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We are currently witnessing a momentous time for the euro area. As the recovery seemed to be consolidating, the Greek crisis showed that the architecture of the Economic and Monetary Union (EMU) is still a fragile construction. It is true that significant progress has been achieved both at the national and supranational level in improving the functioning of the euro area since 2007. However, the euro project has not been completed. The large differences in both economic growth rates across euro area Member States (see Section 2) and crises-related narratives (both on responsibilities and remedies) pose a challenge for the euro area.

How to proceed? Welcome inspirations can be drawn from the so-called 'Five Presidents' Report', which was published at the end of June by Commission President Juncker in close cooperation with the President of the Euro Summit, the President of the Eurogroup, the President of the European Central Bank, and the President of the European Parliament.

Let me present three challenges that need to be addressed in the report to put the EMU on a sustainable path.

A first challenge is to ensure a sustainable real convergence process. The hypothesis that the euro area would converge 'endogenously' towards an optimal currency area (OCA) turned out to be overly optimistic. It is true that the desire to become member of the euro club led to strong nominal convergence in the run up to the EMU. It is also true that capital flowed from the core to the periphery of the euro area during the first ten years of the EMU in order to benefit from the higher marginal product of capital. However, these capital flows were largely misallocated and they did not translate into faster total factor productivity (TFP) growth. As a consequence, several EMU Member States accumulated severe fiscal and/or macroeconomic imbalances and were left exposed to sudden stops of capital flows when hit by the global economic and financial crisis. In others, persistently weak domestic demand has led to large current account surpluses. In response to the crisis macroeconomic surveillance was strengthened and expanded beyond the fiscal domain. At the same time, some Member States implemented ambitious reform plans, contributing to a process of structural adjustment in the periphery. Despite these efforts, differences in Member States exposure to shocks have persisted and the adjustment capacity to respond to shocks has remained insufficient in many countries. This is worrisome since the sluggish medium-term growth prospects and the proximity to the zero-lower-bound are likely to put Member States' adjustment capacity to test in the coming decade.

The five Presidents propose measures to better incentivise the implementation of reforms, thus fostering a sustainable real convergence process in the euro area. Measures to reinforce economic coordination in the context of the European Semester notably include a more effective use of the instruments of the Macroeconomic Imbalance Procedure (MIP). In addition, coordination could be reinforced by the establishment of a system of Competitiveness Authorities. These authorities should assess whether wages are in line with productivity but could also assess progress made with economic reforms with a view, in particular, to address the euro area's weak productivity problem. Such a system could increase ownership of reforms at the national level, although ensuring a fruitful cooperation between the national and supranational level may turn out to be challenging. Overall, measures to strengthen the national adjustment capacity are vital for a sustainable functioning of the EMU and should, in the medium-term, take a binding nature via a set of agreed common standards.

A second challenge is to ensure that financial markets no longer hamper the smooth functioning of the EMU or threaten its existence. The close nexus between banks and sovereigns, insufficient financial integration and the lack of financial market discipline can hamper economic growth and the corresponding adjustment process in the euro area. Recent EU level initiatives – the establishment of a Single Supervisory Mechanism (SSM) for the banking sector and a Single Resolution Mechanism (SRM) – will reduce macro-financial risks.

The additional elements proposed by the five Presidents to complete the financial union deserve our

full support. In particular, measures to complete the banking union, such as concrete steps towards the common backstop to the Single Resolution Fund (SRF) and a common Deposit Insurance Scheme, are crucial. The launch of a Capital Markets Union would contribute to the integration of equity markets across the EU. This would reduce the volatility of cross-border investment. It would also enhance risk sharing by helping to reallocate excess savings within the euro area via equity rather than debt. These elements should help to reduce the risks of local negative loops between banks, sovereigns and the non-financial private sector, even though some flanking measures may have to be considered.

A third challenge is that sound fiscal policies are a matter of vital common interest in the EMU. Unsustainable fiscal policies not only endanger price stability in the Union, but also harm financial stability insofar as they create contagion between Member States and financial fragmentation. The ultimate goal of fiscal policies in the EMU is twofold: they aim to guarantee sustainable public debt ratios and to allow fiscal automatic stabilisers to operate freely in order to cushion country-specific economic shocks. While the fiscal surveillance framework has been significantly strengthened in recent years, it has also become more complex owing to a multiplication of procedures and rules.

The proposals by the five Presidents would indeed help to strengthen the implementation of responsible national fiscal policies in the euro area.

A new advisory European Fiscal Board would coordinate and complement national fiscal councils by providing a public and independent assessment of fiscal performance against the economic objectives and recommendations set out at the EU level. In addition, a common macroeconomic stabilisation function could be established in the medium-term to better deal with large shocks than cannot be managed at the national level alone. While the adjustment to asymmetric shocks heavily depends on the response at the national level, the crisis has shown that the national adjustment capacities can be insufficient to deal with large shocks. Overall, these measures should contribute to much better fiscal outcomes. However, further work is needed to streamline the fiscal surveillance framework and design rules that strike an appropriate balance between simplicity and economic efficiency.

These proposals are not removed from the present Greek crisis. In order to tackle its root causes, it is key to transform the current lack of trust into a positive reform spirit and bring all Member States to agree on the way forward. The main lessons from the crisis indicate that more ambitious changes in the governance framework are necessary to ensure a successful and sustainable functioning of the EMU. The Greek crisis makes this all the more urgent: swiftly implementing the proposals in the Five Presidents' Report would be a tangible way to show to Europe's citizens that there is political determination to build our future together.

I. The euro area services sectors [1]

In modern and increasingly globalised value chains, services are closely intertwined with other sectors of the economy and across borders. Therefore, where they show underperformance, this has consequences for the economy as a whole.

Services are also relevant for the functioning of the economic and monetary union. With no exchange rate between themselves, the ability of euro area Member States to adjust to specific shocks depends on the ability of their economies to adjust through their production and prices. This adjustment is hampered if rigidities and distortions affect significant sectors of the economy. Indeed, given that services are traditionally less exposed to competition, they are more likely to suffer from rigidities which prevent them from reacting efficiently to economic signals. In some Member States, rigidities in services –which are to a large extent non-tradable- can also be an important constraint on growth in domestic demand, thereby hampering intra-euro area current account rebalancing.

This chapter shows that service sectors have both strong backward (demand) and forward (supply) interlinkages with manufacturing, and that these spillovers also create added value. Econometric estimates show that productivity growth in services contributes to the export performance of manufacturing. Evidence of underperformance in services sectors is presented in terms of a misallocation of productive resources across firms and relatively high mark-ups. These facets of underperformance are driven by a lack of competition. Indeed, product market regulation is for some countries and service sectors still relatively strict.

By tackling structural bottlenecks, reforms to liberalise and enhance competition in service sectors can play an important role for growth and competitiveness. Although there is a general consensus on the need to liberalise service sectors in the euro area, little progress has been achieved over the last few years as only a few Member States have carried out significant reforms.

I.1. Introduction

Service sectors, like wholesale and retail trade, transport, telecommunications and business services are often studied in isolation, with no consideration of their potential role in a country's overall macroeconomic performance. There is, however, strong evidence that the functioning of service sectors affects the whole economy, not only because of their sheer size but also because of their interlinkages with other sectors in the economy. Services are used as inputs in the production process of downstream firms, and service sectors are in turn an important source of demand for upstream producers.

Well-functioning service sectors are therefore an important ingredient of a country's overall macroeconomic performance. Various signals of possible underperformance in service sectors require policy attention. Such underperformance can become visible in relatively low productivity, high mark-ups, and an inefficient allocation of resources. At the same time, it appears that service sectors in many countries are still subject to competition-unfriendly regulation.

Reforms tackling structural weaknesses in service sectors can help to remove impediments to fundamental drivers of growth: they can foster employment creation and investment and improve productivity. Reforming services is high on the agenda of the EU's European Semester and six euro area countries have received country-specific recommendations (CSRs) related to their services sectors. In addition, the euro area as a whole has also received a recommendation in the area of services. Service sector reforms can, however, face opposition from the rent-seeking activities of groups protecting their interests. Providing evidence of the potential economy-wide benefits of such reforms could help to overcome resistance and build political support for reforms.

This chapter first provides evidence of the key role that service sectors play in the economy, including their role as drivers of manufacturing exports, which is an aspect that is seldom considered. It

(1) Chapter prepared by Erik Canton, Mats Marcusson and Josefina Monteagudo.

then reviews a series of performance indicators. ([2]) Finally some policy implications are discussed.

I.2. The economic contribution of market services

Market services ([3]) are the largest economic sector in euro area economies: in 2014 they generated 51 % of euro area GDP and accounted for 45 % of employment. In addition, their increasing interconnectivity with other sectors (including manufacturing as well as non-market services) magnifies their significance for the overall economy's performance. Their economic importance exceeds their size in several ways:

- Services are important determinants of competitiveness as they are both 'inputs' in, and facilitators of, exports. Manufacturing firms both use and offer services as a means to improve their competitiveness. This can work in essentially two ways. The first way is through increased productivity and/or reduced costs; the second, through upgrading their products so that they can charge customers a higher premium. Services, which increase management skills and improve the organisation of firms, are examples of the former effect. A well-known example of the latter is the smart phone, in which the manufactured hardware, the telephone itself, is bundled with a range of different services.

- Compared to manufacturing, services are relatively labour intensive and thus a natural source of job creation. This is an important consideration when emerging from a crisis, as well-functioning service sectors can more easily absorb workers affected by restructuring.

- Rigidities in service sectors hinder the adjustment capacity of an economy to shocks and the efficiency of resource reallocation. The inadequate regulation and lack of competition that often characterises services sectors can lower their resilience and adjustment capacity to shocks by creating rigidities and distorting economic signals. This has particularly important implications for the euro area because of the absence of nominal exchange rate movements as an alternative adjustment mechanism.

- Finally, despite their increasing tradability, services are still mostly non-tradable. Rigidities in services can therefore be an important constraint on growth in domestic demand, thereby contributing to an asymmetric process of current account rebalancing within the euro area.

I.2.1. Services and the rest of the economy

Services have become increasingly interconnected with other sectors, both as users of other sectors' inputs and as inputs into the production process of other sectors. The strength of the interconnections between services, either as users of other sectors' inputs, or as suppliers of inputs to other sectors, is gauged by backward or *demand* linkages and forward or *supply* linkages respectively.

Backward linkages measure the multiplier effects that services have on the rest of the economy. These backward linkages show the total production generated, directly and indirectly, to satisfy one euro of final demand for services. The range of the value of multipliers for services in the euro area is 1.5 (financial services) to 2.5 (air transport). ([4]) Air transport and other service sectors such as telecommunications, business services, wholesale trade and financial services have relatively large demand linkages. It is worth noting that demand spillovers generated by some service sectors are of the same order of magnitude as the ones generated by manufacturing industries such as transport equipment and the chemical industry (see Graph I.1).

The role of services as intermediate inputs into the production of all goods and services produced in the economy is analysed by calculating forward or *supply* linkages. The forward linkages show the total production generated in downstream industries, directly and indirectly, by one euro worth of supply

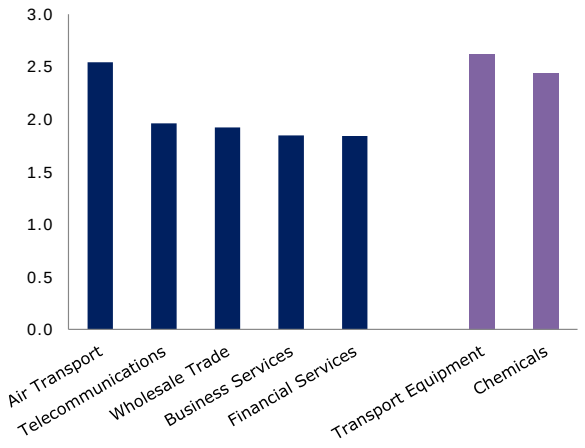
([2]) A problem when assessing performance in services sectors is data availability and thus it is not always possible to present up-to-date indicators.

([3]) Through the chapter, services are defined as market services and include: wholesale and retail trade; transport; accommodation and food service activities; information and communication; financial services; real estate activities; and professional, scientific and technical activities. Public administration, defence, education, human health and social work activities are therefore excluded.

([4]) Calculated as the average of backward linkages in euro area countries. The domestic linkages account for around 90 % of total backward linkages, thus only 10 % of the demand leaks out abroad. Data source is Input-Output tables from the World Input-Output Database (WIOD), www.wiod.org.

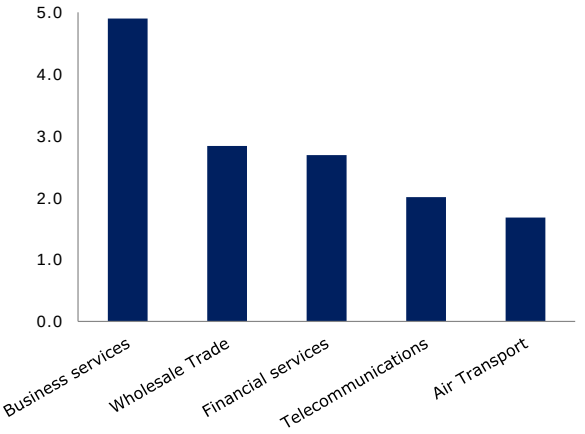
in an upstream industry. The range of these interlinkages for services in euro area economies is 1.3 (for air transport) to 4.8 (for business services). Indeed, business services and wholesale trade are the service sectors with the strongest forward links with the rest of the economy (Graph I.2). ([5])

Graph I.1: **Demand effects — Backward linkages for selected services and manufacturing industries, euro area(1)**



(1) 2011 averages for the 19 euro area countries. See main text for the explanation of backward linkages.
Source: WIOD, www.wiod.org

Graph I.2: **Supply effects — Forward linkages for selected services industries, euro area(1)**

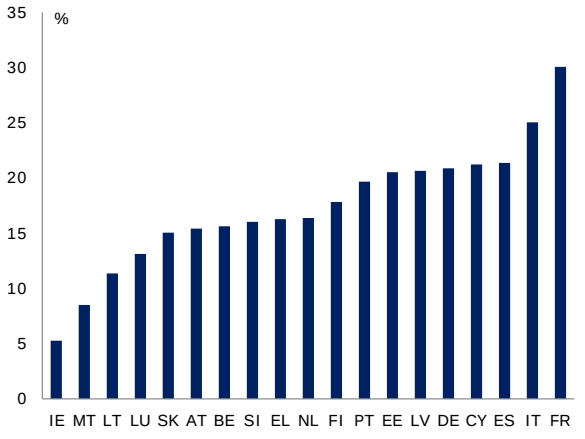


(1) 2011 averages for the 19 euro area countries. See main text for the explanation of forward linkages.
Source: WIOD, www.wiod.org

But do these interlinkages between services and other sectors create significant added value? The answer is yes. Graph I.3 shows the domestic value-added content of market services embodied in manufacturing exports in 2011, the latest year for which data are available. There is a large variation across euro area countries. Irish manufacturing, for example, uses domestic services to a much lesser extent than French manufacturing industries. Note, however, that a high content of domestic services in value-added does not necessarily indicate healthy domestic service sectors. This is partly because small and open economies tend to source more intermediate goods and services from abroad than large countries. Moreover, a high value-added content of domestic services can be compatible with low productivity, in particular for non-tradable services as manufacturing firms cannot easily find foreign substitutes for them.

Countries whose manufacturing exports use a high proportion of domestic services could therefore potentially boost their export performance by addressing underperformance in their service sectors.

Graph I.3: **Domestic services value-added content of manufacturing exports, euro area countries(1)**
(2011, %)



(1) Calculated as percentage of total manufacturing exports.
Source: WIOD, www.wiod.org

I.2.2. Services and competitiveness ([6])

Services are important for exports of goods and services. The competitiveness of manufacturing firms in open economies is determined partly by

([5]) Euro Area services industries have on average stronger forward linkages than manufacturing industries while the opposite is true for backward linkages. Average services forward linkages is 2.7 while average manufacturing forward linkages amount to 1.4. Calculations based on World Input-Output tables.

([6]) The results are based on a forthcoming publication by W. Connell, M. Marcusson and J. Monteagudo.

access to low-cost and high-quality services (telecommunications, transport and distribution services, financial intermediation, business services etc.). But to what extent do well-functioning domestic service markets have an impact on the export of manufactured goods?

This question can be addressed by combining information on the importance of different service sectors in the production of manufactured goods with an indicator of service sector performance i.e. labour productivity growth. Empirical evidence shows that in a majority of euro area countries and for the euro area on average, there is a negative correlation between productivity growth in service sectors and their forward (*supply*) linkages with the rest of the economy. Reforms that improve the capacity of service sectors to innovate and adjust and increase competition should translate into productivity gains. This, in turn, should benefit manufacturing sectors which use the inputs of services in the production of goods.

An augmented export growth equation that incorporates the importance of service sector efficiency confirms that service sectors matter for exports. The methodology and key results are presented in Box I.1. The econometric findings support the hypothesis that productivity growth in services (the proxy for efficiency) can be an important driver for the growth of manufacturing exports.

But not all service sectors contribute equally to increased manufacturing exports. Higher productivity in business services, telecommunications and postal services, and financial services, increase growth of manufacturing exports. However, it seems that the trade (wholesale and retail) services, transport services, and hotels and restaurants, do not significantly affect the growth of manufacturing exports. The lack of statistical significance for transport services may seem surprising, however, the results should not be interpreted as suggesting that transport services are not important for exports. Rather, it means that productivity changes in the transport sector (which were relatively flat over the sample period) have had less impact on export growth than productivity changes in other services sectors. A plausible explanation for this result may be that transport includes three sub-sectors -air, land and water transport- whose productivity performance may have evolved differently, making the aggregate coefficient less meaningful.

The results in Box I.1 show that the estimated elasticities for the service sector productivity variables do not seem to be large. However, when used in conjunction with the average productivity growth in services observed during the sample period, the impact on exports can be as high as the impact of the real effective exchange rate. (7) Thus the efficiency of services used by exporting manufacturing industries seems to be an important determinant of the non-price competitiveness of goods exports.

I.3. The economic performance of services

The integration of services has been high on the European agenda for the single market over the last two decades. Despite their economic importance and the recognition of their importance at the EU level, service sectors have not always been high on the reform agendas of Member States. This has not been because reforms were not needed, on the contrary, many service sectors show signs of underperformance and limited competition. The lack of competitive pressure can be linked to limited tradability, small national markets, the limited presence of foreign firms, 'natural' monopoly characteristics, or just regulation.

In this section three indicators are presented: Unit Labour Costs (ULC) developments as a measure of the competitiveness of services, and allocative efficiency and mark-ups as other measures of their economic performance.

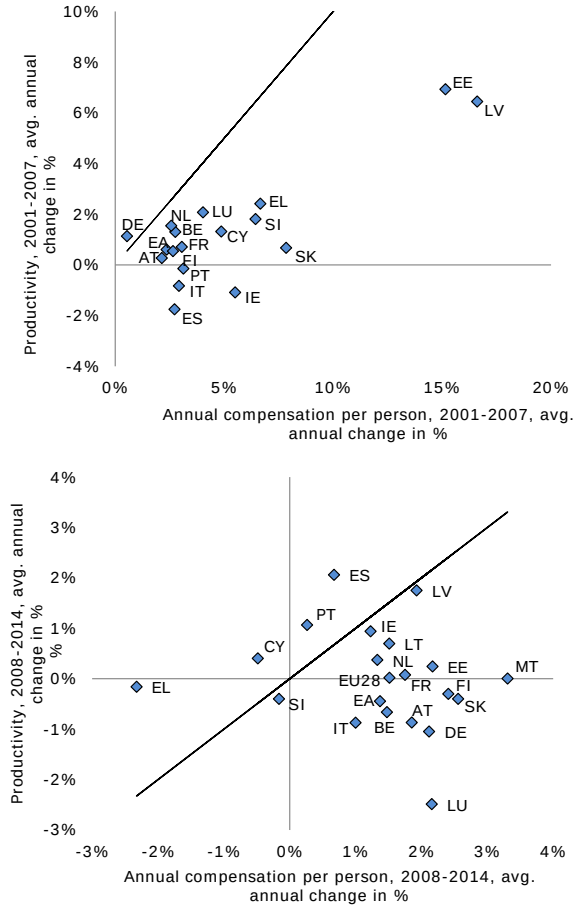
I.3.1. The 'competitiveness' of services

To what extent do labour productivity developments in services go hand in hand with labour compensation trends? Graph I.4 shows the average annual per capita growth rates for labour productivity and labour costs in market services before (top panel) and after (bottom panel) the crisis. The comparison between these two indicators can be seen as an indicator of competitiveness gains.

(7) The average impact is larger for telecommunications, followed by financial and business services.

The graph shows that since the crisis, labour productivity in market services has only outpaced labour compensation in countries such as Portugal, Spain, Cyprus and Greece (those left of the diagonal line), which have experienced strong market pressures and which have been undergoing major competitiveness adjustments. There are however significant differences between them. While Portugal and Spain show increases in both labour productivity and wages, the strong wage adjustment in Greece has not been accompanied by improvements in labour productivity in services.

Graph I.4: **Compensation per hour and labour productivity before (top)and after the crisis (bottom), euro area countries**

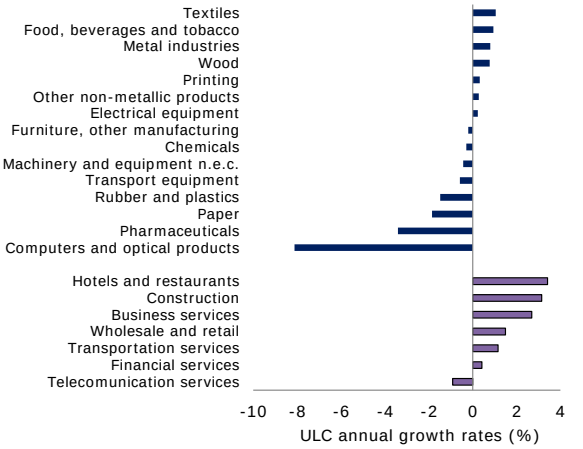


Source: DG ECFIN calculations based on Eurostat data.

The situation before the crisis was quite different with most countries showing the reverse pattern of wage compensation growing faster than labour productivity. Indeed, losses of competitiveness in the pre-crisis period were driven by large unit labour cost increases in the non-tradable sector. As shown in Graph I.5, euro area market services had significantly higher unit labour cost growth than manufacturing, which holds across almost all sectors.

Graph I.5: **Sectoral ULC before the crisis, euro area**

(2001-2007, avg. annual change in %)



Source: DG ECFIN calculations based on AMECO data.

I.3.2. Indicators of allocative efficiency

Allocative efficiency, the extent to which productive resources are allocated towards their most productive uses, is relatively low in service sectors compared to manufacturing. ([8]) This is shown in Graph I.6 for manufacturing sectors compared, as an example, with professional services. ([9])

The allocative efficiency indicator (AE) uses information on employment and value-added distribution across firm-size classes. Although data are only available until 2011, it is useful to look at the insights of this, rather structural, indicator. The interpretation is the following. In, for example, the Austrian manufacturing sector, the actual allocation of resources implies a 23 % higher productivity (compared with a theoretical benchmark where all resources would be allocated uniformly across firms). For services, the AE indicator is typically negative, implying that firms with relatively low productivity have above-average market shares. In the case of Austria, the productivity loss from this

([8]) European Commission (2013), 'Product market review 2013: Financing the real economy', *European Economy 8/2013*, DG ECFIN, European Commission.

([9]) Professional services are part of market services (and therefore included in this aggregate sector in the analysis). The indicator for allocative efficiency is calculated for NACE Rev. 2 sectors (not for market services as a whole), where sector M corresponds to professional services.

Box I.1: The role of services in EU exports

The model estimates consists of an export demand equation that includes, together with relative prices and foreign demand, the extent and efficiency of interlinkages between manufacturing and services. A panel data model is estimated for 22 Member States, of which 15 have adopted the Euro (1), and 10 manufacturing sectors for the years 2000-2013. The econometric analysis follows the approach in European Commission (2010). (2)

$$\Delta lnX_{c,i,t} = b_1 \Delta lnREER_{c,i,t-1} + b_2 \Delta lnM^*_{c,i,t} + b_3\, FL_{c,i} \Delta ln\, ProdServices_{c,i,t-1} + \lambda_{c,i} + CRISIS_t + EA_c + \varepsilon_{c,i,t}$$

Where t indexes time, c country and i sector. The dependent variable, X, is real manufacturing exports. REER is the real effective exchange rate from AMECO with national export prices as deflators, http://ec.europa.eu/economy_finance/db_indicators/ameco/documents/list_of_variables.pdf. M^* is foreign demand which is measured by foreign imports. Exports and imports are collected from COMTRADE and deflated with national export and import prices. *ProdServices* is a vector capturing the efficiency of different service sectors, measured by the sectors' labour productivity. The productivity variable is combined with the *supply* or forward linkages between each service sector and manufacturing sectors (*FL*). The forward linkages are calculated from the WIOD input-output tables. (3) The resulting variable measures therefore not only the productivity of service sectors, but also how interconnected they are to manufactures as suppliers of inputs. The service sectors considered are: trade (including wholesale and retail); transport (including air, water and land transport); hotels and restaurants; business services (including professional services, scientific and technical activities, R&D activities and advertising and marketing research), telecommunications (including also postal services); and financial services. Finally, the model also includes country and sector dummies ($\lambda_{c,i}$), and controls for the crisis and membership in the euro area.

The results show that the relative price and foreign demand variables are significant with the expected signs: an increase of foreign demand growth increases export growth (elasticity of almost 0.7) while a real appreciation negatively affects export growth (elasticity of -0.3). The productivity performance of service sectors matters for exports, particularly productivity growth in business services, telecommunications (and postal services) and in the financial sector. The estimated elasticities for these three sectors are of the order of 0.06 -0.07. The coefficient of the euro area dummy implies that being in the euro area gives a country a premium in the form of higher export growth of 0.8 pps.

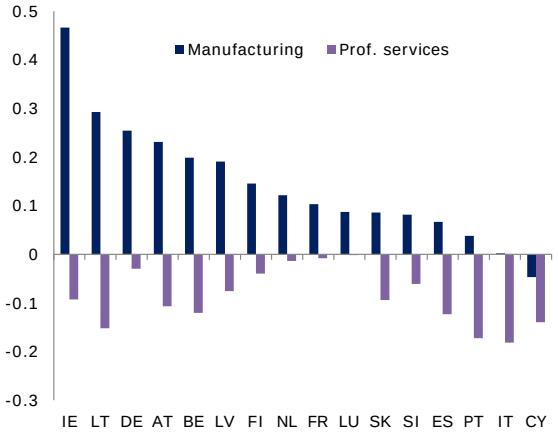
Dependent variable is real export	
REER $_{t-1}$	-0.31**
	(0.11)
Foreign demand $_{t}$	0.68***
	(0.04)
Productivity trade services $_{t-1}$	-0.03
	(0.04)
Productivity business services $_{t-1}$	0.07**
	(0.03)
Productivity transport services$_{t-1}$	0.03
	(0.02)
Productivity financial services $_{t-1}$	0.06**
	(0.02)
Productivity telecommunications $_{t-1}$	0.06**
	(0.02)
Productivity hotel and restaurants $_{t-1}$	0.01
	(0.03)
Euro Area	0.8**
	(0.25)
Crisis	-0.03***
	(0.01)
N	2 320
R^2	0.57
adj. R^2	0.53
Fixed Effects	Country & Sector

Note: Standard errors in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.001$. The variables, REER, foreign demand and productivity in services are expressed as first difference logs. The productivity in services variable is combined with the *supply* or forward linkages between services and manufactures.

(1) Lack of data on productivity in services industries, made it impossible to construct the services interlinkages variable for Croatia, Cyprus, Estonia, Ireland, Luxemburg, Malta and Sweden.
(2) European Commission (2010), 'Product Market Review 2010-11', *European Economy 8|2010,* DG ECFIN.
(3) www.wiod.org

mis-allocation of resources is about 10 %. In France and Germany the AE indicator is close to zero, but these countries could also reap substantial gains by reallocating resources in order to arrive at positive values for the indicator (as observed in for example the United Kingdom where it is +6 %).

Graph I.6: **Allocative efficiency, euro area countries(1)**
(2011, %)



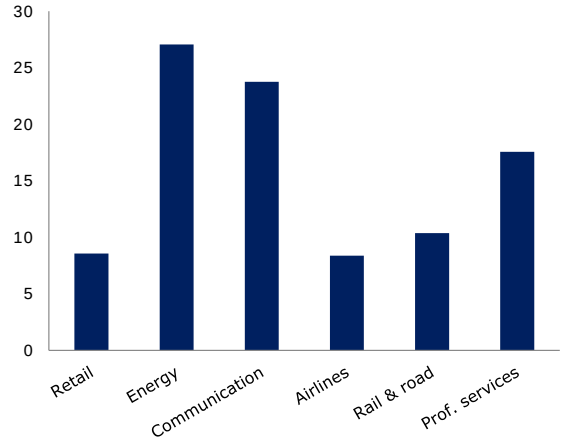
(1) Some EA countries are missing because of data availability issues.
Source: DG ECFIN calculations using Eurostat data.

I.3.3. Competition indicators: mark-ups ([10])

Mark-ups, i.e. the difference between the cost and the selling price of a good or service, are an important determinant of the producer and consumer surplus. Lower mark-ups increase purchasing power for consumers and downstream users and are generally seen as welfare enhancing.

This sub-section presents estimates of mark-ups in the services sectors of EU Member States. The work is based on an extension of Roeger's (1995) mark-up estimation methodology by allowing for the mark-ups to depend on sectoral product market regulations. ([11]) Roeger's methodology was previously used by DG ECFIN to compute time-invariant mark-ups. Changes in product market regulations and competition in Member States, however, are likely to have changed mark-ups. With the additional assumption that mark-ups depend on product market regulation, one can estimate time-varying mark-ups. It is then assumed that the mark-up in country *i*, sector *j*, and time *t* is a function of the sector-specific product market regulation and a country-specific component controlling for other factors (see Box I.2). Using the EU-KLEMS/WIOD database, the OECD sectoral Product Market Regulation indicators and applying Roeger's method, mark-up estimates are derived for the six sectors shown in Graph I.7.

Graph I.7: **Mark-ups in selected service sectors, euro area**
(2013, %)



Source: DG ECFIN calculations based on Thum-Thysen and Canton (2015).

In general, the regressions confirm the existence of a strong link between mark-ups and regulation: declining mark-ups over time are related to a reduction in the strictness of product market regulations. For example, in the Austrian retail sector, estimated mark-ups decreased from 17 % in 1996 to 9 % in 2013. In the Spanish professional services, the mark-up declined from 28 % in 1996 to 18 % in 2013. Secondly, with regard to the comparison across sectors, comparably high mark-ups in energy, communication (that includes postal and telecommunication activities) and professional services are found.

This may, to some extent, be explained by sector-specific technological characteristics (such as high fixed costs in network sectors), but can also indicate above-normal rents associated with sheltered competition and restrictive product market regulation.

([10]) The results in this section are based on Thum-Thysen A., and E. Canton (2015), 'Estimation of service sector mark-ups determined by structural reform indicators', *European Economy — Economic Papers,* No 547, DG ECFIN, European Commission.

([11]) Roeger W. (1995), 'Can imperfect competition explain the difference between primal and dual productivity measures?' *Journal of Political Economy*, Vol. 103, No 21, pp. 316-330.

Box I.2: Methodology for the mark-up estimations (*)

To estimate time-varying mark-ups based on structural reform indicators a method developed by Roeger (1995) is used. A well-known measure of mark-ups is the Lerner index, which relates prices to marginal costs. The difficulty with this direct measure of mark-ups is that marginal costs are not directly observable. Therefore, Hall (1988) came up with an indirect measure based on short-run fluctuations of production inputs and output on the macro level. The idea is the following: under perfect competition, production input shares equal output elasticity. Under imperfect competition, however, production input shares are smaller than output elasticity because the monopolist collects rents and factors are consequently remunerated below their productivity. As a consequence the Solow Residual underestimates factor input contribution to output growth and this measurement error can be used to estimate the mark-up. The non-zero difference between the primal (SR) and dual (SRP) Solow Residual can be written as:

$$SR_{it} - SRP_{it} = B(PMR_{it})\left(\Delta y_{it} + \Delta p_{it} - (\Delta k_{it} + \Delta r_{it})\right) + b_1 \Delta PMR_{it}$$

Δy_{it}, Δp_{it}, Δk_{it}, Δr_{it} are the log differences of output, price of output, capital and price of capital. B is interpreted as the mark-up, and PMR measures the strictness of product market regulation.

The estimation model is derived as follows. Assuming $B_{it}=b_{0i}+b_1 PMR_{it}$, inserting this in the above equation, defining $Y_{it}=SR_{it}-SRP_{it}$ and $Xit=\Delta y_{it}+\Delta p_{it}-(\Delta k_{it}+\Delta r_{it})$ and adding an error term provides the following equation, which is estimated by sector in order to retrieve sectoral estimates of the parameters β_{0i} and β_1:

$$Y_{it} = \beta_{0i} X_{it} + \beta_1 (PMR_{it} X_{it} + \Delta PMR_{it}) + \varepsilon_{it}$$

Note that a main difference with traditional panel methods is that the country-specific term β_{0i} is a slope parameter rather than an intercept. The term β_{0i} is interpreted as a country-specific random coefficient (varying across countries), rather than a country-specific fixed or random effect.

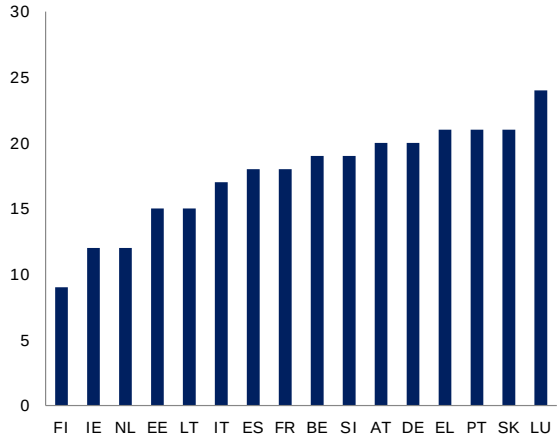
The PMR indicator is not the only factor that explains mark-ups; indeed competition or labour market policies may play a considerable role. Furthermore, country-specific factors such as capital costs - and in particular transfer pricing - may bias the estimation results for the country-specific effects and cause measurement errors. These two facts could explain why in some countries (in particular Italy in the retail sector) despite comparably strict product market regulations, the mark-up calculated from the estimation model is low compared to countries with lose product market restrictions such as the United Kingdom. A GDP-weighted average of country-specific effects β_{0ave} can be used, so that cross-country variation stems only from the PMR indicators and cross-country variation coming from capital productivity is averaged out. The estimates shown in this section are based on the GDP-weighted average.

(*) Based on Thum-Thysen and Canton (2015)

Relatively low mark-ups were found for the retail and transport sectors. ([12]) From a cross-country perspective, the estimations point at low to medium mark-up levels in UK, the Netherlands, and Denmark. Country examples with medium to high mark-ups differ per sector. For example, high mark-ups in professional services are found in Greece, Portugal, Slovakia, and Luxembourg. High mark-ups in retail are found for Luxembourg, Belgium, and Italy. Graph I.8 shows the estimated mark-ups in 2013 across the included euro area countries for the professional services.

([12]) The sectors covered in the estimations do not cover manufacturing. Other studies typically find that mark-ups in services are higher than in manufacturing. For example, an ECB study reports average mark-up ratios in the euro area for the 1981-2004 period of 1.56 for market services and 1.18 for manufacturing & construction, cf. Christopoulou R. and P. Vermeulen (2008), 'Markups in the Euro Area and the US over the period 1981-2004; A comparison of 50 sectors', *ECB Working Paper Series*, No 856.

Graph I.8: **Mark-ups in professional services, selected euro area countries**
(2013, %)



Source: DG ECFIN calculations based on Thum-Thysen and Canton (2015).

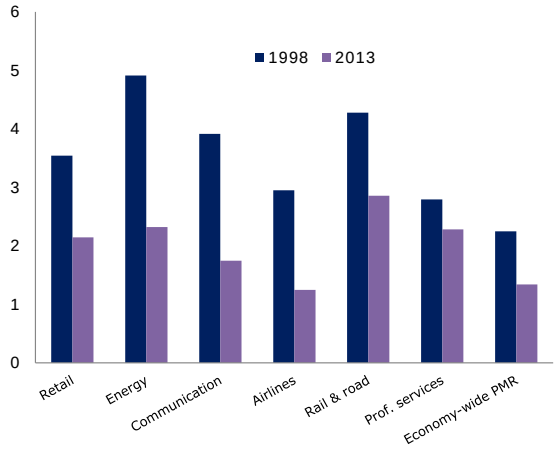
I.4. Improving the functioning of services

I.4.1. Regulation indicators in services

The product market regulation in services indicator of the OECD (PMR) approximates the level of regulatory burden for retail, professional services, transport, energy and communication sectors. The PMR indicators take values from 0 (least restrictive) to 6 (most restrictive).

Graph I.9 shows the indicator values for the different service sectors for the initial (1998) and the final (2013) year compared to the economy-wide PMR. The graph shows that, in all sectors, product market regulations were generally less strict in 2013 than they were in 1998, but progress has been slow in professional services. These averages for the euro area hide differences across countries. OECD countries that show comparatively low PMR in several sectors are the Netherlands, the United Kingdom, Sweden, Australia and the United States (the Netherlands being the only euro area country). In several sectors, the variability across countries seems to have decreased and countries seem to converge to more similar levels of product market regulation. This is in particular the case in the energy sector, the communication sector and the rail and road sectors, likely driven by EU regulatory framework in these sectors. ([13]) ([14])

Graph I.9: **PMR indicator, euro area**
(1998, 2013)



Source: DG ECFIN calculations based on OECD.

Reduced strictness of product market regulations can contribute to sectoral performance through various channels. For example, abolishing unnecessary regulation can help to achieve a more efficient allocation of productive resources in the sector. The relationship between allocative efficiency and product market reform can work through business dynamics, i.e. the entry and exit of firms in the market. The idea is that reduced product market regulation can foster the entry of productive new firms and the exit of inefficient firms, which would contribute to allocative efficiency. Canton, Ciriaci and Solera investigate this for the professional services ([15]) and find that a reduction of the PMR indicator by one point increases business dynamics (the sum of the entry and exit rate in a market) on average by 1.75 percentage points, which in turn increases allocative efficiency by 5.7 percentage points.

In addition, regulation could have an impact on firms' price setting behaviour. The earlier mentioned work by Thum-Thysen and Canton can be used to calculate the impact of changes in the PMR on mark-ups, and a typical finding is that a

([13]) However, this convergence is observed across most OECD countries, and is not confined to the euro area.

([14]) The estimated impact of the PMR on mark-ups is sector-specific, which explains for example that the observed reduction in the PMR in the communication sector has yielded only a relatively modest reduction in the mark-ups.

([15]) Canton, E., D. Ciriaci, and I. Solera (2014), 'The economic impact of professional services liberalisation', *European Economy — Economic Papers,* No 533, DG ECFIN, European Commission.

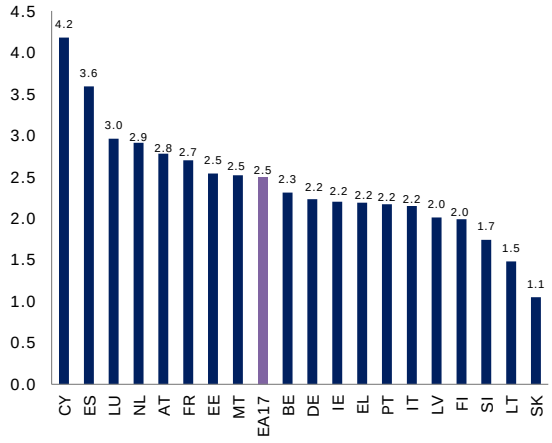
1 point decrease in the PMR indicator would reduce mark-ups by about 1 percentage points for rail & road, by 3 percentage points for energy, and by 5 percentage points for retail and professional services (for the other sectors the results are statistically insignificant). ([16]) ([17])

I.4.2. Implementing the Services Directive ([18])

The Services Directive (SD) has been a milestone in leading the Member States to simplify administrative procedures for business and to eliminate requirements that undermine fair competition in the Single Market. The services covered by the Directive account for nearly 45 % of EU GDP. ([19]) Thanks to the implementation of the Services Directive, Member States have improved their regulatory environment for businesses but reforms have been flagging in recent years in many Member States and much further work remains to be done.

Lack of reform has a significant cost in terms of growth. In fact, estimates of the potential GDP gains from implementation of the Services Directive are significant. Graph I.10 shows the reform gains in terms of GDP if countries were to reduce regulatory barriers to the level of the five best-performing countries (per sector). For the euro area as a whole, this ambitious implementation could yield about an extra boost to GDP of 2.5 %, with the majority of effects materialising during the 5-10 years following implementation. Given the reform efforts so far, more than half of the benefits are, on average, still pending.

Graph I.10: **Services directive: GDP impact of ambitious implementation, euro area countries[(1)]**
(2011, %)



(1) If countries would reduce barriers to the level of restrictions of the five best countries in the EU.
Source: Monteagudo et al. (2012)

I.4.3. Services-related CSRs

Service sector reforms are an important challenge for many euro area Member States and for the euro area as a whole. An assessment of the degree of implementation of the 2014 services-related country-specific recommendations yields a very low score and shows service sector reforms as one of the main areas lagging behind in terms of reform efforts. Indeed, no country has shown significant progress and reforms either lack ambition (i.e. France in professional services) or face difficulties in adoption or implementation (i.e. Spain also in professional services).

Member States have not seized the opportunity to make service markets more flexible and stimulate growth through a reduction in barriers. Cumbersome authorisation requirements, strict legal form and shareholding requirements, reserved activities, insurance obligations and complex administrative procedures, remain obstacles.

Country-specific recommendations that aim to improve the functioning of services markets have been proposed for a number of euro area countries in 2015: Austria, Germany, Spain, Finland, France and Italy. The euro area has also received a CSR in this area. The focus is on taking measures to stimulate competition and removing

([16]) Mark-up reductions can be driven by particular types of product market regulations. For example, professional services mark-ups are mostly affected by entry regulations, and retail sector mark-ups by registration and licensing regulations.

([17]) Mark-ups and allocative efficiency are often-used indicators of a sector's static efficiency. In this paper service sector performance in terms of innovation (a form of dynamic efficiency) is not discussed. Indeed, increased firm entry may also contribute to productivity gains through Schumpeterian creative destruction (see for example Aghion P., R. Blundell, R. Griffith, P. Howitt and S. Prantl (2004), 'Entry and productivity growth: Evidence from microlevel panel data', *Journal of the European Economic Association*, vol. 2, pp. 265-276).

([18]) See Monteagudo, J., A. Rutkowski and D. Lorenzani (2012), 'The economic impact of the Services Directive: A first assessment following implementation', *European Economy — Economic Papers, No 456*, DG ECFIN, European Commission.

([19]) The scope of the Directive is broad both in terms of requirements and sectors covered: wholesale and retail trade, construction, business-related services, most regulated professions, tourism, etc. Economically important sectors excluded (e.g. financial services, telecommunications, transport) are covered by other EU legislation.

disproportionate and unjustified restrictions. Regulated professions, and to a lesser extent retail services, are priority sectors for reform.

I.5. Conclusions

Given the sheer size of service sectors and their inter-linkages with the rest of the economy, the economy-wide effects of reforms to liberalise them are considerable.

Euro area countries are aware of the importance of reforming service sectors but they face challenges in designing, adopting and implementing reforms. The resistance of sometimes powerful vested interests groups that benefit from the status quo should not be underestimated.

Improving competition in services is beneficial not only from a national point of view. It is relevant for the euro area as it facilitates its adjustment capacity and the process of current account rebalancing. It is also important from a single market perspective due to the services' strong cross-border spillovers. A further integrated services market depends on the efforts undertaken by Member States to reduce barriers and facilitate the free movement of service providers across the single market. Of particular relevance are reforms adopted in the context of the implementation of the Services Directive (given its broad coverage both in terms of service sectors as well as requirements). Reforms of service sectors are ongoing but progress varies across countries and has generally slowed down. In particular, although significant progress was achieved following the entry into force of the Services Directive, reforms have been flagging in recent years in many Member States.

At EU level, further deepening the Single Market remains high on the agenda in order to help Member States' modernise their economies and become more competitive and attractive for investors. A more integrated Single Market for goods and services remains one of the priorities of the 2015 Work Programme of the European Commission and the new Internal Market Strategy will be presented to Member States by the end of the year.

In addition to identifying priority areas for action (on the basis of the economically most significant barriers), the Internal Market Strategy will also focus on enforcement policy and on regular monitoring and reporting on single market developments.

II.1. Revisiting the macroeconomic effects of oil price changes ([20])

Oil prices have fallen by around 40 % in euro terms since mid-2014, and are expected to remain relatively low in the medium term. With this situation in mind, this section assesses the effect of changes in oil prices on inflation and economic activity in the euro area. The analysis shows that the impact of low oil prices on GDP growth and inflation is likely to be substantial, with the largest change in both variables (0.6 percentage points and 0.3 percentage points, respectively) predicted to occur in 2015. The effect on employment is estimated to peak at around 1 %. The economic impact of oil prices does not seem to vary significantly depending on whether monetary policy is or is not constrained by the zero lower bound. However, the analysis also confirms that large oil price shocks have a nonlinear effect on output growth, especially in the context of the recent sharp fall in oil prices. The fall in output growth that results from a large rise in oil prices is greater in magnitude than the increase in output growth seen when there is a large fall in oil prices.

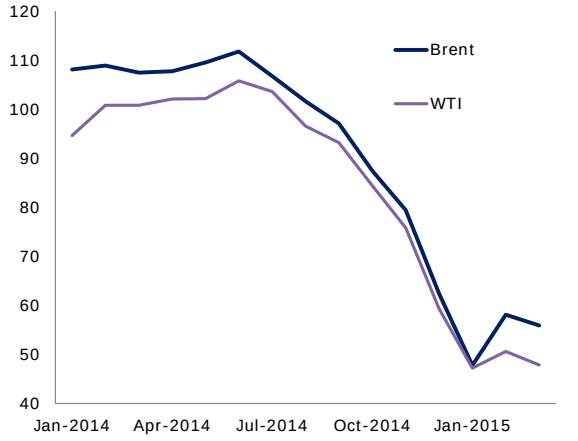
Introduction

Crude oil prices have fallen significantly since mid-2014. Prices per barrel fell by more than USD 50, i.e. more than 50 %, between June 2014 and March 2015 (Graph II.1.1).

The price fall in euro terms has been less pronounced, as a result of the depreciation of the euro against the dollar over the same period. Prices fell by around EUR 30 per barrel between June 2014 and March 2015, corresponding to a fall of around 40 % (Graph II.1.2).

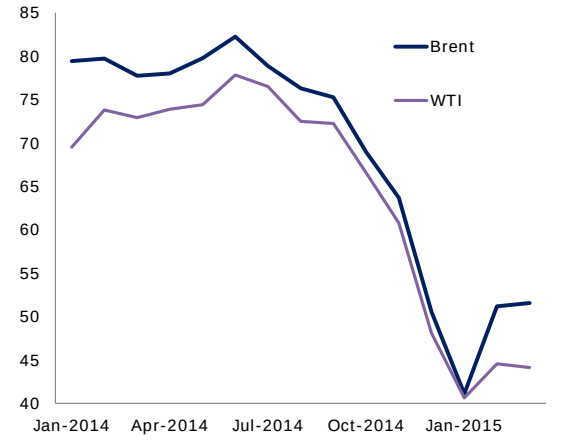
Graph II.1.3 plots the crude oil spot price relative to the Harmonised Index of Consumer Prices (HICP) for the euro area. Looking at a longer time period, it can be seen that oil prices have returned to their mid-2000s level.

Graph II.1.1: **Spot price of oil, USD / barrel**
(Jan 2014 – Mar 2015, monthly average)



Source: Thomson Reuters.

Graph II.1.2: **Spot price of oil, EUR / barrel**
(Jan 2014 – Mar 2015, monthly average)



Source: European Central Bank, Thomson Reuters.

The fall in oil prices has caused all energy prices in the euro area to drop in recent months, as illustrated by the fall in the energy component of the HICP (Graph II.1.4). The fall in the energy component of this index has been less pronounced than the fall in the sub-component representing liquid fuels. This shows that prices of other sources of energy have not fallen to the same extent as the oil price.

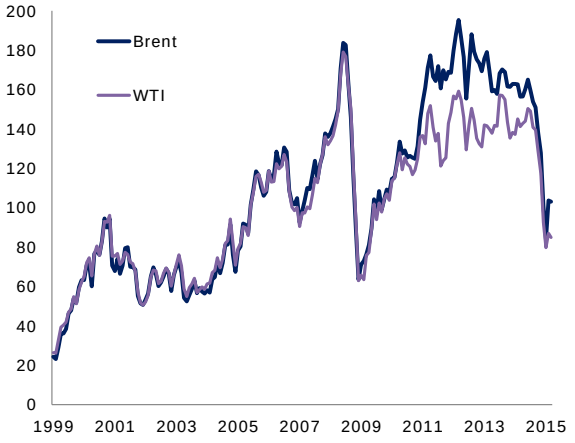
Although oil prices have recovered slightly since February, it is expected to be some time before they return to mid-2014 levels. This expectation is reflected in the Commission's spring 2015 forecast, which assumes only a limited recovery of the oil price to USD 67 per barrel by the end of 2016.

([20]) Section prepared by Rafal Raciborski, Anastasia Theofilakou and Lukas Vogel.

Low oil prices would normally be expected to have a positive effect on the economy of the euro area. This section presents the results of analysis carried out to quantify this effect and reassess the impact of changes in the oil price on the euro area economy.

Graph II.1.3: **Oil price relative to euro area HICP**

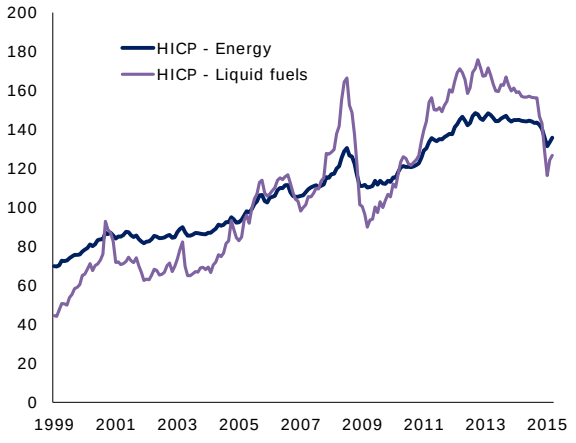
(Jan 1999 – Mar 2015, index: 2005 = 100)



Source: European Central Bank, Thomson Reuters.

Graph II.1.4: **Energy and fuel prices, euro area HICP**

(Jan 1999 — Mar 2015, index: 2005=100)



Source: European Central Bank.

The analysis draws on the results of model simulations and econometric evidence.

This section has three parts: the first discusses in general terms the transmission channels through which a change in oil prices affects overall prices and economic activity; the second part then presents the results of simulations carried out using a multi-region macroeconomic dynamic general equilibrium model designed to estimate the magnitude of the change in inflation and output caused by changes in oil prices; and the third part discusses estimates of the effect of an oil price shock generated using a threshold vector autoregression (TVAR) model. This model allows for nonlinearity in the effects of oil prices on economic activity. In particular, it takes account of the asymmetry between the effects of rising and falling oil prices.

Assessing the potential asymmetric effects of oil price shocks on economic activity is important for several reasons. First, asymmetry in the transmission of oil shocks could arise as a result of second-round effects on wages, savings or investment, which could amplify the effects of oil shocks beyond what would be expected were only direct demand and supply channels considered. Second, asymmetric effects may have implications for policy decisions, in particular in terms of how monetary policy is used to respond to oil shocks. Finally, the presence of asymmetric effects has implications for the ways in which oil prices should be modelled.

Transmission channels

The qualitative and quantitative effects of the oil price on inflation and economic activity depend on the relative strength of the various transmission channels. The oil price affects oil importers such as the euro area via three main channels: ([21])

- The real income effect: falling oil prices increase households' purchasing power by reducing the price of the oil/energy component in final demand. The complementarity between oil/energy and other items in final demand means that the real income effect is stronger than, and therefore outweighs, the substitution effect (associated with falling relative prices of oil/energy), leading to higher demand for non-oil goods and services.

- The production cost effect: a fall in oil prices reduces production costs in industries where oil is an intermediate input in production. Depending on the degree of competition, the fall in production costs may lead to higher profits or lower output prices. In the latter case,

([21]) Arezki, R. and O. Blanchard (2015), 'The 2014 oil price slump: seven key questions', *VOX*, 13 January 2015.

the real income effect (explained above) is amplified. Cheaper oil may also create a substitution effect in production, with manufacturers moving towards more oil-intensive technologies. This will also increase investment in these areas.

- The inflation effect: the fall in oil/energy prices and production costs creates downward pressure on the overall price level, i.e. leading to lower inflation. Inflation rates may even become negative (deflation) if inflation is already low.

The impact of falling inflation on economic activity depends on the response from policymakers. In particular, central banks would tend to cut benchmark interest rates if the economic situation is 'normal', thus stimulating demand and economic activity. If, however, monetary policy is already at, or close to, the zero lower bound, as is currently the case in the euro area, conventional monetary stimulus is no longer available to policymakers. Under this scenario, real interest rates may increase in response to downward pressure on prices, an effect which may partly offset the positive effects of gains in real disposable income.

In addition to experiencing the direct effects of lower prices of imported oil/energy on domestic activity, open economies, such as the euro area, are also exposed to spillover effects resulting from the consequences of changes in oil prices on other regions of the world economy.

Cross-border spillover effects from falling oil prices can be expected to be positive for the euro area, as export demand benefits from increases in real income and the resulting higher demand in other oil-importing countries. These positive effects are partly offset by the negative spillover effect of reduced demand from oil-exporting countries.

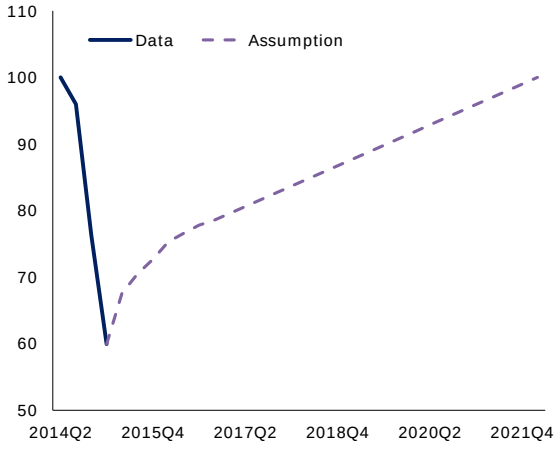
Model simulations

Changes in the oil price have a significant effect on economic activity and inflation in the euro area, and are therefore given significant consideration in forecasting. This section discusses these effects on the basis of the results of simulations generated using a three-region version of the global multi-country model, a dynamic general equilibrium model being developed by the Directorate-General for Economic and Financial Affairs and the Joint Research Centre of the European Commission. The three regions are the euro area, the US, and the rest of the world. The euro area is modelled as an oil importer.

The model includes oil as an intermediate input in the production of final output. The combination of oil and value-added (created by capital and labour) being used to produce total output follows the logic of input-output accounts, in which total output is decomposed into intermediate inputs and value-added.

An important determinant of the impact of oil price shocks is the substitutability between value-added and oil in demand. Empirical evidence suggests that the elasticity of substitution varies depending on the time period being considered. ([22]) The model therefore assumes a gradual adjustment of oil demand to relative price changes, so that the price elasticity of demand for oil is low in the short term and higher in the longer term.

Graph II.1.5: **Oil price path in the simulation (in EUR)**
(2014Q2 – 2022Q1, index: 2014Q2 = 100)



Source: Thomson Reuters, European Central Bank, DG ECFIN calculations.

The oil prices used in the simulated scenario are: the observed prices from 2014Q2 to 2015Q1 (thus a fall in the oil price); the oil price assumption used in the Commission's Spring 2015 Forecast for the period up to 2016Q4; and prices based on the

([22]) See the summary of estimates in Hamilton, J. (2008), 'Understanding crude oil prices', *NBER Working Papers*, No 14492, and Hamilton, J. (2009), 'Causes and consequences of the oil shock of 2007-08', *Brookings Papers on Economic Activity*, Spring 2009, pp. 215-283.

assumption of a continuation of the gradual recovery for the period after 2016Q4. In particular, oil prices are assumed to return to the level seen in 2014Q2 by 2022. The oil price shock is therefore being assumed to be very persistent but not permanent. Graph II.1.5 shows the underlying change in the oil price assumed for the simulation.

The oil price path reflects the effect of two shocks: a pure world oil price shock (expressed in dollar terms) and the recent euro depreciation, which is thought to have been driven by other factors. Using the oil price in USD, i.e. treating the countervailing effect of the simultaneous depreciation of the euro against the dollar as a separate factor, would amplify the negative effect of the oil price shock on inflation and its positive effect on economic activity. The model treats the fall in the oil price as if it were a pure price shock, although the effect of the euro depreciation is actually also included in the figures.

The model also assumes the price shock to have been caused by an expansion in world oil supply, in line with the empirical evidence. ([23]) Oil prices have also fallen, on various occasions in the past, as a result of slowing world demand for oil. Were lower oil prices assumed to be a consequence of slowing world demand, additional, negative spillover effects would also need to be accounted for in the model? These would cause euro area growth to slow, through the trade channel, and would increase deflationary pressures.

The model includes an excise tax on oil. This represents the non-proportional taxes levied on fossil fuels by euro area Member States. ([24]) An excise tax on oil lessens the fall seen in the price paid by consumers for oil products for any given fall in the price of oil on the world market.

The effect of the oil price shock shown in Graph II.1.5 on the main macroeconomic variables in the euro area is summarised in Table II.1.1. The results are annualised figures for each calendar year and are expressed as deviations from a no-shock, i.e. no oil price decline, baseline.

Table II.1.1: **Model simulation results: deviations from the no-shock baseline, euro area[(1)]**

(%)

	2014	2015	2016
Energy price (EUR, after tax)	-2.3	-10.6	-7.8
Oil imports (volume)	0.2	2.3	3.5
Real GDP	0.2	0.8	0.7
Employment	0.2	1.0	0.9
Private consumption	0.1	0.6	0.6
Private investment	0.4	1.0	0.8
Real GDP growth	0.2	0.6	-0.2
CPI inflation	-0.1	-0.3	0.1
Trade balance (% of GDP)	0.1	0.6	0.3

(1) Results in the upper part of the table are deviations from the baseline, in %; results in the lower part of the table (GDP growth, CPI inflation and trade balance) are deviations from the baseline in percentage points.
Source: DG ECFIN calculations.

Imposing a constant excise duty on oil products (notably fuel) moderates the effect of the fall in oil prices on domestic prices. The after-tax price of domestically consumed oil is expected to fall by only 11 % in 2015 (relative to the average price over 2014).

The demand for oil increases when the oil price falls as a result of, firstly, oil being substituted for value-added in the production of final output, i.e. the substitution effect, and, secondly, higher demand for oil resulting from higher demand for final output, i.e. the income effect. The adjustment in demand is gradual, however, delaying the increase in the demand for oil. The model simulations show demand for oil to be 2 % and 3 % above the baseline in the years 2015 and 2016 respectively.

The positive income effect resulting from lower oil prices, together with the limited substitutability between oil and non-oil goods, also increases the demand for non-oil output. The demand for domestic value-added and the demand for non-oil imports therefore increase. The simulation results estimate the fall in the oil price to make a positive

([23]) Arezki, R. and O. Blanchard (2015), 'The 2014 oil price slump: seven key questions', *VOX*, 13 January 2015. Simulating a combination of oil supply and demand shocks would require an additional shock to the scenario, namely a decline in global economic activity and oil demand. Such decline in global activity would deteriorate the situation in the euro area. With regard to the oil price effect itself, however, demand-driven and supply-driven oil price reductions should have very similar effects as they constitute a positive supply shock for the oil-importing euro area. The scenario in the article can hence be interpreted as illustrating the isolated effect of an oil price decline, whether supply- or demand-driven, without taking into account developments such as a slowdown in global activity that may have contributed to the fall in oil prices.

([24]) Taxation currently accounts for around 50-60% of the price of transport fuels in the EU. Data on energy taxation are provided by the European Commission's Directorate-General for Energy at http://ec.europa.eu/energy/en/statistics/weekly-oil-bulletin.

contribution to GDP growth in 2015 of 0.6 percentage points. In 2016, the effect on growth becomes negative, as oil prices are assumed to gradually recover. It should, however, be noted, that GDP itself remains above the baseline, due to the fact that the oil price stays below its baseline level.

The fall in the oil price initially reduces consumer prices, as shown by the negative effect on CPI inflation in 2014 and 2015. The results of the model simulation suggest that the fall in oil prices will slow CPI inflation by 0.3 percentage points in 2015. The deflationary effect remains temporary, however, as oil prices are assumed to gradually recover over the period being considered.

The euro area trade balance improves when oil prices fall, as a result of lower expenditure on oil imports. The price effect is, however, mitigated by higher import volumes, including of non-oil products. In the simulations, the trade balance, in % of GDP, is seen to peak at 0.6 percentage points above its baseline level in 2015.

The model used to produce the simulation results shown in Table II.1.1 assumes that monetary policy is operating close to the zero lower bound on nominal interest rates during the period being considered. This assumption reflects the current situation, euro area monetary policy rates being close to zero, and assumes benchmark interest rates will not be cut in response to the deflationary impact of falling oil prices. Simulations generated using models that do not assume a binding zero lower bound provide similar results. The reason for this is that the policy rule used in the model reflects a delayed and muted response to the oil shock, i.e. it assumes that there will be a moderate degree of monetary easing in response to a fall in the oil price.

Asymmetric effects of oil price shocks

The recent period of low oil prices has generated a heated debate on the asymmetric effects of oil price shocks on real economic activity. The issue has featured in a number of empirical papers, whose main focus, reflecting that of the public debate, has been on whether the effect of falling oil prices differs from that of rising oil prices in absolute value terms. ([25])

There are known to be mechanisms that could generate this type of asymmetry in the effects of oil shocks. One such mechanism is the zero lower bound constraint on monetary policy. In periods when nominal benchmark interest rates are close to zero, policymakers can still use monetary policy in response to rising oil prices and inflation pressure, by increasing interest rates. They cannot, however, lower interest rates in response to falling oil prices. Nonetheless, as has been shown in the previous sub-section, this type of nonlinearity is not likely to be very strong. Another potential channel through which an asymmetric effect on economic activity may be caused is price and wage adjustment. In particular, downward nominal price and/or wage rigidity leads to asymmetry in the respective second-round effects of falling and rising oil prices. ([26])

Empirical evidence on the asymmetric effects of oil price shocks on real economic activity in the euro area is scarce. ([27]) This section assesses the potential asymmetric effects of rising and falling oil prices on real output growth in the euro area using a nonlinear, threshold VAR model (see Box II.1.1 for details of this methodology). Stylised evidence suggests there has been an overall rising trend in oil prices in recent decades, with gradual increases followed by sharp corrections. In addition to the usual effects of demand and supply, a number of new factors, such as the growing financialisation of the energy market, seem to have contributed to the 'boom and bust' trend seen in the oil market and to the

([25]) See among others, Herrera, A. M., L. G. Lagalo and T. Wada (2015), 'Asymmetries in the response of economic activity to oil price increases and decreases?', *Journal of International Money and Finance*, Vol. 50, pp. 108-133. Herrera, A. M., L. G. Lagalo and T. Wada (2011), 'Oil price shocks and industrial production: Is the relationship linear?', *Macroeconomic Dynamics*, Vol. 15, No 3, pp. 472-497. Kilian, L. and R. J., Vigfusson (2011), 'Are the responses of the U.S. economy asymmetric in energy price increases and decreases?', *Quantitative Economics*, Vol. 2, No 3, pp. 419-453.

([26]) Theoretical models suggest that asymmetric effects could also be caused by costly sectoral reallocation of capital and labour from contracting to expanding sectors. In oil-importing countries, allocative disturbances (e.g. mismatches of factor inputs across sectors) would amplify the recessionary effects of rising oil prices and mitigate the expansionary effects of falling oil prices. Nonlinearities could also arise as a result of an asymmetric monetary policy response to rises and falls in oil prices, and an increase in precautionary saving amid concerns about income and employment prospects. Uncertainty related to oil price fluctuations may weaken investment irrespective of whether prices are rising or falling. Nonetheless, theoretical models emphasise the irreversibility of investment, arguing that rising oil prices could increase uncertainty, forcing firms to postpone purchases of capital goods.

([27]) See, for example, Jiménez-Rodríguez, R. and M. Sánchez (2005), 'Oil price shocks and real GDP growth: empirical evidence for some OECD countries', *Applied Economics*, Vol. 37, No 2, pp. 201-228.

Box II.1.1: The threshold vector autoregression (TVAR) methodology

The threshold VAR model allows to capture potential nonlinearities in the relationship between oil prices and real economic activity. Nonlinearities can occur for a number of different reasons: first, the effect of rising and falling oil prices on real output may be asymmetric; and second, the effect of any particular oil price shock on the economy may vary according to whether it occurs in an environment where there is a general strong upward trend in oil prices, or in an environment where there is a downward trend (regime-switching effects).

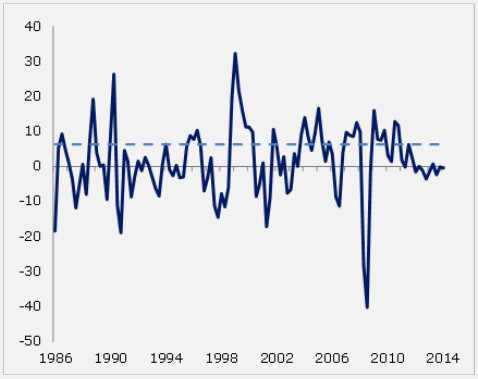
Following the approach used by Balke (2000) for estimating TVAR models, the asymmetric effects of oil price shocks on real economic activity in the euro area were analysed on the basis of the following structural TVAR model:

$$\Delta y_t=(A_0+\sum_{i=1}^{p} B_{1,i}\Delta y_{t-i})+(A_1+\sum_{i=1}^{p} B_{2,i}\Delta y_{t-i})I(\delta_{t-d}>\gamma)+U_t \qquad (1)$$

where y_t is a vector of the model's variables, which include the oil price (in euros), real GDP, the HICP index, the three-month interest rate and the real wage. A and B represent matrices of coefficients, p is a lag length of order three of the endogenous variables and U_t defines the structural disturbances. A recursive identification scheme is used for identifying the structural contemporaneous relationships between the variables. The variables are ordered as listed above in this scheme. The results are, however, sufficiently robust that the same conclusion would be reached using an alternative ordering scheme. All variables are expressed in logarithms, with the exception of the interest rate which is defined in levels. The sample covers quarterly data for the euro area over the period 1986Q1 to 2014Q3.

In equation (1), δ_{t-d} is a threshold variable determining which of the two regimes the economy is in at any point in time, and d is the time lag of this variable, which is set to one. The threshold variable is the two-quarter moving average of the percentage change in the oil price, which is a rough measure of oil price fluctuations and boom-bust trends in oil prices. $I(\delta_{t-d}>\gamma)$ is an indicator function that is equal to 1 when changes in the oil price exceed an estimated value, γ, and 0 otherwise. In the TVAR model, the threshold parameter, γ, is not known *a priori* and is estimated from the threshold model for all possible threshold values. Tests of a linear VAR against a threshold alternative show the threshold value to be statistically significant, thus indicating the existence of nonlinearities in the model. The estimated threshold value ($\hat{\gamma}$ = 6.3%) splits the sample into two regimes: one being an environment characterised by steep upward moves in the oil price, which may signal a boom in the market, and the other being an environment where oil prices are rising less quickly, or falling, which may suggest a period of market correction or a bust phase. Graph 1 shows the threshold variable over time and the estimated threshold value. The division between the two states appears to well capture both types of phase, with periods of upward spikes in the oil price accounting, in total, for less time than those where oil prices are more slowly rising or falling.

Graph 1: Threshold variable and estimated threshold value



(1) The vertical axis represents the threshold variable defined as the two-quarter moving average of the percentage change in the oil price. The dashed line corresponds to the estimated threshold value ($\hat{\gamma}$ = 6.3%). Where the series is above the threshold value, this indicates a state characterised by large rises in oil prices. Where the series is below the threshold value, this indicates more slowly rising or falling prices.

Source: DG ECFIN calculations.

(Continued on the next page)

Box (continued)

Following the methodology set out in Koop *et al.* (1996), nonlinear impulse response function (NIRF) analysis was performed in order to assess the dynamic nonlinear propagation of oil shocks. Nonlinear IRFs and standard IRFs vary in a number of ways. First, standard IRFs are used in linear models and model the effects of an initial shock assuming that the economy is not affected by any other shocks. Second, nonlinear IRFs, unlike linear ones, are determined by the sign and size of the shock as well as by the initial condition of the system (for example, whether the environment is characterised by large rises in oil prices). This implies that the estimated responses generated by nonlinear IRFs are not symmetric in terms of the size and sign of the structural shocks. In this context, the potential asymmetry in how output growth in the euro area responds to oil price shocks was assessed by modelling shocks with different signs (positive and negative) and sizes (one and two standard deviations).

References

Balke, N. (2000), 'Credit and economic activity: credit regimes and nonlinear propagation of shocks', *Review of Economics and Statistics*, Vol. 82, No 2, pp. 344-349.

Koop, G., M. H. Pesaran and S. Potter (1996), 'Impulse response analysis in nonlinear multivariate models', *Journal of Econometrics*, Vol. 74, pp. 119-148.

increased volatility of oil prices. ([28]) In this context, the model is used to analyse the effects of oil price shocks on output growth under two different 'regimes' for the oil price: an environment characterised by sharp upward moves in the oil price, which may signal a boom in the market (denoted as the 'upper regime'), and an environment where the oil price is rising less quickly, or falling, which may suggest a period of market correction, or a bust phase (denoted as the 'lower regime'). ([29])

Graph II.1.6(a) plots the responses of real output growth to positive and negative oil price shocks of a magnitude of one standard deviation, in each of the environments described above (the 'upper' and 'lower' regimes as defined above). Graph II.1.6(b) shows the responses of output growth to larger shocks (of magnitude two standard deviations), both positive and negative, and in the two environments. The response of output growth following a fall in oil prices is plotted with the sign reversed (i.e. positive values plotted as negative and vice-versa), so as to facilitate comparison with the equivalent response following a rise in oil prices. A 'large' (two standard deviation) oil shock is estimated to correspond to a price change of around 19 % of the oil price in absolute terms, and a 'small' (one standard deviation) shock to around 9 %. The size of the shock is roughly similar in both regimes.

As can be seen from the graphs, the results produced by the nonlinear VAR model do suggest that rising and falling oil prices have asymmetric effects on output growth in the euro area.

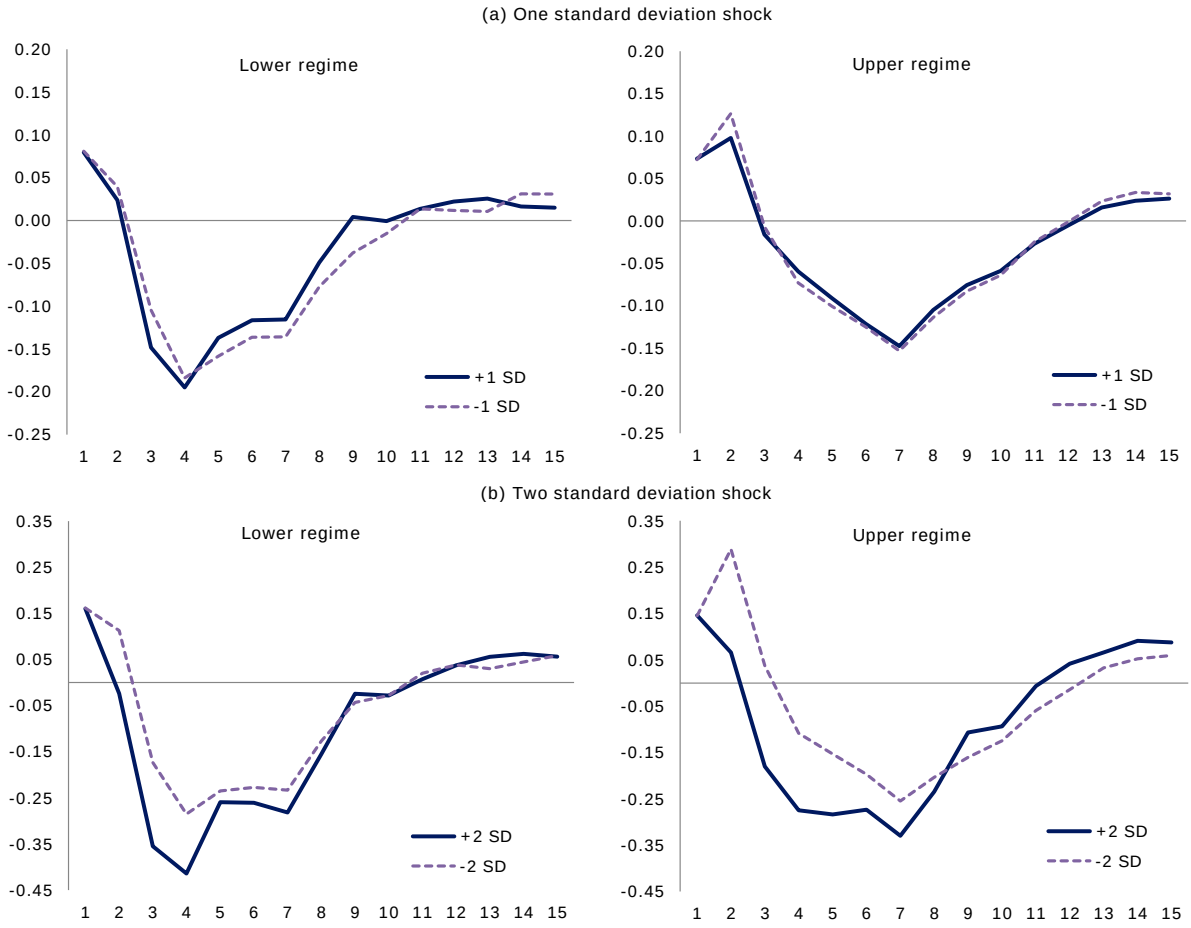
First, the effect of a large oil price shock (modelled as a two standard deviation shock) on output growth can be seen to be of a different magnitude according to the direction of the shock. The fall in output growth that results from a large rise in oil prices (a two standard deviation positive shock) is greater in magnitude than the increase in output growth seen when there is a large fall in oil prices (a two standard deviation negative shock). When oil prices are rising only slowly or falling (the 'lower regime'), as is currently the case for the world economy, a large positive oil shock would cause output to fall, at its steepest point, by 0.42 % over a quarter (equivalent to an annual change of 1.7 %). By contrast, a negative oil shock of the same magnitude would cause a rise in output, with output growth peaking at 0.28 % over a quarter (equivalent to an annual change of 1.1 %).

These results could be explained by the asymmetric second-round effects of falling and rising oil prices, including downward price and/or wage rigidity,

([28]) COM(2011) 25. 'Tackling the challenges in commodity markets and on raw materials'.

([29]) A period of generally rising (falling) commodity prices can be described as a boom (bust) period in commodity markets. See also Kashin, P., C. J. McDermott and A. Scott (1999), 'Boom and slumps in world commodity markets', *IMF Working Papers*, WP/99/155.

Graph II.1.6: **Effect of oil price shocks on output growth**



(1) The vertical axis measures the effect that an oil price shock has on output growth over a 15-quarter window. The graphs show the effects of rises and falls in the oil price, and of shocks of different sizes (one or two standard deviations), i.e. the series labelled '-1 SD' illustrates the effect of a fall in the oil price, of magnitude one standard deviation. The response of output growth following a fall in oil prices is plotted with the sign reversed. 'Upper' and 'lower' regime denote, respectively, a state where the oil price is rising steeply, which may signal a boom in the market, and a state where it is rising slowly or falling, which may suggest market corrections or a bust phase in oil prices.
Source: DG ECFIN calculations.

asymmetric monetary policy responses, and a zero lower bound constraint on monetary policy. ([30])

Second, the asymmetry in the effects of large positive and negative oil price shocks is somewhat less pronounced when the economy is in a state where oil prices are generally moving strongly upwards ('upper regime'). The decline in output resulting from a large positive oil shock is at its steepest at a fall in output of 0.32 % over a quarter, whilst the rise in output following a negative oil shock of the same magnitude sees the change in output reach 0.25 % quarter-on-quarter. When oil prices are rising, with frequent sharp upward spikes, economic agents may find it more difficult to interpret the information about the state of the economy contained in oil price variations. They will therefore be more reluctant to reallocate resources across sectors, given the high costs associated with such adjustments. ([31]) Asymmetric second-round effects will therefore be less marked and the overall effect on the economy more muted

([30]) The non-linear impulse response functions suggest that there would be an initial decrease (increase) in output growth following a negative (positive) oil price shock. Oil price shocks could cause shifts in demand across goods depending on the intensity of oil use in different sectors. Allocative disturbances, including idle labour and capital, could cause a fall in the oil price to have a contractionary effect on the economy in the short run. See, also, Hamilton, J. D. (2003), 'What is an oil shock?', *Journal of Econometrics*, Vol. 113, No 2, pp. 363-398. Rahman, S. and A. Serletis (2010), 'The asymmetric effects of oil price and monetary policy shocks: A nonlinear VAR approach', *Energy Economics*, Vol. 32, pp. 1460-1466.

([31]) See among others, Lee, K., S. Ni and R. Ratti (1995), 'Oil shocks and the macroeconomy: the role of price variability', *Energy Journal*, Vol.16, pp. 39–56.

compared to that seen during a period where the oil price is generally changing less or falling. ([32])

Finally, the effect of rising and falling oil prices on the euro area economy seems to be symmetric when the size of the oil shock is smaller (one standard deviation), with quarterly output growth peaking at 0.18 % (equivalent to an annual growth rate of 0.7 %). The effect of a small oil price shock on output growth is also broadly similar in the two economic environments considered - states of high and lower (or negative) oil price changes ('upper' and 'lower' regime). Economic agents appear to act similarly in response to small positive and negative oil price fluctuations.

Conclusions

Crude oil prices have fallen significantly since mid-2014 and are expected to remain low for an extended period of time. Changes in oil prices are likely to have a significant and positive impact on the economy of the euro area. According to the simulations generated using a three-region version of the global multi-country model, the positive contribution to GDP growth from falling oil prices will peak in 2015 at around 0.6 percentage points. Employment will also benefit, with the positive effect of falling oil prices reaching a peak of 1 %, again in 2015. The fall in oil prices is also predicted to reduce consumer prices, with CPI inflation slowing to 0.3 percentage points below the baseline rate in 2015.

The findings on the asymmetric effects of oil price shocks suggest that only large oil price shocks have an asymmetric effect on real output growth. Furthermore, the asymmetric effect of a large oil price shock on the economy is found to be somewhat more pronounced if it occurs in an environment of lower (or negative) oil price changes, as it is observed currently. Smaller positive and negative oil price shocks do not appear to have asymmetric effects on output growth.

The results of the simulation demonstrate that the empirically observed nonlinearities cannot be attributed to the binding zero lower bound constraint. Further analysis is needed to investigate the factors causing the asymmetries observed.

([32]) Differences in market strategies for hedging energy prices in times of boom and bust in oil prices could be an additional reason for the differences between the response of output growth to changes in the oil price in the two regimes.

II.2. Business cycle synchronisation in the euro area ([33])

The initial global financial shock in 2008 and the subsequent collapse of global trade did not seem to affect the euro area countries asymmetrically, as all countries slipped into recession at the same time. However, the subsequent euro area sovereign crisis has propagated heterogeneously across euro area countries causing significant cross-country differences in domestic demand and resulting in large business cycle divergence between 2011 and 2013.

Differences in Member States' debt overhang can have a negative impact on business cycle synchronisation across euro area Member States during deleveraging periods, as they make euro area-wide shocks propagate heterogeneously. As a result, they can be a major source of asymmetries. While the impact is not likely to be permanent, a long-lasting deleveraging period in some Member States can lead to a protracted period of business cycle decoupling from the rest of the euro area, making the common monetary policy less effective for certain countries. Even though differences in growth in real GDP per capita between Member States and the euro area average recently returned to pre-crisis levels, risks of asymmetric shocks in the euro area will remain significant until the ongoing balance sheet adjustment period in both private and public sectors is completed. However, policies can contribute substantially to contain risks of divergence. Recent and planned institutional and structural changes, including the Banking Union, the Capital Markets Union and in structural reforms in Member States, have a key role to play in this respect.

Introduction

Business cycle synchronisation is a central issue when designing macroeconomic policies in a monetary union. Asymmetric shocks (or common shocks with asymmetric effects across countries) hamper the effectiveness of the common monetary policy and force Member States to embark on potentially painful adjustment processes in the real economy. In such cases, the lack of an independent monetary policy results in a loss of welfare. A reasonably high cyclical convergence is therefore a necessary condition for economic and monetary union (EMU) to function smoothly.

Past analysis in this report pointed to the emergence in recent years of large business cycle differences in the euro area. ([34]) The global financial crisis tipped Member States into a highly synchronised recession, but the ensuing period of adjustment was associated with a phase of cyclical divergence. To better understand the drivers of this increased heterogeneity, this section revisits the issue of business cycle synchronisation in the euro area, both during the pre-crisis period and since the outbreak of the global financial crisis in 2008. It draws on a different econometric methodology from that used in past analysis. Unlike past research presented in this report, which was based on a breakdown of GDP into a trend (or potential GDP) and a cyclical component, the methodology used considers cross-country dynamic interactions in GDP per capita developments without statistically filtering the data. Stylised facts on the business cycle are known not to stand up well to different de-trending techniques. ([35])

Heterogeneity in growth rates in the euro area

To illustrate the cyclical divergence that has emerged since the global financial crisis, Graph II.2.1 shows cross-country dispersion of differences in growth in real GDP per capita between Member States and the euro area average over time. Countries are weighted according to their population size. ([36])

After reaching record highs between 2011 and 2013 the dispersion across euro area Member States has returned to the level prevailing in the pre-crisis years. The initial global financial shock in 2008 and the subsequent collapse in global trade do not seem to have affected the euro area countries asymmetrically, the dispersion during the

([33]) Section prepared by Narcissa Balta.

([34]) Valdes Fernandez I. (2014), 'Growth differences between euro area Member States since the crisis', *Quarterly Report on the Euro Area*, Vol. 13, No 2.

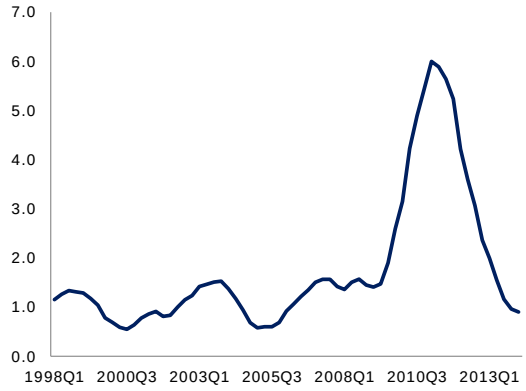
([35]) Canova, F. (1998), 'De-trending and business cycle facts', *Journal of Monetary Economics*, No 41(1998), pp. 475-512.

([36]) The euro area is defined here as the 'EA-10' and includes the following Member States that were members of the euro area when it was launched: Germany, France, Italy, Spain, Portugal, Greece, Belgium, Austria, the Netherlands and Finland. Due to data not being available, Ireland and Luxembourg were not included in the sample. The dispersion measure is calculated as the weighted cross-sectional average of the quadratic mean of the gap of GDP growth between Member States and the euro area average. The measure is smoothed out by taking a centred moving average: $\Sigma_{i \in EA10}\, w_i \left[(1/2H+1) \Sigma_{h=-H \text{ to } H} (\Delta y_{i,t+h} - \Delta y_{ea,\, t+h})^2 \right]$.

2008-2011 period remaining almost flat. It was only during the second phase of the crisis that a pattern of heterogeneity emerged.

The statistic in Graph II.2.1 was chosen because it provides a simple economic interpretation of potential gains from complete risk sharing. ([37]) In the absence of risk sharing, members of a monetary union are fully exposed to asymmetric shocks: a fall in GDP is fully translated into a fall in consumption. With cross-border risk sharing (either via capital markets or a common euro area insurance system), consumption can be smoothed out and asymmetric GDP shocks are not fully reflected in fluctuations in consumption. As households value consumption stability their welfare is higher when risk sharing mechanisms exist.

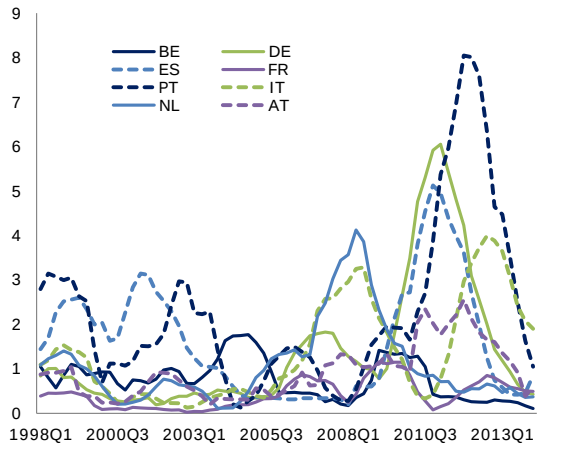
Graph II.2.1: **Dispersion of per capita GDP growth rate , EA countries[(1)(2)]**
(1998Q1 — 2014Q1)



(1) Euro area average is defined as EA-12.
(2) The dispersion measure is calculated as the weighted cross-sectional average of the quadratic mean of the gap of GDP growth between 10 euro area Member States and the EA12. The measure is smoothed out by taking a centred moving average: $\Sigma_{i\in EA10}\ w_i\ [(^1/_{2H+1})\ \Sigma_{h=-H\ to\ H}\ (\Delta y_{i,t+h} - \Delta y_{ea,t+h})^2]$.
Source: DG ECFIN, Eurostat.

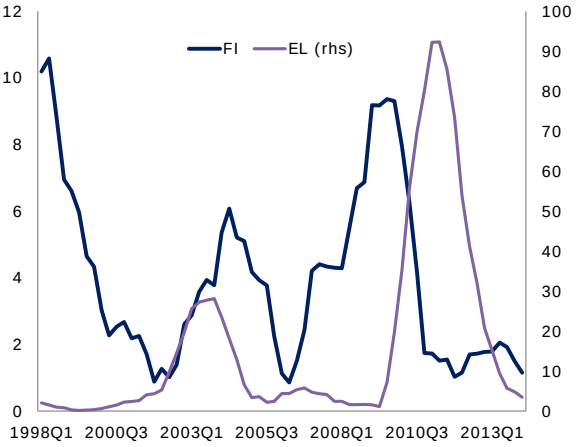
Graph II.2.2 shows the growth differentials presented as averages in Graph II.2.1, only this time at country level. In this way country-specific divergence patterns can be identified. During the pre-crisis period, the growth differentials were smaller for the countries that were closer to each other in terms of GDP per capita when the euro was launched.

Graph II.2.2: **Quadratic mean of growth differentials in real GDP per capita[(1)]**
(1998Q1Q1 — 2014Q1)



(1) The quadratic mean of the differential in GDP per capita growth in 10 euro area Member States compared with the EA-12.
Source: DG ECFIN, Eurostat data.

Graph II.2.3: **Quadratic mean of growth differentials in real GDP per capita relative to EA-10: exceptions[(1)]**
(1998Q1 — 2014Q1)



(1) The quadratic mean of the differential in GDP per capita growth in 10 euro area Member States compared with the EA-12. Finland experienced a large idiosyncratic period of volatility in the 1990s, which was related to the banking crisis there in the early 1990s. Greece joined the euro area a year later than its inception.
Source: DG ECFIN, Eurostat data.

However, during the global financial and sovereign crises, heterogeneity increased significantly, irrespective of initial starting conditions, with cycles diverging in countries both in the periphery

([37]) For details on the structural model and the derived economic interpretation, see Kalemli-Ozcan S., B. Sorensen and O. Yosha (2001), 'Economic integration, industrial specialisation, and the asymmetry of economic fluctuations', *Journal of International Economics*, No 55 (2001), pp. 107-137. Under some assumptions, the dispersion measure is directly proportional to the potential gains from complete risk sharing at euro area level.

and in the core. ([38]) This is particularly true for the second phase of the crisis in 2011-2013, showing that the sovereign crisis was a major cause of divergence between euro area Member States.

Among the Member States that made up the euro area when the euro was launched, two countries displayed particularly large growth differentials compared with the euro area as a whole, both during the pre-crisis and the crisis periods (see Graph II.2.3). This is likely due to large idiosyncratic components in GDP per capita developments in those two countries.

Euro area-wide shocks and business cycle fluctuations

The main purpose of this section is to analyse the extent to which euro area-wide shocks have been driving euro area Member States' business cycle fluctuations since the launch of the EMU by looking at differentials in economic activity in a cross-country dynamic interaction model. A large system that models the joint dynamics of real GDP per capita in 10 euro area Member States and the euro area as a whole has been estimated for the period 1996Q1 — 2007Q4. Given the estimated past correlations (i.e. given the estimated parameters of the model), counterfactual paths for the Member States' GDP per capita growth rates were calculated for the entire period, i.e. 1996Q1 — 2014Q4, conditional on observed euro area real GDP per capita developments. The deviation of a country's observed growth rate from this counterfactual path can be interpreted as representing the country-specific component of the business cycle, as opposed to the common component of the business cycle driven by euro area growth developments. Therefore, the extent to which Member States deviate from their counterfactual paths gives a measure of business cycle heterogeneity. The variations in the country-specific components of the business cycle may originate either in idiosyncratic shocks or in heterogeneous reactions to euro area shocks. The more a country's growth rate dynamics are aligned with the average euro area growth dynamics, the smaller the country-specific components of the business cycle and the higher its business cycle synchronisation with the euro area as a whole.

The dynamic correlations in the data have been estimated using a large Bayesian vector autoregression (BVAR) in levels and differences (see Box II.2.1 for details on the methodology).

Graphs II.2.4 and II.2.5 present the conditional forecasts of real GDP per capita growth for 10 euro area Member States, as can be inferred from the observed path of real GDP per capita in the euro area as a whole between 1998Q1 and 2014Q4. ([39]) The green line in the graph shows the actual data as compared with the results obtained from the model; (i) the shades of orange show the distribution of the conditional forecasts in the BVAR in levels; and (ii) the solid blue line shows the point estimate of the median of the distribution of the conditional forecasts in the BVAR in differences. The model points qualitatively towards the same conclusions both in levels and differences.

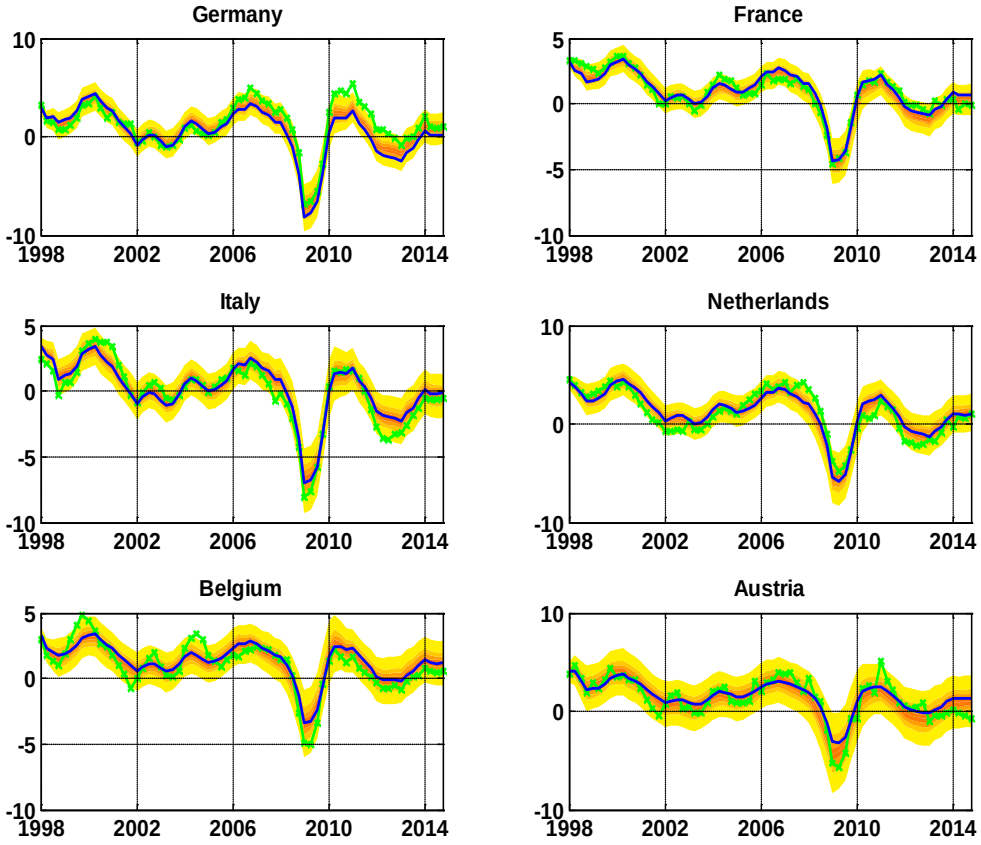
During the pre-crisis period, growth fluctuations in several euro area Member States were mainly driven by euro area-wide shocks, which propagated in the same way across the euro area. This is particularly true for the countries which had similar initial conditions in terms of GDP per capita levels at the launch of the euro: Germany, France, Italy, Belgium, Austria and the Netherlands (see Graph II.2.4). However, this is also true to a large extent for catching-up economies such as Spain for most of the pre-crisis period (see Graph II.2.5). Conditional on euro area-wide developments, Spain slightly underperformed in terms of GDP per capita growth only in 2006-2007, i.e. the years just before the crisis, while Germany and the Netherlands slightly over-performed during the same years. Otherwise, the actual growth rates of these countries lie very close to the centre of the distribution of conditional forecasts during the pre-crisis period. The relatively close cyclical synchronisation reflects the high degree of economic integration prevailing in the euro area notably in terms of trade.

In a context of generally high synchronisation, several euro area Member States registered

([38]) For more insight into the correlation between initial starting conditions in terms of levels of GDP per capita and business cycle synchronisation in the euro area, see Giannone D., M. Lenza, and L. Reichlin (2009), 'Business cycles in the Euro area', *Europe and the Euro*, pp. 141-167, University of Chicago Press.

([39]) The euro area is here defined as the EA-12, i.e. it includes all the Member States in the euro area when the euro was launched. Note that Greece joined the euro area a year later than its inception.

Graph II.2.4: **Conditional forecasts of growth in real GDP per capita: Member States synchronised with the euro area business cycle fluctuations**
(1998Q1 — 2014Q4, in %)



(1) Shades of orange: distribution of the conditional forecasts in the BVAR in levels, excluding the lower and higher 5 % quintiles. Solid blue line: point estimate of the conditional forecasts in the BVAR in differences, which is calculated as the median of the distribution of the conditional forecasts in this model. Green line with crosses: actual values. The variables are all reported in terms of annual percentage changes. Conditioning assumptions: real GDP per capita in the EA-12.
Source: DG ECFIN, based on the MATLAB codes replication files of the methodological paper (see Box II.2.1).

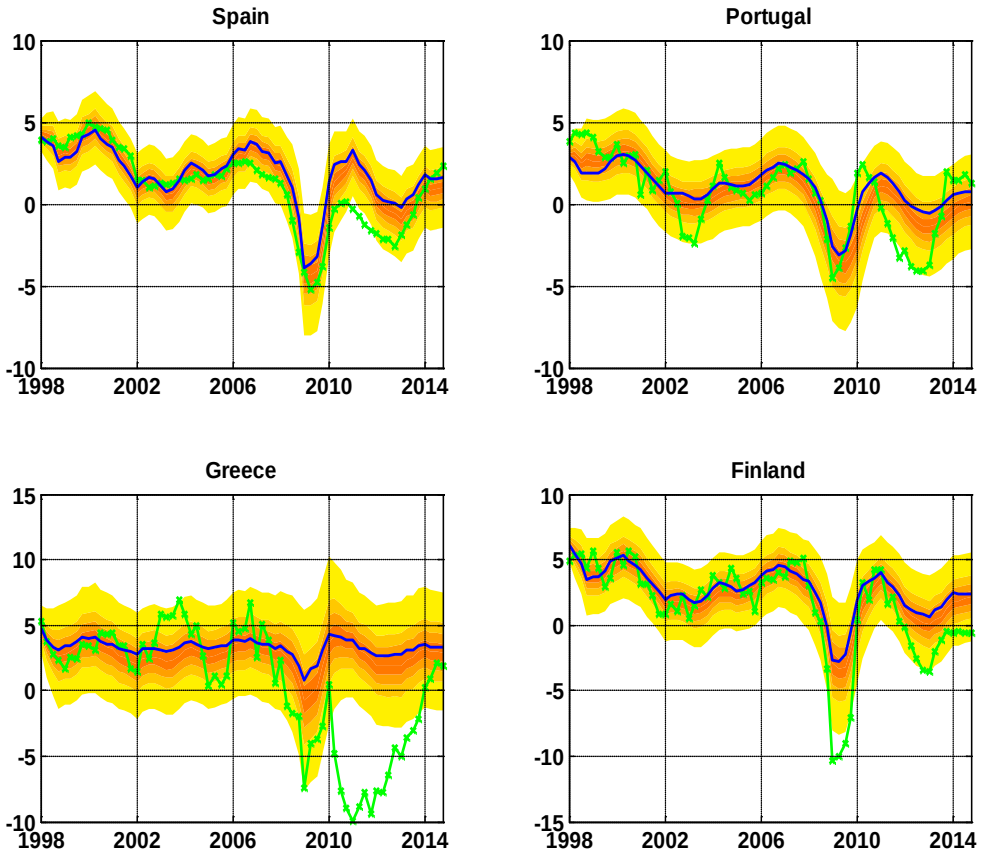
relatively large country-specific business cycle components before the crisis. This was particularly true for Portugal, Greece and Finland. The actual growth rates of those countries lie almost in the tail of the distribution of conditional forecasts during the pre-crisis period and/or cannot be closely tracked by euro area-wide GDP per capita developments (see Graph II.2.5).

While shocks seem to have propagated relatively homogeneously across Member States during the pre-crisis period, they have started to propagate heterogeneously since the global financial crisis. The country-specific components of the business cycle have increased in all Member States since the crisis, even those showing synchronised business cycle pattern in pre-crisis years. ([40])

Zooming in on developments since the global financial crisis, some countries have performed better than what the euro area average would have implied, for example Germany and to some extent Austria. However, many countries have registered larger drops in GDP per capita growth than what euro area developments would have predicted. This includes Member States where country-specific

([40]) It is important to stress that while in terms of growth rates convergence can be observed again at the end of the estimated period for most euro area Member States, in terms of GDP per capita levels, differences have not started to decrease. They are just not widening further. In other words, the cyclical divergence identified in some Member States turns out to be very persistent.

Graph II.2.5: **Conditional forecasts of growth in real GDP per capita: Member States with a large country-specific business cycle component**
(1998Q1 — 2014Q4, in %)



(1) Shades of orange: distribution of the conditional forecasts in the BVAR in levels, excluding the lower and higher 5 % quintiles. Solid blue line: point estimate of the conditional forecasts in the BVAR in differences, which is calculated as the median of the distribution of the conditional forecasts in this model. Green line with crosses: actual values. The variables are all reported in terms of annual percentage changes. Conditioning assumptions: real GDP per capita in the EA-12.
Source: DG ECFIN, based on the MATLAB codes replication files of the methodological paper (see Box II.2.1).

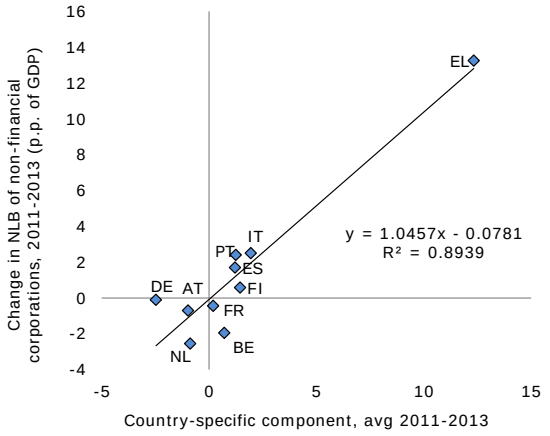
shocks were already comparatively more prevalent before the crisis (EL, FI and PT) but also countries which posted business cycles relatively well aligned with the euro area average in pre-crisis years (IT, ES, and NL). Divergences are particularly large for the second phase of crisis during the period 2011-2013.

Cyclical divergences asymmetries may be due to a number of factors, including differences in economic structures (e.g. sectoral and trade specialisation), differences in domestic policies, different levels of structural rigidity and/or macroeconomic imbalances. Both the timing of the divergence observed in recent years (i.e. essentially during the sovereign crisis) and the countries which have underperformed below euro area average growth point to the central role of macroeconomic imbalances accumulated before the crisis, notably in terms of private and public debt levels.

Graph II.2.6 illustrates the importance of debt and deleveraging in explaining cyclical divergences during the sovereign crisis. The graph shows the correlation between deleveraging efforts in the corporate sector, as expressed by the change in net lending/borrowing (NLB) and the country-specific components of the business cycles of selected euro area Member States, obtained using the model for the 2011-2013 period. The increase in NLB in the corporate sector was higher in the countries that registered larger drops in GDP per capita growth than what would have been expected based on euro area developments during that period (i.e. in the countries with large country-specific components of the business cycle).

Ascribing a central role to imbalances and deleveraging in the recent cyclical divergence raises the question of possible differences between periods of accumulation of imbalances and periods of adjustment to imbalances. Euro area-wide shocks seem to have propagated more symmetrically across Member States during the per-crisis period of accumulation of imbalances than during the ensuing period of adjustment. For example, Spain was remarkably synchronised with the rest of the euro area in pre-crisis years, while since the crisis the country-specific component of its business cycle has increased substantially. The asymmetry between leveraging and deleveraging phases can be explained by the existence of strong non-linearities during deleveraging periods which are frequently characterised by sudden stops in capital inflows, abrupt swings in investor behaviour and rises in risk premia. Leveraging tends to be much more progressive than deleveraging and in a world of rigid prices and wages, abrupt changes in balance sheets can have large effects on economic activity.

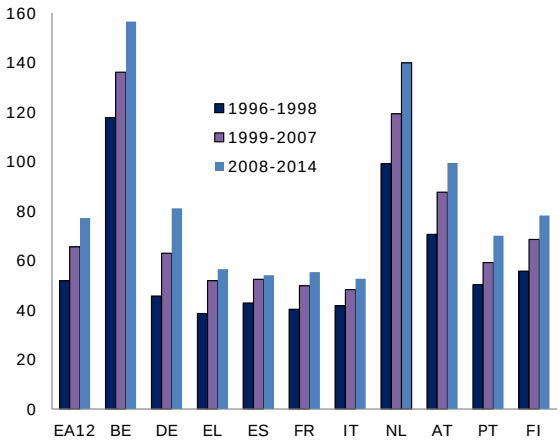
Graph II.2.6: **Country-specific business-cycle component and corporate NLB (1)**



(1) Country-specific component is calculated as the growth differential between the point estimate of the median of the distribution of the conditional forecasts in the BVAR in differences and the actual data. Positive components indicate larger drops in domestic demand than what euro area developments would have predicted.
Source: DG ECFIN, Eurostat.

Graph II.2.8 shows that domestic demand has been the main source of increase in cross-country heterogeneity. The same model is used to estimate the dynamic interaction between domestic demand in each Member State and the euro area as a whole. As for GDP per capita growth, conditional forecasts are obtained for domestic demand in each Member State. Again, the largest deviations can be observed in the countries that have undergone a deleveraging process both in the private and public sectors, in particular during the second phase of the crisis. While the impact is not likely to be permanent, a long-lasting deleveraging period can, as a consequence, lead to a protracted period of business cycle decoupling across euro area Member States, in particular between countries where balance sheets are still adjusting and the rest of the euro area. ([41]) This limits the common monetary policy's ability to support domestic demand, making the policy less effective for individual countries. In other words, a common monetary policy cannot address persistent differences in business cycle stabilisation needs across euro area Member States.

Graph II.2.7: **Openness: selected euro area Member States(1)**
(in % of GDP)



(1) Euro area includes EA-10. Openness defined as exports plus imports as % of GDP.
Source: DG ECFIN, Eurostat.

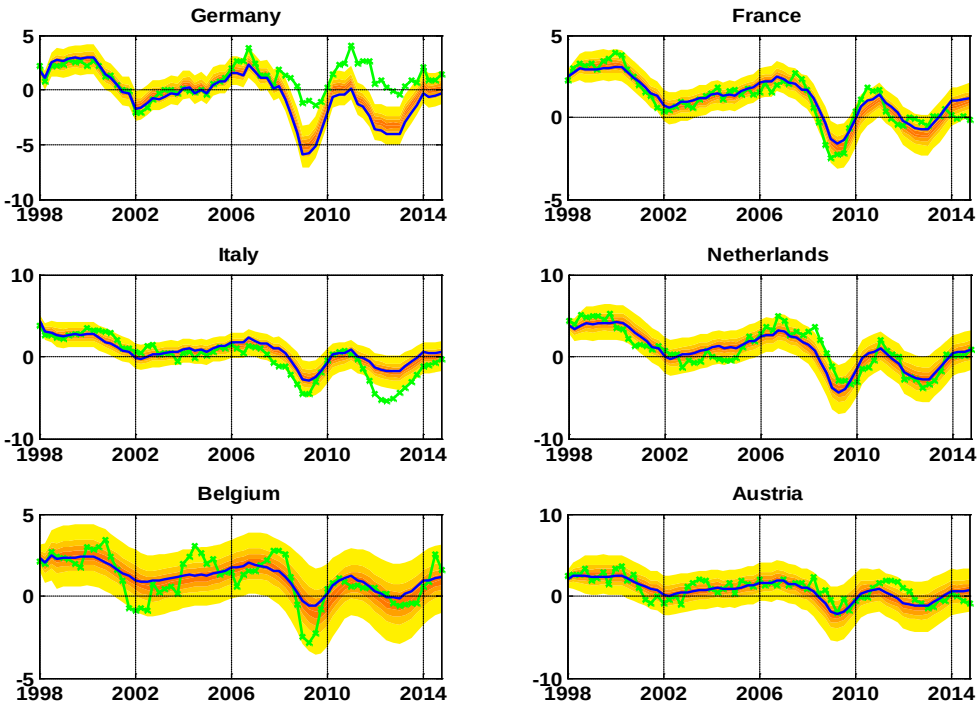
Finally, it is interesting to note that the recent phase of cyclical divergence seems to have happened despite a continued upward trend in trade openness in all countries during the same period, which should have supported the synchronisation of business cycles across euro area Member States (see Graph II.2.7). ([42])

([41]) The protracted nature of adjustment is consistent with the fact (stressed earlier) that we have recently seen tentative signs of renewed convergence in GDP growth rates but not yet in GDP levels. In other words, cyclical divergences have recently narrowed in terms of growth but not in terms of levels.

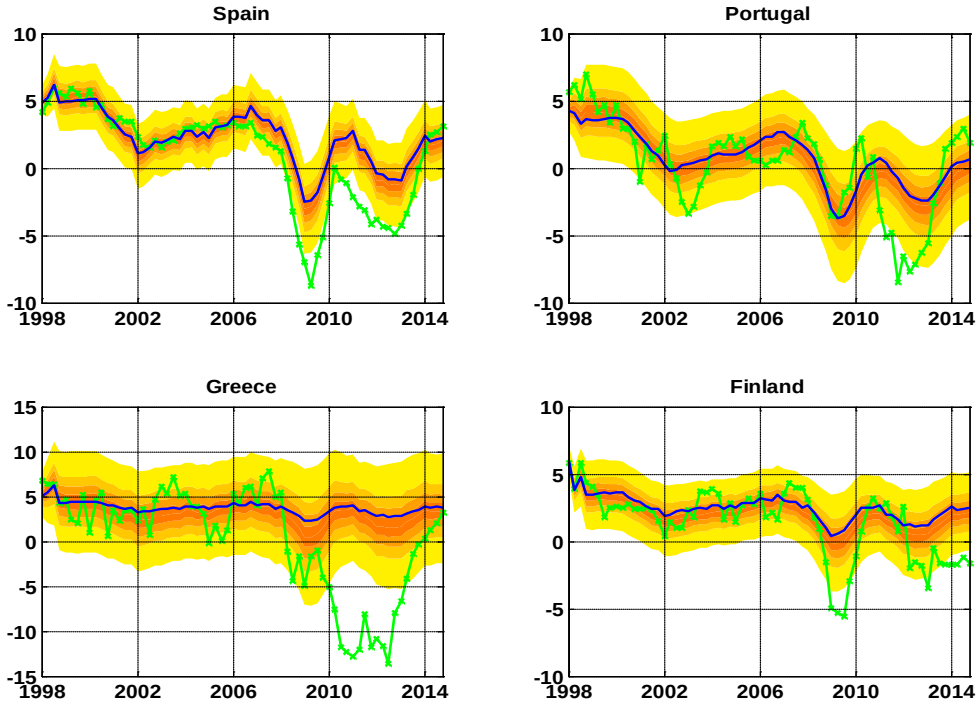
([42]) Frankel, J.A. and A.K. Rose (1998), 'The Endogeneity of the Optimum Current Area Criteria', *Economic Journal*, Vol. 108, No 449, pp. 1009-1025.

Graph II.2.8: **Conditional forecasts of growth in domestic demand**
(1998Q1 — 2014Q, in %)

Member States synchronised with euro area business cycle fluctuations



Member States with a large country-specific business cycle component



(1) Shades of orange: distribution of the conditional forecasts in the BVAR in levels, excluding the lower and higher 5 % quintiles. Solid blue line: point estimate of the conditional forecasts in the BVAR in differences, which is calculated as the median of the distribution of the conditional forecasts in this model. Green line with crosses: actual values. The variables are all reported in terms of annual percentage changes. Conditioning assumptions: real domestic demand per capita in the EA-12.
Source: DG ECFIN, based on the MATLAB codes replication files of the methodological paper (see Box II.2.1).

Box II.2.1: Conditional forecasts of real GDP per capita in selected euro area Member States

The analysis is based on recent developments in the literature of vector autoregressions (VARs) tools for large data sets (Banbura et. al, 2015, Giannone et. al, 2014). VARs are considered to be a reliable tool for building empirical benchmarks as a complement to alternative representations such as dynamic stochastic general equilibrium (DSGE) models, which provide structural benchmarks more grounded in theory, at the cost of imposing more restrictions on the dynamic cross-sectional correlations in the data. The Bayesian VARs offer a solution to the curse of dimensionality in the VAR framework by adopting Bayesian shrinkage. The idea of this method is to combine the likelihood coming from a highly parameterised VAR model with a prior distribution for the parameters that is naïve but enforces parsimony. As a consequence, the estimates are "shrunk" toward the prior expectations.

The analysis will consider two versions of the BVAR – with data in (log-)levels and in (log-)differences. The dataset includes the euro area Member States at the launch at the euro and the euro area average defined as EA12. Ireland and Luxembourg were not included in the sample due to data availability. The sample covers the period from 1996Q1 to 2014Q4. Data comes from Eurostat, Quarterly National Accounts.

From each of the two models, forecasts of real GDP per capita for each country are generated conditional on the observed realised path of real GDP per capita in EA12. The conditional forecasts are generated over the period 1998-2014. The first two years in the sample are used as initial conditions. Thus the conditional forecasts for 1998-2007 can be considered as "in-sample" while those over 2008-2014 as "out-of-sample". The conditional forecasts computed for the two models provide similar insights: (i) the "in-sample" part (1997-2007) of the conditional forecasts can be compared with the observed developments in order to gauge whether knowing only the time series of real GDP per capita of EA12 is sufficient to capture the salient features of the GDP per capita developments in the individual euro area Member States; (ii) by comparing the "out-of-sample" part (i.e. from 2008 onward) of the conditional forecasts with the observed developments, we can also assess whether the turmoil associated to the financial and the sovereign debt crises was reflected in a change in business cycle synchronisation between the individual countries and the euro area as a whole. A change in the business cycle synchronisation would likely lead to relevant inaccuracies of the conditional forecasts based on parameters representing the pre-2007 relationships (Graph II.2.4 and Graph II.2.5 in the text).

The conditional forecasts are close to the actual outcomes, in particular in the "in-sample" period for most countries. This fact suggests that real GDP per capita of EA12 is sufficient to capture the growth developments in most euro area economies. Turning to the "out-of-sample" evidence, there is a general similarity of the conditional forecasts across approaches. The results indicate that some differences appear between forecasts and observed developments for a few countries, indicating instability in the business cycle synchronisation of these countries with euro area as a whole. For example, notable differences appear for countries that accumulated macroeconomic imbalances in the pre-crisis period, and underwent a deleveraging process in both private and public sectors.

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Conclusions

The initial global financial shock in 2008 and the subsequent collapse in global trade do not seem to have affected euro area countries asymmetrically, as all of them slipped into recession at the same time. However, the subsequent euro area sovereign crisis has propagated heterogeneously across countries causing significant differences in domestic demand and resulting in large business cycle divergence.

The analysis presented in this section shows that the country-specific components of the business cycles increased in all euro area Member States during the sovereign crisis. Some countries performed better than what the euro area average would have implied, whereas countries which had accumulated macroeconomic imbalances during the pre-crisis period performed much worse in terms of GDP per capita growth.

Given the pattern of heterogeneity observed in growth differentials during the recent turmoil, there are large potential gains from risk sharing in times of financial crisis in the euro area for all Member States. The more the countries in the monetary union are able to share risk fully, the more only euro area-wide fluctuations matter and the less pain is caused by asymmetries in terms of loss of welfare.

Differences in Member States' debt overhang and domestic financial imbalances can have a significant negative impact on business cycle synchronisation within the euro area during the deleveraging period, as they make euro area-wide shocks propagate unevenly.

While the impact is not likely to be permanent, a long-lasting deleveraging period in some Member States can lead to a protracted period of business cycle decoupling from the rest of the euro area, limiting the effectiveness of the common monetary policy for individual countries.

Furthermore, even though growth differences in real GDP per capita between Member States and the euro area have returned to pre-crisis levels, the risks of asymmetric shocks in the euro area will remain significant until the balance sheet adjustment process in both private and public sectors is completed.

Therefore, in cases where households' and firms' debt levels are not sustainable but their income and business models are deemed viable, structural reforms to help address non-performing loans, including debt restructuring and better insolvency arrangements, could help speed up the balance sheet adjustment process. These reforms, in conjunction with closer economic surveillance to prevent the build-up of imbalances and product and labour market reforms to facilitate the deleveraging processes, could decrease the likelihood of asymmetries in the propagation of euro area-wide shocks. The Banking Union and the future Capital Market Union have an important role to play in this respect.

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