category	Section	Indicator value available as of 31 July 2015							Commentary
		2005	2009	2010	2011	2012	2013	2014	

Economic alignment of euro area countries

Convergence of real and nominal variables in the euro area									
GDP per capita	D 1.1	divg.	con.	stability			slight divg.		Following convergence of GDP per capita levels during crisis, differences stabilised in 2010 but have been rising again since 2013.
GDP growth	D 1.1	stab.	divergence		stability		con.		Following divergence in 2009–2010, GDP growth rates stabilised and have been converging again since 2013.
Unemployment	D 1.1	con.	divergence				stab.		Divergence in unemployment rate peaked in 2013. However, marked difference persists: Germany has lower rate than before crisis, while rate in Greece and Spain exceeds 20%.
Inflation rate	D 1.1	con.	divg.	convergence					Temporarily higher misalignment in inflation rates during crisis has been falling again since 2011. Inflation is currently well below ECB's definition of price stability in all euro area countries. Some countries recorded deflation at start of this year. Low or even negative levels of inflation pose risk to further real convergence and debt sustainability of euro area countries.
Long-term interest rates	D 1.1	con.		strong divergence			con.	divg.	Strong divergence of long-term interest rates started in late 2009; differences declined visibly between late 2012 and mid-2014, then increased somewhat again.
Fiscal positions of euro area countries									
Number of countries not compliant with SGP deficit criterion	D 1.2	5	15	16	13	12	7	9	Sizeable crisis-related increase gradually subsiding. However, number of countries above 3% remains high.

Cyclical and structural alignment

Direct alignment indicators

Real economic convergence									
GDP per capita, PPP, EA=100	1.1.1	73.8	77.2	75.2	76.6	76.5	77.2	78.8	Convergence process resumed in 2013. Indicator exceeds pre-crisis level and is above levels of PT, HU, SI, SK and PL.
Price level of GDP, EA=100	1.1.1	56.2	66.2	69.8	69.9	68.5	66.1	62.8	Indicator slightly exceeds pre-crisis level, but lags well behind AT and DE, but also PT and SI, and also moderately behind SK.
Real exchange rate against euro, 2004=100	1.1.1	106	124	130	133	131	127	120	Real rate of appreciation 1.8% a year on average so far, but real exchange rate has depreciated on average since start of crisis. Further real appreciation of koruna against euro can be expected going forward, but at much slower rate than before crisis.

Analysis Method / Category		Section	Indicator value available as of 31 July 2015							Commentary
			2005	2009	2010	2011	2012	2013	2014	
3M real interest rates		1.1.1	0.4	1.6	0.1	-0.9	-2.4	-0.9	-0.1	Relatively low real rates mean lower need for adjustment after euro adoption. 3M real interest rates would reach (-2.0:0.5) over next five years.
Correlation coefficients of real economic activity										
GDP 2005 Q1–2015 Q1	t	1.1.2	0.85**							Czech Republic ranks among countries with highest GDP correlation even when adjusted for effect of crisis.
	t-1	1.1.2	0.69**							
	t-2	1.1.2	0.43**							
GDP adjusted for crisis	t	1.1.2	0.69**							
	t-1	1.1.2	0.64**							
	t-2	1.1.2	0.51**							
IPI 2005 Q1–2015 Q1	t	1.1.2	0.35**							Czech Republic ranks alongside AT, SI and SK among countries with lowest correlation, especially when adjusted for effect of crisis, due to much faster growth of industrial output than in euro area after 2013.
	t-1	1.1.2	0.12							
	t-2	1.1.2	0.27**							
	t-3	1.1.2	0.17*							
IPI adjusted for crisis	t	1.1.2	0.19**							
	t-1	1.1.2	-0.05							
	t-2	1.1.2	0.20**							
	t-3	1.1.2	0.10							
Czech exports to EA vs. EA GDP IPI 2005 Q1–2015 Q1	t	1.1.2	0.72**							High positive correlation between euro area GDP and Czech exports to euro area member countries; indicator attains high levels even when adjusted for effect of crisis.
	t-1	1.1.2	0.45**							
	t-2	1.1.2	0.19							
Czech exports to EA vs. EA GDP adjusted for crisis	t	1.1.2	0.60**							
	t-1	1.1.2	0.31*							
	t-2	1.1.2	0.17							

Analysis Method / Category	Section	2005	2009	2010	2011	2012	2013	2014	Commentary
Correlation of the cyclical component of unemployment									
Unemployment gap	1.1.3	0.7	0.4	1.3	1.2	1.0	1.0	0.9	Unemployment gap had been opening into negative values since 2006 thanks to economic growth, but it closed and turned positive again after crisis began. Has recently started to close again.
Unemployment gap correlation in Czech Republic and euro area (1998–2014)	1.1.3	0.70**							Correlation between unemployment gap in Czech Republic and euro area is relatively high.
Unemployment gap concordance in Czech Republic and euro area (1998–2014)	1.1.3	0.82							Concordance ranks among highest among countries under review.

Analysis Method / Category	Section	Indicator value available as of 31 July 2015							Commentary
		2005	2009	2010	2011	2012	2013	2014	
Structural similarity of the Czech economy and EA economy									
Landesmann index	1.1.4	0.07	0.10	0.10	0.11	0.10	0.10	0.10	Czech Republic has second-highest structural dissimilarity among countries compared behind PL, owing to higher share of industry and lower share of services in economy.
Interest rate convergence									
Differences in three-month and ten-year interest rates vis-à-vis euro area.	1.1.5	Sustained high alignment							Sustained low interest rate differentials increased slightly in 2012 and then decreased again. Lower than in HU and PL.
Alignment of exchange rates to euro									
Bivariate GARCH	1.1.6	high corr.	slight fall in corr.	strong correlation, short-term fall after 11/2013					Correlation of exchange rates of koruna and euro against dollar is highest among countries under comparison; alignment temporarily decreased only in connection with financial crisis and then koruna weakening in late 2013. By contrast, correlation of exchange rates has been boosted since then by Czech National Bank's exchange rate commitment.
Exchange rate volatility (exchange rate against euro, annualised, in %)									
Historical volatility (daily returns for period of six months; value corridors for entire year)	1.1.7	4–6	13–16	6–7	4	7–8	4–7	1–7	Koruna weakening in late 2013 following Czech National Bank's adoption of exchange rate commitment caused one-off rise in historical volatility, but exchange rate of koruna against euro has since been exceptionally stable.
Implied volatility (options; value corridors for entire year)	1.1.7	5–7	9–19	6–10	6–7	8–10	4–7	3–5	
Integration of the economy with the euro area									
Exports, %	1.1.8	69.0	67.6	66.7	66.1	64.0	63.4	63.6	Relatively high level of trade links. Slightly falling trend in exports reflects search for sales opportunities in emerging markets.
Imports, %	1.1.8	68.4	63.8	60.7	60.2	60.3	60.8	60.8	
Inflow of direct investment, % of GDP (stock)	1.1.8	-	57.4	60.5	56.7	64.0	62.8	-	Sustained high level of ownership links, particularly on FDI inflow side.
Outflow of direct investment, % of GDP (stock)	1.1.8	-	11.4	13.6	13.4	15.7	19.0	-	
Intra-industry trade, Grubel-Lloyd index	1.1.8	0.53	0.58	0.58	0.57	0.57	0.57	0.57	High share of intra-industry trade (only DE has higher share; AT has identical share).

Analysis Method / Category	Section	Indicator value available as of 31 July 2015							Commentary
		2005	2009	2010	2011	2012	2013	2014	

Similarity of monetary policy transmission

Financial sector									
Financial system assets (% of GDP)	121	-	148	151	157	166	174	174	Ratios of financial system assets to GDP and private sector debt to GDP are substantially lower than in AT, DE and PT and slightly higher than in PL and SK.
Private sector debt (% of GDP)	1.2.1	-	54	55	58	59	59	60	

Structure of financial assets and liabilities, transmission of policy rates to client rates									
Structure of financial assets and liabilities of corporations and households	1.2.2	-	-	-	-	-	-	differences	Differences in Czech non-financial corporations sector include high share of trade credits and lower share of total loan debt than in euro area. Czech household sector holds more liquid assets than investment assets compared to euro area.
Effect of monetary policy on client interest rates	1.2.3	similarity							Effect of money and financial market rates on client rates is similar in Czech Republic as in euro area.

Inflation persistence									
Method 1 (non-parametric)	1.2.4	0.79 (2009)	0.81 (2010)	0.81 (2011)	0.81 (2012)	0.86 (2013)	0.86 (2014)	0.88 (2015)	Inflation persistence in Czech Republic is average compared to other countries under review. (Indicator value estimated on time series ending with relevant year.)
Method 2 (sum of AR coefficients, constant mean)	1.2.4	0.82 (2009)	0.91 (2010)	0.81 (2011)	0.84 (2012)	0.85 (2013)	0.81 (2014)	0.90 (2015)	
Method 3 (sum of AR coefficients, time-varying mean)	1.2.4	0.32 (2009)	0.38 (2010)	0.38 (2011)	0.43 (2012)	0.42 (2013)	0.50 (2014)	0.50 (2015)	

Financial market integration									
Money market	1.2.5	-	-0.38	-0.37	-0.38	-0.39	-0.39	-0.39	In recent years alignment level has stabilised in most monitored markets. However, this situation is conditional on active implementation of unconventional monetary policy by central banks.
Foreign exchange market	1.2.5	-	-0.90	-0.88	-0.89	-0.88	-0.86	-0.87	
Bond market	1.2.5	-	-0.69	-0.73	-0.73	-0.74	-0.74	-0.74	
Stock market	1.2.5	-	-0.77	-0.79	-0.80	-0.80	-0.80	-0.80	

Spontaneous euroisation									
Degree of euroisation	1.2.6	low							Use of euro by Czech corporations is consistent with openness of economy. Czech households make minimal use of euro.

Analysis Method / Category	Section	Indicator value available as of 31 July 2015							Commentary
		2005	2009	2010	2011	2012	2013	2014	

Adjustment mechanisms

Fiscal policy

General government balance and debt									
Overall general government balance (% of GDP, ESA 2010) (outturns until 2014, CNB forecast from 2015)	2.1.2	-3.1	-2.7 (2011)	-4.0 (2012)	-1.3 (2013)	-1.9 (2014)	-1.3 (2015)	-0.6 (2016)	Significant (but procyclical) consolidation in 2010–2013. Deficit comfortably compliant with Maastricht convergence criterion in recent years.
General government structural balance (% of GDP, ESA 2010, EC methodology) (outturns until 2014, CNB forecast from 2015)	2.1.2	-2.3	-2.9 (2011)	-2.0 (2012)	-0.1 (2013)	-0.4 (2014)	-1.0 (2015)	-0.7 (2016)	Economically restrictive fiscal consolidation in 2010–2013 reduced structural deficit, but fiscal policy easing in 2014–2015 led to moderate rise. Deficit will decline only gradually according to CNB prediction.
Government debt (% of GDP, ESA 2010) (outturns until 2014, CNB forecast from 2015)	2.1.2	28.0	39.9 (2011)	44.7 (2012)	45.2 (2013)	42.7 (2014)	40.9 (2015)	39.5 (2016)	Government debt has long been well below reference value of 60% of GDP, and has even shown slight downward trend since 2014. Its sustainability remains risk.

Labour market flexibility

Unemployment and internal labour market flexibility									
Long-term unemployment rate, %	1.2.2	4.2	2.0	3.0	2.7	3.0	3.0	2.7	Long-term unemployment rate is traditionally one of lowest among countries under review, with only AT and DE at lower levels.
Regional coefficient of variation in unemployment rate (at regional level, NUTS III)	1.2.2	47	35	32	28	34	32	30	Regional differences in unemployment rate gradually decreasing since 2013 after increase in 2012.
Internal migration (per 1,000 inhabitants)	2.2.1	21	22	23	22	22	22	23	Internal migration lower than in AT, DE and SI.

Structural unemployment									
NAIRU structural unemployment rate (%)	2.2.2	7.2	6.4	6.0	5.6	6.1	6.1	5.3	Structural unemployment rate among lowest of countries under comparison, together with AT and DE.

International migration									
Share of foreign nationals in population (%)	2.2.3	1.9	3.9	4.0	4.0	4.0	4.0	4.1	Share of foreign nationals in population flat at relatively low levels in recent years.

Analysis Method / Category	Section	Indicator value available as of 31 July 2015							Commentary
		2005	2009	2010	2011	2012	2013	2014	
Institutional environment									
Minimum wage as % of average wage	2.2.4	39.1	34.3	33.3	32.4	31.6	32.6	33.0	Indicator had been decreasing since 2005 but increased slightly in 2013 and 2014; lowest among countries under comparison. Government plans further increase to 40%.
Overall labour taxation (persons on average wage, %)	2.2.4	43.8	-	-	42.5	42.4	42.4	42.6	Overall labour taxation in Czech Republic rose slightly in 2014. At average wage level it is higher than in PT, PL and SK, but lower than in DE, AT and HU.
Overall labour taxation (persons on two-thirds of average wage, %)	2.2.4	42.1	-	-	39.5	39.3	39.3	39.7	
Ratio of net household income when breadwinner is unemployed / employed (%)	2.2.4	56	-	-	77	77	77	-	Financial incentive to work in case of short-term and long-term unemployment in Czech Republic is low relative to countries under review and absolutely lowest in case of childless unemployed persons.

Rate of adjustment of real wage growth to unemployment rate									
Correlation of cyclical components of output and unemployment	2.2.5	-	-	-	-	-0.94 ***	-0.94 ***	-0.76 ***	Czech Republic ranks among average in terms of strength of negative correlation between output and unemployment.
Correlation of cyclical components of output and wages	2.2.5	-	-	-	-	-0.11	0.56*	0.63*	Czech Republic ranks among average in terms of strength of positive correlation between output and wages.

Product market flexibility

Administrative conditions for business									
Conditions for starting a business (ranking, WB)	231	-	-	138 (2011)	140 (2012)	110 (2013)	90 (2014)	93 (2015)	Conditions in Czech Republic third-worst among countries under comparison, behind DE and AT.
Conditions for closing a business (ranking, WB)	231	-	-	33 (2011)	35 (2012)	20 (2013)	20 (2014)	22 (2015)	Conditions worse than in DE, PT, SI and AT, but better than in other new Member States.

Taxation rate									
Implicit corporate taxation rate	2.3.2	-	20.5	19.8	20.2	21.4	-	-	Implicit tax rates higher than in HU, PL, PT, SK and SI, lower than in AT.

Analysis Method / Category	Section	Indicator value available as of 31 July 2015							Commentary
		2005	2009	2010	2011	2012	2013	2014	

Flexibility and shock-absorbing capacity of banking sector

Macroprudential indicators of banking sector									
Return on Tier 1, on consolidated basis, %	2.4	-	26.4	19.7	18.3	20.4	16.2	16.5	Profitability of banking sector as measured by return on capital and assets is high by comparison with countries under review.
Return on assets, on consolidated basis, %	2.4	-	1.5	1.3	1.2	1.4	1.2	1.2	
Non-performing loans/total loans, %	2.4	-	5.2	6.2	6.0	6.0	5.9	6.0	NPL ratio has been steady at low levels in recent years.
Capital ratio, on consolidated basis, %	2.4	-	14.0	15.3	15.0	15.6	16.5	17.0	Capital ratio at high levels comparable with other countries under review.
Deposit-to-loan ratio, in relation to residents, %	2.4	-	134	134	134	141	147	143	Sufficient deposit financing sources ensure relative independence of Czech banks on both Czech interbank market and foreign financial markets.
Net external position of banking sector, %	2.4	-	6.2	5.7	5.0	7.5	5.1	2.8	Net external position of banking sector has long been positive, although it has been decreasing in recent years.

F   METHODOLOGICAL PART

D   *Economic alignment of euro area countries*

The economic alignment of the euro area countries was analysed using simple descriptive statistics of macroeconomic fundamentals – GDP per capita, real GDP growth, unemployment, the inflation rate and long-term interest rates. The individual descriptive statistics were calculated across countries, i.e. with no weight adjustment for the size of the given economy or the population of the given country. In addition to unweighted values, the charts show values for the euro area as a whole.

In the charts, therefore, the standard deviation at time t is calculated using the formula

$$\sigma_t = \sqrt{\frac{\sum_{i=1}^{n}(x_{i,t} - \overline{x_t})^2}{(n-1)}}$$, where $x_{i,t}$ is the value of the macroeconomic variable for country i,

$$\overline{x_t} = \frac{\sum_{i=1}^{n} x_{i,t}}{n}$$ is the arithmetic (unweighted) mean of the variable across countries at time t and

n is the number of countries under review. In addition to the standard deviation and the mean, the median is analysed. It indicates the value of the variable lying in the middle of the set sorted by magnitude. This means that one-half of the countries have values above the median.

The relative alignment of the variables in the euro area (see Chart 8) is depicted using their normalised standard deviations. A negative value means that alignment is above the long-term mean.

BOX 1

Cluster analysis divides elements into groups (clusters) based on similarity or distance, i.e. it maximises intra-group homogeneity and inter-group heterogeneity. At the same time, it enables concurrent analysis of multiple indicators without significant statistical assumptions. Cluster analysis can be performed using various algorithms, agglomerative hierarchical clustering being the most commonly used in the literature. The objective is to find the nearest neighbouring element. In the first step, the distances between elements C_i, C_m are defined:

$$d(C_i, C_j) = d_{ij}$$

In the second and subsequent steps, the distances are minimised:

$$d(C_i \cup C_j, C_m) = min\left(d(C_i, C_m), d(C_j, C_m)\right)$$

In Ward's method, clusters with the minimum increase in the total intra-group sum of the squared deviations of the individual values from the cluster average are merged in successive steps. The result is a dendrogram illustrating the arrangement of elements into clusters depending on the squared Euclidean distance. The smallest cluster, with zero distance, is therefore the element itself.

E   Analyses of the Czech Republic's Alignment with the Euro Area

1   CYCLICAL AND STRUCTURAL ALIGNMENT

1.1   DIRECT ALIGNMENT INDICATORS

1.1.1   Real economic convergence

The comparison of GDP per capita at purchasing power parity (PPS – Purchasing Power Standard) and the average price level of GDP is based on Eurostat data. The real exchange rate against the euro is based on the Harmonised Index of Consumer Prices. The average annual rate of real appreciation is calculated as the geometric mean of the appreciation in 2005–2014.

The outlook for future real appreciation for the next five years is based on two alternative panel estimates which link the price level of final consumption of households with GDP at purchasing power parity per capita for 36 European countries between 1995 and 2014 (see also Čihák and Holub, 2003 and 2005).

Model I was estimated using a two-stage least-squares panel method with no fixed or random effects:

$$P_{C,it} = 21.00 + 0.81\ GDP_{PPS,it} + 0.89\ AR(1)_{it},$$

where $P_{C,it}$ is the price level of final consumption of households in country i in year t, $GDP_{PPS,it}$ is the gross domestic product of country i at purchasing power parity per capita in year t (in both cases EA-19 = 100) and $AR(1)_{it}$ is the first-order autoregressive term.

Model II was estimated using the same method, but with fixed effects, which enable us to account for price level differences due to other country-specific characteristics not individually captured by the model. The estimate is as follows:

$$P_{C,it} = 43.60 + FE_i + 0.53\ GDP_{PPS,it} + 0.66\ AR(1)_{it},$$

where FE_i is the fixed effect for country i and the other symbols are the same as in the previous equation.

The simulations of the future pace of equilibrium real exchange rate appreciation take as their starting point the estimates of GDP and the price level for 2015 based on European Commission and Eurostat forecasts for real GDP growth, nominal exchange rates and inflation in the individual countries in that year. They also assume beta-convergence of GDP towards the level of the EA-19 at a rate of 2.5% a year. In the case of Model II, the simulations also account for the statistically significant positive relationship between the individual countries' fixed effects and their GDP per capita at purchasing power parity in 2014. It is therefore assumed for converging economies that their other specific – but not individually captured – characteristics will converge towards the advanced euro area countries in parallel with convergence of GDP.[149]

Real interest rates are derived from three-month money market interest rates. The average annual level of interest rates is deflated by the annual inflation rate for the country concerned, using the Harmonised Index of Consumer Prices. The estimate of real "equilibrium" rates going

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[149] Convergence of GDP per capita at purchasing power parity of 1 percentage point will increase the estimated fixed effect of the country by 0.25 percentage point (i.e. it will reduce the negative fixed effect in the case of less advanced countries). The overall impact of convergence of GDP per capita of 1 percentage point is 0.78 (0.53 + 0.25), i.e. it is similar as in Model I.

forward is based on the assumptions of full elimination of the money market risk premium thanks to euro adoption and an equilibrium three-month real rate in the euro area of 1.5%. From this figure, the range of the estimates of future equilibrium real exchange rate appreciation for each of the countries (see above) is subtracted, corresponding to the future expected inflation differential vis-à-vis the euro area average.

The wage level data are taken from the European Commission's AMECO database (indicator "Nominal compensation per employee: total economy") in both euro and PPS.

1.1.2 Correlation of economic activity

The alignment of economic activity in the selected countries with the euro area is analysed using correlation analysis. Mutual relationships between individual countries and the euro area are assessed using the pairwise correlation coefficients applied to real GDP time series, industrial production indices (IPIs) and export indices, taking into account the different lags of the time series in the different countries relative to the euro area series. To identify the impact of the onset of the economic crisis on the size of the correlation coefficient, correlation coefficients are given both for the entire period under review from 2005 Q1 to 2015 Q1 (January 2005 to May 2015 for IPIs) and for the same period excluding 2008 Q4 and 2009 Q1 (October 2008 to March 2009 for IPIs).

The **simple (Pearson) correlation coefficient** is used to assess the strength of the linear relationship:

$$r_{xy} = \frac{s_{xy}}{\sqrt{\sigma_x^2 \sigma_y^2}} ,$$

where s_{xy} is the estimate of covariance and σ_x and σ_y are estimates of the standard deviation of time series x and y.

Simple correlations are calculated over a moving time window to obtain the **rolling correlation**. The corresponding time window for a given quarter is defined as the last 20 observations (5 years). The rolling correlation should help reveal trends in alignment.

When examining the alignment of cyclical behaviour between selected economies in order to assess the impact of economic policy, it is appropriate to monitor the correlation only within a certain band. Cycles between one and a half and eight years long are considered most frequently. **Dynamic correlation**,[150] which allows this requirement to be met, was therefore used as a third method. Dynamic correlation is based on spectral analysis of time series, takes values in the range [-1, 1] and, analogously to the static correlation coefficient, is defined by the relationship:

$$\rho_{xy}(\lambda) = \frac{C_{xy}(\lambda)}{\sqrt{S_x(\lambda)S_y(\lambda)}} ,$$

where $S_x(\lambda)$ and $S_y(\lambda)$ are spectral density functions and $C_{xy}(\lambda)$ is a co-spectrum, while λ takes values in the range [-π, π]. The simple static correlation is then a function (approximately the average) of the dynamic correlations across the entire observed spectrum.

The analysis uses quarterly real GDP time series at 2000 constant prices (expressed in national currencies), monthly time series of the Industrial Production Index adjusted for working days,

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[150] Croux, Forni and Reichlin (2001).

and quarterly time series of exports to the euro area expressed in the national currency. The source of the GDP and IPI data is Eurostat; the export data are obtained from the IMF database.

Data on exports to the euro area are available only in USD in the IMF database, so they were converted into national currencies using average quarterly exchange rates according to the IMF.

Time series are expressed in logs, seasonally adjusted and detrended. For detrending we used the method of quarter-on-quarter (or month-on-month) differences of the seasonally adjusted time series (ln $y_{sa,t}$):

ln $y_{sa,t}$ − ln $y_{sa,t-1}$, where y_{sa} is seasonally adjusted using the TRAMO/SEATS method.

In most cases, it is possible – based on the resulting time series – to conclude that the above method succeeds in detrending. As regards GDP in the Czech Republic, Hungary and Portugal, the results are not entirely clear. However, the shortness of the time series makes it impossible to check reliably whether the resulting series are stationary.

Given the requirement to assess the alignment of the business cycles of individual countries vis-à-vis the euro area, correlation coefficients (both static and dynamic) with respect to the quarterly real GDP time series are calculated separately for two time periods: 2004 Q1–2008 Q3 and 2008 Q4–2014 Q1. An analysis using rolling correlations was prepared as an alternative to the breakdown into two periods.

1.1.3   Correlation of the cyclical component of unemployment

Concordance is a statistical method used, for example, in situations where simple correlation may not provide a complete picture or is unsuitable. Concordance measures the agreement between certain monitored characteristics. In the case of the NAIRU gap, it shows the part of the period under review for which two time series are in the same phase of the cycle (i.e. both have a positive or negative gap). Let time series $S_{i,t}$ and $S_{j,t}$ be defined by the value 1 when their gap is positive and 0 in the opposite case. The concordance statistic then takes values between 0 and 1 and is calculated using the following formula (McDermott and Scott, 2000):

$Cij = T - 1\{\sum(Si,tSj,t) + (1 - Si,t)(1 - Sj,t)\}$

1.1.4   Structural similarity of the economies

The structural similarity of the economies is compared using the Landesmann structural coefficient. The coefficient is calculated by comparing the shares of individual sectors, e.g. industry or construction, in total value added in country A (in our case, the Czech Republic, Germany, Austria, Portugal, Hungary, Poland, Slovenia and Slovakia) vis-à-vis country B (i.e. the EA-19). The difference between the shares is weighted by the share of the sector in country A in the total, and the weighted shares are then summed.[151]

The calculation of the coefficient can be expressed formally as follows:

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[151] The index calculated in this way shows the importance of differences in economic structure from the perspective of the converging country. Another way of calculating the Landesmann index is to weight using the given sector of the reference country, i.e. the euro area:

$$SL = \sum_{i=1}^{n} \sqrt{\left(sh_A^i - sh_B^i\right)^2 \left(\frac{sh_B^i}{100}\right)}$$

. A similar approach is used, for example, in Michael Landesmann, "Chapter 4. Structural change in the transition economies, 1989–1999", Economic Survey of Europe, 2000 No. 2/3, pp. 95–123.

$$SL = \sum_{i=1}^{n} \sqrt{\left(sh_A^i - sh_B^i\right)^2 \cdot \left(\frac{sh_A^i}{100}\right)}$$

,

where sh_A^i is the percentage share of the *i*-th sector in value added as a whole in country A and sh_B^i is the percentage share of the *i*-th sector in value added as a whole in country B. The calculation is performed separately for each selected period. In our case, it is based on annual data. The source of the data is Eurostat. The structure of the coefficient is described in detail in Landesmann (1995) and also in Flek et al. (2001).

For the purposes of the analysis the coefficient was modified to SL/100.[152] The modified coefficient takes values in the range [0, 1]. The closer the coefficient is to zero, the more similar in structure are the economies.

1.1.5 Interest rate convergence

The simple method of a chart showing the interest rate differential vis-à-vis the euro area is used to analyse the convergence of interest rates in the Czech Republic, Hungary, Poland, Slovenia and Slovakia.[153] Datastream data based on central bank data (three-month interbank market rates) and Eurostat data (ten-year government bonds) were used to measure the interest rate differentials between three-month and ten-year rates in the euro area and these countries.

The time series start in January 2004 and end in June 2014 for both three-month rates and ten-year rates. The time series "EMU convergence criterion bond yields" from the Eurostat database, compiled for the purposes of assessment of the Maastricht convergence criterion on long-term interest rates, were used to compare 10Y government bond yields. These time series are based on the gross yield on government bonds on the secondary market with approximately ten years to maturity.

1.1.6 Exchange rate alignment

Aguilar and Hördahl (1998) express the probability of adoption of the euro by eleven EMU candidate countries using the correlation of the exchange rates of their currencies and the Deutsche Mark (as a substitute for the euro) vis-à-vis the US dollar.[154] The exchange rates of the two currencies are thus expressed in terms of the currency of a third country which is not an EMU member. The correlation between the movements of two currencies in a monetary union should by definition equal 1; therefore, a higher correlation means higher probability of participation in the EMU.

The analysis in this document uses the same method to assess how close the Czech Republic, Hungary, Poland, Slovakia and Slovenia are to adopting the euro.

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[152] $$SL = \sum_{i=1}^{n} \sqrt{\left(I_{sh_A^i} \cdot 100 - I_{sh_B^i} \cdot 100\right)^2 \cdot \left(\frac{I_{sh_A^i} \cdot 100}{100}\right)} = 100 \sum_{i=1}^{n} \sqrt{\left(I_{sh_A^i} - I_{sh_B^i}\right)^2 \cdot I_{sh_A^i}} = 100 \cdot I_{SL}$$

In this case, indices are used rather than the percentage shares of individual sectors in the total.
[153] Interest rate convergence can be examined using the unit root test (see, for example, Lee and Wu, 2004, and Kočenda, 2001). However, the analyses must take into account the relatively short length of the available time series, as well as breaks in the time series.
[154] The same method is used in Castrén and Mazzotta (2005).

The correlation coefficient is based on a GARCH estimate and is calculated according to the following formula:

$$corr_t = \frac{\text{cov}(X/USD, EUR/USD)_t}{\sqrt{\text{var}(X/USD)_t * \text{var}(EUR/USD)_t}}$$

, where X represents the national currencies.

This method returns a correlation coefficient which changes over time and therefore provides more information than a simple correlation coefficient of the exchange rate of the national currency against the euro. Moreover, the use of the GARCH technique allows all the information in the data to be utilised. A higher GARCH correlation means similar developments in exchange rate volatility, which can be interpreted as synchronisation of exchange rate shocks in the countries under review.

The analysis covers the period from 1 January 2005 to 31 July 2015 and uses daily data from Thomson Datastream.

1.1.7 Analysis of exchange rate volatility

The historical exchange rate volatility is calculated as the standard deviation of the logarithmic daily returns for a period of six months:

$$\sigma = \sqrt{\frac{1}{T-1}\sum_{t=1}^{T}(r_t - \bar{r})^2},$$

where σ is the standard deviation, r_t is the daily return and T is the number of working days in the period of six months (126 for a year with 252 working days). We use the following relationship to translate the standard deviation of logarithmic daily returns to an annualised form:

$$\sigma_{ann} = \sigma\sqrt{N},$$

where $N = 252$ represents the approximate number of business days in the year.

The historical volatility of the exchange rates of the countries under comparison against the euro is calculated using the exchange rates announced by the CNB.

The implied volatility is derived from market prices of options using the given valuation model. This volatility is directly quoted in the trading system. The source of the data is Datastream.

1.1.8 Integration of the economy with the euro area

International trade with the euro area

The Grubel-Lloyd (GL) index was used to analyse intra-industry trade:

$$GL_t = 1 - \frac{\sum_k\sum_i \left|X_{it}^k - M_{it}^k\right|}{\sum_k\sum_i \left|X_{it}^k + M_{it}^k\right|}$$

GL_t is the ratio of the absolute value of net intra-industry trade to foreign trade turnover. X_{it}^k and M_{it}^k denote exports to and imports from the k-th country of the i-th commodity at time t. The index takes values ranging from 0 to 1. A value of 0 means that all trade is inter-industry

trade and that there is specialisation in different commodities. By contrast, a value of 1 indicates that all trade is intra-industry trade (Flek et al., 2001).

The GL index is calculated using data on total exports and imports to and from the euro area in the countries under review.[155] To calculate the index, foreign trade is broken down on the basis of the SITC classification (the commodities *i* are thus given by SITC groups at the one- to five-digit level). The data source is the Eurostat COMEXT database.

The value of the GL index depends, among other things, on the level of detail of the branch breakdown. The breakdown according to the one- or two-digit SITC is a rather broader sector breakdown which may put together in one category branches whose output is not closely related,[156] resulting as expected in a higher value of this indicator for all countries. Although the qualitative message of the analysis is relatively independent of the degree of aggregation selected, the cross-country differences are largest when using the five-digit (most detailed) breakdown.[157]

Foreign direct investment

The data for the calculation of the shares of exports to and imports from the euro area in total exports and imports are taken from Eurostat (January 2005–April 2015, monthly data).

The source of data for the analysis of the euro area's share in direct investment is the Eurostat database and for Hungary the national central bank. Stock data on foreign direct investment (FDI) from euro area countries and direct investment (DI) to euro area countries were used. The GDP statistics are from the Eurostat database.

1.2   SIMILARITY OF MONETARY POLICY TRANSMISSION

1.2.1   Financial system

Depth of financial intermediation (the ratio of financial sector assets to GDP at current prices) expresses the asset strength of intermediation by banks and non-bank financial institutions: insurance corporations, pension funds, credit unions, management companies and investment funds (unit trusts), financial leasing corporations and other financial corporations (forfaiting and factoring companies, investment firms, bureaux de change, etc.). Generally speaking, the more advanced the market, the larger the assets and the deeper the financial intermediation relative to GDP.

Indebtedness of the private sector (the ratio of the gross book value of loans to non-bank clients, corporations and households to GDP at current prices) expresses the level of lending by banks. Usually, the more advanced the market, the larger this ratio, but an excessively high value may reflect overleveraging of the private sector.

1.2.2   Structure of financial assets and liabilities of corporations and households

Quarterly financial accounts data published by national central banks and the ECB are used as the input data for the analysis of the alignment of the structure of the financial assets and liabilities of non-financial corporations and households. The quarterly financial accounts are

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[155] As the trade balances of euro area countries can take either positive or negative values, it is recommended to calculate the aggregated Grubel-Lloyd index using bilateral export and import flows.
[156] This is particularly so in SITC 7 (Machinery and transport equipment).
[157] The simplest calculation of the Gruber-Lloyd index, using SITC 1, is based on 10 categories.

compiled according to ESA 95 methodology. In line with national accounting, a unified classification of **institutional units** and **financial instruments** is being promoted. As regards institutional units, the analysis provides a detailed examination of real sectors, i.e. non-financial corporations (S.11) and the merged sector of households (S.14) and non-profit institutions serving households (S.15). The analysis distinguishes five main types of financial instruments: currency and deposits, securities other than shares, loans, shares and other equity, and other accounts receivable/payable including insurance technical reserves and financial derivatives.

The analysis works with **outstanding amounts of financial assets and liabilities** as at the end of the period (quarter) under review. Consequently, the effect of transactions, revaluation and other changes in the volume of assets/liabilities on the change between the initial and final balance in each quarter is not explicitly taken into account. The analysis discusses the net positions of the aforementioned sectors in detail. The net position, expressed as **net financial assets**, is obtained as the balance of financial assets and liabilities and indicates the sector's financing ability or financing needs.

A detailed look at the structure of financial assets and liabilities is provided by **balance sheet indicators**, which capture the degree of risk arising from any mismatch between individual items of the financial balance sheet. The main indicators include:

Debt/equity   = *(bonds issued + loans accepted + other liabilities) / equity issued*

... …measures the risk of mismatch between capital structure and excessive debt

For non-financial corporations, liquidity and the share of short-term liabilities may be affected by omission of the short-term component of other liabilities. In the case of the liquidity indicator, this omission is less problematic, as it is reasonable to assume that the shares of short-term other assets and liabilities (trade credits etc.) are approximately equal.

The debt/equity ratio cannot be used for the household sector. Given its insufficient information content with regard to the objective of the analysis, the liquidity indicator for the household sector was also excluded.

1.2.3   Effect of monetary policy on client interest rates

The **interest rate sensitivity of loans to non-financial corporations and loans for house purchase** is expressed by the breakdown of new loans by initial interest rate fixation. Subsequently, the degrees of similarity between the breakdown of loans in the Czech Republic and in the other countries under review are compared with that for the euro area as a whole. For the single monetary policy to operate effectively, it is important that the interest rate sensitivity of these loan types to changes in market and client interest rates is similar, thereby eliminating some asymmetry in the event of economic shocks.

Average weighted interest rates on new business, which reflect the rates agreed for all new business during the month, and three-month money market interest rates were used in the graphical comparison of interest rate spreads between client and market rates.

The strength of the relationship between client and market rates in the countries under review and in the euro area is assessed using correlation analysis. The simple (Pearson) correlation coefficient is used to assess the strength of the linear relationship (see the *Methodological Part*, section 1.1.2 *Correlation of economic activity*). The maximum value of the coefficients of correlation between interest rates on client loans and the relevant market interest rate is also determined for several possible lags.

1.2.4 Inflation persistence

Inflation persistence is measured by three different methods. Quarterly data on HICP inflation (annual HICP changes) from 2005 Q1 to 2015 Q2 are used for the calculation. The source of the data is OECD MEI.

Method 1

Method 1 uses the non-parametric technique proposed by Marques (2004) to estimate inflation persistence. This approach defines inflation persistence, γ, as $\gamma = 1 - n/T$, where n is the number of times actual inflation crosses the medium-term inflation value and T is the number of observations. Medium-term inflation is approximated using the Hodrick-Prescott (HP) filter with the parameter $\lambda = 1,600$.

Method 2

Inflation persistence is measured as the sum of autoregressive coefficients. For the purposes of the calculation, inflation is modelled as an autoregressive process and the coefficients of the autoregressive terms are estimated. The modelled process used in Method 2 is described as

$$\pi_t = \mu + \sum_{i=1}^{4} \alpha_i \pi_{t-i} + \varepsilon_t,$$

where π_t is inflation observed at time t. The sum of autoregression coefficients is defined as

$$\rho_K = \sum_{i=1}^{4} \alpha_i$$

and estimated using the method proposed by Hansen (1999), which provides an unbiased estimate and asymptotically correct confidence intervals.

Method 3

Inflation persistence is again measured as the sum of autoregressive coefficients. The following model is considered:

$$\pi_{t+1}^{T} = \pi_t^{T} + \eta_{1t}$$

$$\pi_{t+1}^{P} = (1-\delta)\pi_t^{P} + \delta\pi_{t+1}^{T}, 0 < \delta < 1,$$

$$\pi_t = \left(1 - \sum_{i=1}^{4} \varphi_i\right)\pi_t^{P} + \sum_{i=1}^{4} \varphi_i L^i \pi_t + \varepsilon_{1t}, \sum_{i=1}^{4} \varphi_i < 1,$$

where π_t^{T} is medium-term inflation (or the central bank's implicit inflation target), π_t^{P} is the inflation target perceived by the public, η_{1t} and ε_{1t} represent independent white noises, L^i is the lag operator and $\sum_{i=1}^{4} \varphi_i$ is the sum of autoregressive coefficients. Inflation π_t is the observed variable and medium-term inflation π_t^{T} is approximated with the inflation time series smoothed using the HP filter. The Kalman filter and Bayesian estimation are used to estimate

the model parameters. The methodology draws on the article by Franta, Saxa and Šmídková (2007), where it is applied to data from a different source and period.

1.2.5 Financial market alignment

Price-based measures

These measures use the concepts of beta-convergence and sigma-convergence (Adam et al., 2002).[158] The concept of beta-convergence enables identification of the speed at which differences in yields are eliminated on individual financial markets (selected against the benchmark). A negative beta coefficient signals the existence of convergence. The closer the value of the beta coefficient is to -1, the higher is the speed of convergence. To quantify beta-convergence, common regression analysis or the panel estimation method is applied (as in Babetskii et. al., 2007), in the form of the equation:

$$\Delta R_{i,t} = \alpha_i + \beta R_{i,t-1} + \sum_{l=1}^{L} \gamma_l \Delta R_{i,t-l} + \varepsilon_{i,t} \, ,$$

where $R_{i,t} = Y_{i,t} - Y_{i,t}^B$ is the difference between the asset yields of country i[159] and a selected reference territory (a benchmark, B) at time t, Δ is the difference operator, a_i is a dummy variable for the respective country, L is the maximum lag considered (four weeks) and $\varepsilon_{i,t}$ is a random term. The size of coefficient β may be interpreted as a direct measure of the convergence speed. A negative beta coefficient indicates the occurrence of convergence. The β coefficient can take values ranging from -2 to 0. The closer the value of the β coefficient to 1, the higher the speed of convergence. If β = -2 or β = 0, no convergence is observed. β values from -1 to 0 indicate monotonous convergence, while oscillating convergence occurs for values from -2 to -1.

The concept of sigma-convergence focuses on the dispersion of the yields on identical asset types in different countries at a given moment in time and thus identifies the degree of integration vis-à-vis the benchmark country achieved at that moment in the individual selected financial market segments. Sigma-convergence increases as the sigma parameter falls to zero. To quantify sigma-convergence, a calculation is used of the (cross-section) standard deviation (σ), according to the formula:

$$\sigma_t = \sqrt{\left(\frac{1}{N}\right)\sum_{i=1}^{N}\left[\log(Y_{i,t}) - \log(\overline{Y}_t)\right]^2}$$

where Y is the asset yield, $\overline{Y}_t$ is the mean value of the yield over time t and i stands for the individual countries (i = 1, 2, …, N). For the purposes of this analysis, we use N = 2, i.e. we explore the evolution of sigma-convergence over time between the euro area and one of the countries under review.[160] In theory, σ takes only positive values. The lower is σ, the higher is the level of convergence. In theory, full integration is achieved when the standard deviation is zero,[161] while high (several digit) values of σ reflect a very low degree of integration. For graphical illustration, the results were normalised over the whole time period and filtered using the Hodrick-Prescott filter with the recommended weekly time series coefficient λ = 270,400.

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[158] The terms beta-convergence and sigma-convergence originate from the literature on economic growth and its dynamics; see, for example, Barro and Sala-i-Martin (1992, 1995).
[159] $Y_{i,t} = [\ln(A_{i,t}) - \ln(A_{i,t-1})]$ where Y denotes the yield on the relevant asset, A the price index of the relevant asset (expressed as a basic index) and i the individual country.
[160] For pairs of countries, the calculated values in each period are essentially equal to half the square of the yield differential.
[161] This occurs on the money and foreign exchange markets for countries entering the euro area on a given date.

News-based measures

This method (Baele et al., 2004) assumes that potential local shocks, which get more alike with increasing integration, can be diversified in an integrated region by investment in other comparable assets. In line with these assumptions, the price movements of a benchmark asset should reflect all relevant common (global) news. So, in a fully integrated market, the price changes of an asset in a single country should not be systematically higher or lower than the price changes of the benchmark asset. Quantification of the degree of shock integration can be estimated (as in Baele et al., 2004) for the money, foreign exchange and government bond markets using the following regression:

$$\Delta Y_{i,t} = \alpha_{i,t} + \gamma_{i,t} \Delta Y_{b,t} + \varphi_{i,t}$$

where $Y_{i,t}$ represents individual asset yields in country i at time t, and b denotes the benchmark country (Germany for the government bond market, otherwise the euro area). $\alpha_{i,t}$ is a specific constant for each country, Δ denotes the difference operator and $\varphi_{i,t}$ is a random term. An increase in this type of integration requires α to converge to zero, γ to converge to one and the ratio of the variances of coefficients γ (for benchmark and national assets) to be close to one. The time-varying parameters γ were estimated using recursive estimation.

To quantify the degree of stock market shock integration between the countries under review and the euro area, the above equation must be adjusted for the impact of the US stock market on the monitored markets and the euro area market. This is due to the lower comparability of the individual national stock indices relative to the other monitored assets (exchange rates, money market rates and government bonds). The modified equation for the stock market has the following form:

$$\Delta Y_{i,t} = c_{i,t} + \gamma_{i,t}^{b} \Delta Y_{b,t} + \gamma_{i,t}^{US} \Delta Y_{us,t} + \upsilon_{i,t}$$

The magnitude of parameters γ expresses the degree of identical response of an asset of a selected country and a comparable benchmark asset to certain news.

Data

The calculations for both measures of financial integration were carried out using weekly data (daily data averages) from Thomson Datastream, covering the period January 2002 to June 2015. Three-month interbank rates were used for the money market, national currencies quoted against the US dollar for the foreign exchange market, five-year government bonds for the bond market and national stock indices for the stock market. The relevant time series were adjusted for exchange rate effects.

Thomson Datastream codes for the data sources used:

	Peněžní trh	Devizový trh	Dluhopisový trh	Akciový trh
CZ	PRIBK3M	PRUSDSP	BMCZ05Y-(RY)	CZPXIDX
AT	–	–	BMOE05Y-(RY)	ATXINDX
DE	–	–	BMBD05Y-(RY)[B)]	DAXINDX
PT	–	–	BMPT05Y-(RY)	POPSI20
HU	HNIBK3M	HNUSDNB	BMHN05Y-(RY)	BUXINDX
PL	POIBK3M	POUSDSP	BMPOZ05Y-(RY)	POLWIGI
SI	–	–	TRSI5YT	SLOETOP
SK	SXIBK3M	SXUSDSP	SXGOVT1	SXSAX16
EA	BBEUR3M[B)]	USECBSP[B)]	–	DJES50I[B),a)]

Note: [B] benchmark; [a] DJES50I consists of stocks from euro area member countries with the following weights: France 34.6%, Germany 28.0%, Spain 16.7%, Italy 11.0%, the Netherlands 5.6%, Finland 2.5% and Luxembourg 1.7%.

1.2.6 Spontaneous euroisation

A comparison of the level of euroisation in the Czech Republic and selected Central European countries, namely Poland, Hungary and Slovakia, and an assessment of the effects of the debt crisis on households' trust in the euro area were performed using a survey conducted by Oesterreichische Nationalbank and published in 2014 Q2.

2   ADJUSTMENT MECHANISMS

2.1   FISCAL POLICY

2.1.1 Stabilising function of public budgets

There are two main approaches to determining the cyclical component of the budget balance. The first is based on the methodology used by the European Commission and other international institutions (OECD, IMF), which assumes a direct relationship between the output gap and revenue/expenditure budgetary items which are subject to cyclicality. The second approach, used by the ECB and central banks within the ESCB, is based on the relationship between individual revenue and expenditure budgetary items and their macroeconomic bases.

Of key importance in the computation of the cyclically adjusted balance using the output gap approach are the estimation of potential product, i.e. the identification of the phase of the economy, and the determination of the sensitivity of budgetary items to change in the output gap. In this approach, the cyclical changes in economic activity in a given year are fully reflected in the computation of the cyclical component of the budget balance.

By contrast, the ECB's approach works not with potential output, but with the trends in relevant macroeconomic variables linked to the revenue and expenditure components of the budget ("macroeconomic bases"). Specifically, these bases comprise compensation of employees, employment, household consumption and operating surplus in the corporate sector. The first step in the computation of the cyclically adjusted balance by this method involves determining the cyclical positions of the individual macroeconomic bases on the basis of the difference between the actual value and the trend value obtained using the Hodrick-Prescott filter. The second step involves quantifying the effect of the cyclical position on the relevant budget variable by means of the tax/expenditure elasticity estimated in advance and then summing the individual cyclical components. Three of the five macroeconomic bases used are labour market variables, and economic shocks affect the labour market with a time lag and hence do not reflect changes in GDP immediately. In this approach, therefore, changes in economic activity – especially when they are sharp fluctuations – show up in the cyclical component of the budget balance only partially or with a lag.

The two approaches naturally provide somewhat different results. When interpreted correctly, however, they are sufficient to identify the basic characteristics of fiscal policy and the main trends in public budgets.

2.1.2 Government deficit and debt and the scope for stabilising fiscal policy

All the debt and deficit figures are based on the ESA 2010 methodology, which is the key methodology with regard to considerations of euro area accession, except for the part of the

table covering mandatory expenditures in the Czech Republic, which also includes figures from the state budget, which is monitored on a cash (non-accrual) basis.

The description of mandatory expenditures is based on the definition used by the Ministry of Finance. These include mandatory expenditures arising from statutory requirements and other mandatory expenditures (namely expenditure arising under international treaties or due to judicial and extra-judicial decisions on disputes that are binding upon the Czech Republic). Included in particular are pension insurance benefits, government payments for health insurance, government social assistance, sickness insurance benefits, debt service expenditure, state contributions related to the support of building savings schemes and private pension schemes, allocations to state funds, expenditure on contributions to political parties, payments to the EU budget and unsuccessful arbitrations.

In addition to the aforementioned mandatory expenditures, there are so-called quasi-mandatory expenditures, which include, for example, wages to public sector employees, defence expenditures and international humanitarian assistance, investment incentives and active employment policy. Such quasi-mandatory expenditures are not considered here, as it is within the government's powers to adjust them quite significantly through its own actions.

Macroeconomic interpretation of mandatory (and quasi-mandatory) expenditure is, however, not entirely trivial. In the short run, these expenditures limit the government's reactive ability to execute an active discretionary policy (in cases of unforeseen economic shocks). On the other hand, thanks to their inertia, they stabilise the business cycle to a certain extent. The key problem related to an increase in mandatory expenditures is that their expected growth is not compensated by any corresponding reductions in other expenditures and/or by increased taxation, which results in an increased fiscal imbalance.

2.1.3 Public finance sustainability

The extrapolation of sustainability was taken from the publication "The 2015 Ageing Report: Economic and Budgetary Projections for the 28 EU Member States (2013–2060)" (European Commission, 2015c).

2.2 LABOUR MARKET FLEXIBILITY

2.2.1 Unemployment and internal labour market flexibility

Long-term unemployment is analysed by comparing the long-term unemployment rate (the share of those unemployed for twelve months or more under ILO methodology in the labour force). The source of the data is Eurostat.

The **Beveridge curve** is an instrument frequently used to differentiate between cyclical and structural unemployment. It expresses the dependence between vacancies and the number of unemployed persons. A decreasing (increasing) number of unemployed persons amid a rising (falling) number of vacancies is associated with cyclical changes, whereas simultaneous movements of the two variables in the same direction signal structural changes. Data on the number of unemployed persons and vacancies are from the Ministry of Labour and Social Affairs (MLSA). The numbers of employees converted into full-time equivalents are from a quarterly CZSO survey.

Regional differences in unemployment are measured by the coefficient of variation. The coefficient of variation in the regional unemployment rate is the ratio of the standard deviation weighted by the district size to the average unemployment rate. The size of the coefficient of

variation depends on the degree of disaggregation. Data for similar region sizes (e.g. NUTS II or NUTS III) and the evolution of the coefficient of variation over time can be used for comparison. The source of the data is Eurostat.

The CZSO publishes the volume of **internal migration** (movement between municipalities). Data on registered internal migration in other countries are published in statistical yearbooks. In the Czech Republic, migration of foreigners with long-term residence (over 1 year) is included in the statistics.

2.2.2 Estimate of structural unemployment using the NAIRU

The NAIRU analysis presented in the main part of the text focuses on the medium-term NAIRU concept,[162] which defines the NAIRU as the equilibrium rate towards which unemployment converges in the absence of temporary supply shocks once the dynamic adjustment of inflation to previous shocks is completed. A semi-structural approach using the Kalman filter is applied.[163]

The estimate of the NAIRU as an unobserved variable is based on the assumption that stable inflation (i.e. inflation equal to inflation expectations) means, *ceteris paribus*, a rate of unemployment equal to the NAIRU. However, rising (falling) inflation indicates a shift in the unemployment rate below (above) the NAIRU. The basic model equation captures the relationship determined by the Phillips curve, modelling inflation as a function of lagged inflation, the deviation of unemployment from the NAIRU and two variables helping to explain short-term supply shocks. The next equation specifies the process generating the NAIRU time series, which is assumed to follow a random walk process. Inflation expectations are not modelled endogenously. Lagged inflation was used to proxy for inflation expectations. Short-term supply shocks are captured using import prices and oil prices. These two variables help explain short-term movements in inflation, which allows us to estimate the NAIRU compatible with non-rising inflation in the absence of such temporary supply shocks. Household consumption represents short-term demand pressures in the equation.

$$(\pi_t - \pi_t^e) = \alpha(\pi_{t-1} - \pi_{t-1}^e) + \beta(u_t - u_t^*) + \gamma\Delta x_t + \delta\Delta s_t + \varepsilon_t \qquad \varepsilon_t \sim N(0, \sigma_\varepsilon^2),$$

$$u_t^* = u_{t-1}^* + v_t, \qquad v_t \sim N(0, \sigma_v^2).$$

In these equations π_t is inflation, π_t^e is expected inflation, u_t^* is the NAIRU, $(u_t - u_t^*)$ is the unemployment gap, x_t represents short-term supply shocks and s_t represents household consumption.

Determining the volatility of the NAIRU is an important part of the estimation. The smoothness of the estimated NAIRU series is determined by the variances of the residuals in the two equations above (Phillips curve, random walk) and the relationship between those two variances. The larger is the ratio of the NAIRU variance to the inflation variance, the more volatile is the estimated NAIRU series, i.e. the unemployment gap explains almost the entire variance in inflation. By contrast, a low ratio of the variances means that the estimated NAIRU changes very little over time.

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[162] The OECD distinguishes three different NAIRU concepts according to their time frame. Short-term and long-term NAIRU concepts exist in addition to the medium-term NAIRU. The short-term NAIRU is the rate of unemployment consistent with stabilising the inflation rate at its current level in the next period. The long-term NAIRU is the equilibrium rate of unemployment corresponding to a long-term steady state, once the NAIRU has fully adjusted to long-term and short-term supply shocks and economic policy influences.
[163] Richardson et al., 2000; Szeto and Guy, 2004.

2.2.3 International labour mobility

International mobility is assessed using foreign migration and the proportion of foreigners in the population. The source of the data on registered international mobility for individual countries (immigration and emigration) and the proportion of foreigners in the population is Eurostat.

2.2.4 Institutional environment

Minimum wage

The relationship of the minimum wage to the average wage and to the wage in the first decile of the wage distribution. The data used are from Eurostat and the Average Earnings Information System (MLSA).

Labour taxation

Overall labour taxation (the tax wedge) is defined as social security contributions paid by employees and employers and income taxes relative to overall labour costs. This indicator is calculated in line with the applicable tax legislation for model types of households. The data are from OECD.

The average effective tax burden is described by **implicit tax rates**, which are calculated as ratios, with the numerator containing the sum of aggregate revenue from direct taxes (in some countries also indirect taxes paid by the employer) and social contributions paid by both employees and employers, while the denominator comprises total compensation of employees (data under ESA 2010 methodology). The disadvantage of this indicator is that it is dependent on the business cycle. Inflation and real income growth increase the tax component of implicit tax rates where the income tax is progressive. Social contributions, which are usually degressive with rising income, can have the opposite effect. The overall effect of the cycle on implicit rates depends on which of the two factors is dominant. The data on implicit tax rates are taken from Eurostat.

The **components of labour taxation** give the decomposition of labour costs into income tax and the contributions paid by employees and employers. The source of the data is OECD.

Work-incentive indicators

Net replacement rates (NRRs) measure the extent to which the combination of taxes and benefits affects the financial gain from work and thereby the incentive for unemployed or inactive persons to enter employment. The NRR is defined as the ratio of net household income when the person under consideration is jobless to that when the same person has a job. Gross incomes of the other members of the household are supposed to be unchanged in both cases. NRRs only identify financial entitlements to social benefits. Provided that there is sufficient monitoring of the job-seeking activity of the unemployed, even high NRRs may be associated with sufficient job-seeking incentives.

The data on net replacement rates (NRRs) are taken from OECD tax and benefit models for individual types of households, persons in the initial phase of unemployment who are entitled to unemployment benefits and persons not entitled to unemployment benefits (inactive or long-term unemployed).

More detailed data for the Czech Republic analysing the incentive to work on the basis of a comparison of total household income for families claiming unemployment benefits, parental allowances or caregiver allowances and for families with economically active members are calculated from individual household budget data for 2012 and 2013.

2.2.5 Rate of adjustment of wage growth to the business cycle

The rate of adjustment of real wage growth to the unemployment rate is analysed using the cyclical components of the relevant variables. For the purposes of this section, the cyclical components are estimated using the Hodrick-Prescott filter with the smoothness parameter $\lambda = 1,600$. The Christiano-Fitzgerald filter was also used to test the robustness of the cycle estimates (the cyclical component corresponds to 6–32 quarters).

The correlations in the table take into account the potential phase shift, which may be up to six quarters. If we denote the cyclical component of output by Y_t and the cyclical component of unemployment by U_t, then we report the highest absolute value of the correlation corr(Y_t, U_{t+k}), where $k \in \{0,...,6\}$. Analogously, we report the highest absolute value for the correlation between the cyclical components of output and wages.

2.3 PRODUCT MARKET FLEXIBILITY

2.3.1 Administrative barriers to entrepreneurship

Administrative barriers to entrepreneurship. The index of barriers to entrepreneurship is taken from the OECD Product Market Regulation Database, where it is a part of a broader OECD indicator assessing the degree of regulation on product markets. The index consists of individual items aggregated in three areas: administrative burdens on start-ups (administrative burdens for corporations, administrative burdens for sole proprietors, and sector-specific administrative burdens), regulatory and administrative opacity (licences and permits system, and government communication and simplification of rules and procedures) and barriers to competition (legal barriers to entry into the industry – limitations on the number of entities, antitrust exemptions for public enterprises, barriers in network sectors, and barriers in services).

The **rankings of countries in the area of starting or closing a business** are taken from the World Bank's Doing Business database. As regards starting a business, number of procedures, time (days), cost and minimum capital requirements in % of income per capita are taken into account. The area of closing a business includes data on time in years, cost in % of total assets and recovery rate in cents on the dollar.

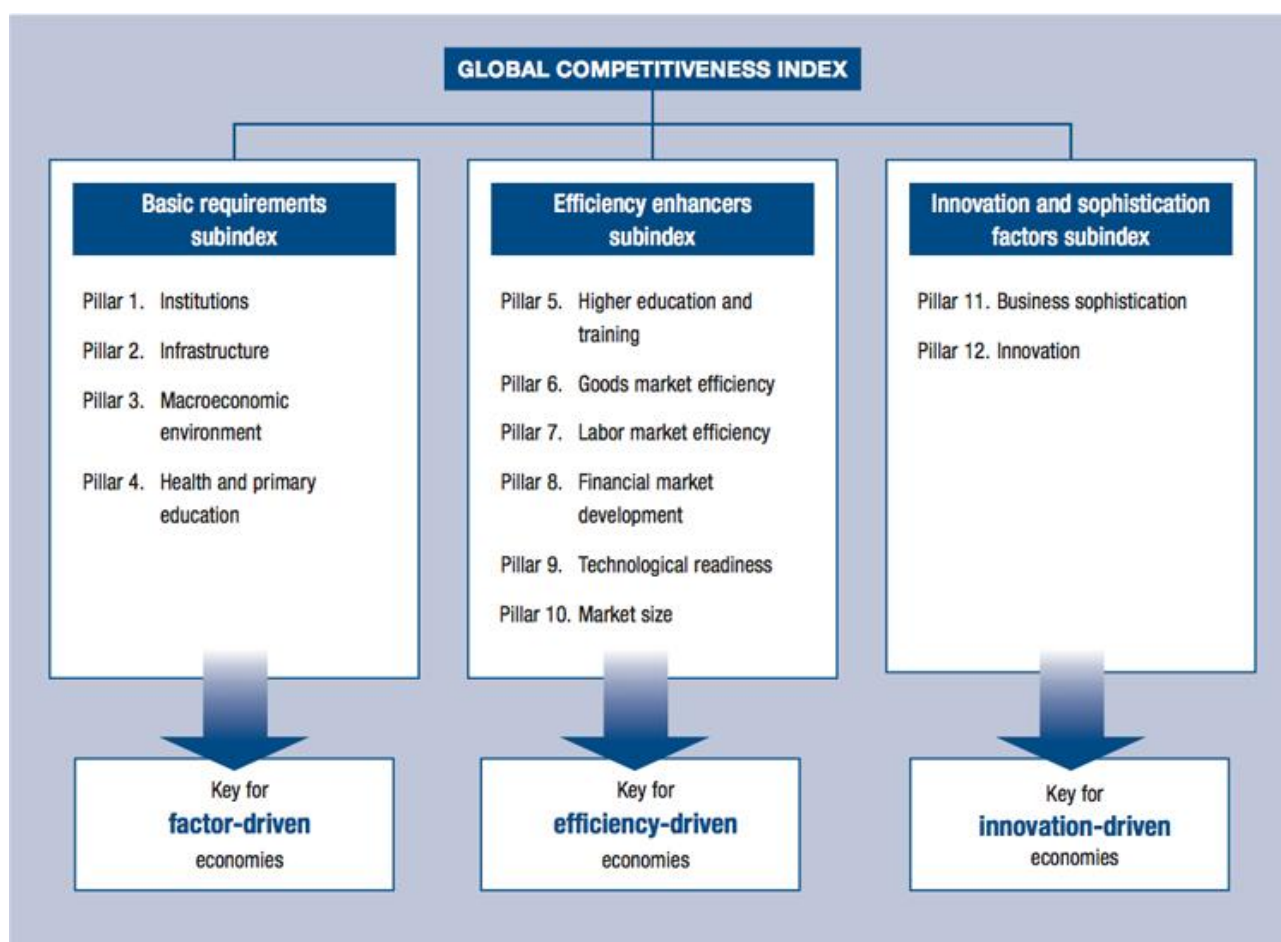**Methodology of the Global Competitiveness Index**

In the context of the Global Competitiveness Index (GCI), competitiveness is defined as the set of institutions, policies and factors that determine the level of productivity of a country. The productivity level determines the rates of return obtained by investments in an economy, which in turn are the fundamental drivers of its growth rates. The assessment of the importance of the GCI is based on a methodology[164] that explains approximately 89% of the change in GDP per capita by differences in the level of productivity. A positive and relatively close correlation between the economic level as measured by GDP per capita and the GCI was demonstrated using a sample of 140 countries (in 2015). The process of convergence of

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[164] Robert E. Hall, Charles I. Jones, The Productivity of Nations, NBER (1996).

economies can be described by a similarly close relationship, as the growth rate of GDP per capita is positively correlated with the GCI and negatively correlated with GDP per capital at any given time. These relationships also apply to the substantially smaller sample of eight countries selected for comparison in this document.[165]

The indicators monitored and assessed for the GCI are divided into three sub-indices and further broken down into twelve pillars. These twelve pillars are assessed separately, but the indicators explaining the evolution of the various pillars affect one another (for example, it will be difficult for a country to achieve a good score in the innovation pillar without a healthy, well-educated and trained workforce). The computation of the GCI is based on successive aggregations of scores from the lowest indicator level up to the overall index for the country. An arithmetic mean is generally used for the lower categories and weighting is applied to the higher aggregation levels. The weights put on the three main sub-indices are not the same for all countries but depend on each country's stage of development.[166]

The pillars are assigned to the sub-indices as shown in the following flowchart:

GLOBAL COMPETITIVENESS INDEX

Basic requirements subindex

Pillar 1. Institutions

Pillar 2. Infrastructure

Pillar 3. Macroeconomic environment

Pillar 4. Health and primary education

Key for **factor-driven** economies

Efficiency enhancers subindex

Pillar 5. Higher education and training

Pillar 6. Goods market efficiency

Pillar 7. Labor market efficiency

Pillar 8. Financial market development

Pillar 9. Technological readiness

Pillar 10. Market size

Key for **efficiency-driven** economies

Innovation and sophistication factors subindex

Pillar 11. Business sophistication

Pillar 12. Innovation

Key for **innovation-driven** economies

In line with the economic theory of stages of development, the GCI assumes that, in the first stage, economic growth is based on unskilled labour and natural resources. The country competes on the basis of price and sells basic products or commodities, with its low

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[165] A detailed description of the methodology is available at http://reports.weforum.org/global-competitiveness-report-2014-2015/methodology/#read.

[166] The GCI weighting methodology is described in detail at http://reports.weforum.org/global-competitiveness-report-2014-2015/view/structure-of-the-gci/.

productivity reflected in low wages. Maintaining competitiveness at this stage of development hinges primarily on well-functioning public and private institutions (Pillar 1), a well-developed infrastructure (Pillar 2), a stable macroeconomic environment (Pillar 3) and a healthy workforce that has received at least a basic education (Pillar 4). As the economy becomes more competitive, productivity will increase and wages will rise and the country will move into the efficiency-driven stage of development, when it must begin to develop more efficient production processes and increase product quality. Competitiveness is therefore increasingly driven by higher education and training (Pillar 5), goods market efficiency (Pillar 6), labour market efficiency (Pillar 7), financial market development (Pillar 8), technological readiness (Pillar 9) and the size of the domestic and foreign markets (Pillar 10). As the country moves into the innovation-driven stage, wages will have risen by so much that it is able to sustain its competitiveness only by producing new and different goods using the most sophisticated production processes (Pillar 11) and by innovating new ones (Pillar 12).

2.3.2 Tax burden on businesses

The highest **statutory tax rates** are taken from Eurostat. **Implicit tax rates on corporate income**, defined as the ratio of total tax revenues to the potential tax base (national accounts data under ESA 95 methodology), are an additional indicator. The potential tax base is approximated using national accounts output and income statistics. In contrast to statutory rates, implicit tax rates take into account depreciation, amortisation and tax exemptions, hence they express the actual average effective tax burden on corporate income. Their disadvantage is that they depend on the business cycle. For example, a decrease in the statutory tax rate does not affect the implicit rates if it is offset by a broadening of the tax base. The data are taken from Eurostat.

2.4   THE BANKING SECTOR AND ITS SHOCK-ABSORBING CAPACITY

Return on equity (RoE, %) and return on assets (RoA, %) can be regarded as measures of profitability of the banking business, assessing its economic efficiency. They aggregate the results of the extent and diversification of banks' activities and the business risks undertaken.

Non-performing loans (NPLs)/total loans (%) – NPLs ("loans in default" in Czech accounting terminology) in gross book value as a percentage of total loans in gross book value express how large or how concentrated is the credit risk faced by the country's banking sector. NPLs are loans that are classed as substandard, doubtful or loss loans.

Capital ratio (%) – the ratio of a bank's capital to the corresponding coverage of unexpected losses from the risks it undertakes – assesses the outlook for the bank's financial situation and indicates its ability to cover potential future losses with capital. The capital adequacy ratio is an aggregate indicator reflecting all activities of a bank (both balance sheet and off-balance sheet) as well as the potential losses (reducing profit) which a bank may incur from the risks it undertakes and the depreciation of assets.

The **ratio of deposits to loans provided** (deposits/loans to residents) expresses the extent to which loans provided are financed by deposits of private sector residents. Values of this indicator above 100% indicate that banks have a sufficient volume of deposits relative to the volume of loans provided and their long-term financing is thus less dependent on other sources.

The **external position of the banking sector** (net external assets in % of GDP) represents the difference between the external assets and liabilities of the domestic banking sector, indicating its degree of dependence on foreign sources.

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