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Quarterly Report on the Euro Area

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The **Quarterly Report on the Euro Area** is written by staff of the Directorate-General for Economic and Financial Affairs. It is intended to contribute to a better understanding of economic developments in the euro area and to improve the quality of the public debate surrounding the area's economic policy.

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Over the past two years, the euro area has benefitted from a broad-based economic expansion. While relatively strong growth has helped re-absorb the large output gap accumulated during the financial crisis, potential growth remains subdued in most Member States and the euro area as a whole. Most of the reforms needed to lift growth potential also strengthen economic resilience by reducing vulnerability and boosting the economy's ability to adjust to shocks.

This issue of the QREA provides policy-relevant empirical analysis related to wage dynamics, the move towards resilient economic structures, external sustainability, as well as the cyclical patterns of residential construction investment.

The first section discusses wage dynamics and the relevance of wage behaviour for macroeconomic adjustment in a monetary union. Whilst in the past, economic research on wages typically focussed on their importance as a signal guiding the efficient allocation of resources and their role in sustaining demand, greater attention is now paid to the role of wages in delivering inclusive growth. The analysis in this issue shows that nominal wage growth in the recent recovery has not been picking up in the way one would expect based on the historical relationship with standard indicators of labour market slack. While remaining pockets of slack and weak labour productivity growth contribute to the subdued behaviour of wages, they do not fully explain the slow pace of growth. Incorporating low core inflation and "sticky" inflation expectations, however, enables current wage developments to be predicted with reasonable precision. The potential contribution of other factors is assessed in a qualitative way, including broader measures of labour under-utilisation, declining hours worked per employee, the after-effects of downward nominal wage rigidities, and the impact of other structural changes such as globalisation, technological progress and the decline in unionisation. Looking ahead, the section reports that productivity-increasing structural reforms, such as reforms that make labour markets more adaptable and responsive and improve allocative efficiency, and adequate investment in human capital, research and

development are key to supporting overall wage growth.

The second section is an econometric investigation of the determinants of economic resilience, in particular the structural factors influencing a euro area economy's ability to absorb and recover from a common shock. The potential determinants include diverse factors that affect the working of markets at Member State level, such as product market regulations, as well as other structural characteristics of economies, including openness to international trade. The analysis suggests that euro area Member States differ considerably in terms of their capacity to absorb and recover from common shocks. The main determinants of resilience are related to how efficiently markets function, particularly financial and product markets, and the business environment. More specifically, the findings suggest that a higher share of non-performing loans in total gross loans and a weakening of competition in the banking sector, as well as product market regulations, such as state control over price setting and network industries, has an unambiguous negative impact on both the absorption and recovery capacity. Trade openness also contributes to stronger resilience, although more open countries are also more affected by external shocks. The interplay between the various determinants, together with the ambiguous impact of some factors also call for further analysis.

To help assess the sustainability of euro area economies' external positions, the third chapter presents a methodology to estimate prudential benchmarks or reference values for a country's net international investment position (NIIP). The results suggest that while stock imbalances persist in some EU countries, external sustainability risks continue to abate. Several net debtor countries still have legacy NIIPs that exceed such prudential benchmarks. But the balanced or positive current accounts in most of these Member States put them on track to return their NIIPs to safe levels by the mid-2020s at the latest. By contrast, while EU creditor countries by definition do not face external sustainability risks, they continue to run current account surpluses that will further increase

their NIIPs from already high levels. The combination of policies leading to a gradual reduction of both NIIPs and current account surpluses would make the euro area more resilient as well as facilitate internal and external rebalancing.

The final chapter examines the cyclical patterns of residential construction investment in the euro area and selected EU Member States over the past several decades. The behaviour of residential investment is important, as housing and GDP cycles are closely linked. Also, the boom and bust of residential construction has often led to the accumulation and unwinding of large imbalances within the euro area and the EU. The analysis quantifies the main drivers of residential construction in the short and medium term. It finds that, in the long run, residential construction activity is determined by real disposable income and to a lesser extent, population developments. In the short run, residential construction cycles are also related to house prices and unemployment. The positive developments now underway in the labour market and the rise in house prices should thus underpin a continued expansion of residential construction investment in the euro area in the near term. It may, however, weaken in Member States where the residential construction cycle is more advanced.

The analysis provided in this issue of the QREA underscores the importance of implementing reforms – taking advantage of the still favourable economic conditions – that will help the euro area to withstand future economic and financial shocks and deliver sustainable growth. At the same time, it points out that policy makers should guard against imbalances that could develop into self-fulfilling crises that could endanger the functioning and cohesion of EMU. This must go hand-in-hand with reforms to the architecture of the EMU– starting with the completion of the Banking Union, strengthening the institutional framework, and making progress on developing a viable central fiscal capacity. We have made great strides in deepening the EMU since the crisis but our union will remain vulnerable until we complete the extra mile.

I. Wage dynamics in the EMU

This section takes stock of recent wage developments in the euro area given their importance for the well-functioning of the EMU. In the euro area, wage developments not only affect the allocation of resources and social cohesion, but also macro-economic adjustment. The latter is especially important in view of the remaining rebalancing challenges in the euro area. The section identifies several factors that may have caused sluggish wage growth in the euro area until recently, in spite of robust economic growth. It shows that remaining slack and low productivity growth can account for some of this slowdown in wage growth, but leave a significant amount unexplained. Adding backward- and forward-looking inflation measures improves the fit of the predicted values considerably. Other potential contributing factors to the observed wage dynamics are reviewed as well: broader measures of labour market slack, ongoing structural labour market changes, the downward trend in hours worked per employee, and the after-effects of downward nominal wage rigidities. The section shows that while wage developments mainly result from the interaction between market forces, policymakers have a number of instruments at hand to influence wage developments. These include public and minimum wages, the tax and benefit system, and the steering of collective bargaining in the private sector via tripartite agreements or by reviewing legal frameworks for negotiation in consultation with social partners. Structural reforms can also influence wage and labour cost developments, albeit in a more indirect way. Of particular importance are reforms that support productivity growth, e.g. by making labour markets more adaptable and improving allocative efficiency, and by investment in human capital and innovation. ([1])

I.1. Introduction

Wages play a key role in an economy. Sound wage behaviour can support economic resilience, by being a possible channel for macro-adjustment in the face of certain types of shocks. This is especially relevant in a currency union, where other channels for adjustment (such as exchange rate adjustment) can no longer be used. Relative wage differences across the economy can also signal where labour can be put to its most productive use, and hence where labour resources should be allocated. At the same time, wages are crucial determinants of household incomes, and hence of aggregate demand and (inclusive) growth.

The euro area is entering its sixth year of uninterrupted economic growth, and is expected to continue growing, albeit at slowing pace (from 2.4% in 2017 to 1.9% in 2020). ([2]) The output gap is estimated to have fully closed in 2018. These improvements are also observed in the labour market, which continues to recover at a rapid pace, with employment reaching pre-crisis levels in 2017 and unemployment rates gradually approaching

levels prior to the recession. According to the Commission's forecasts, unemployment will decline from 9.1% in 2017 to 7.5% by 2020.

Several studies have however observed that until recently, nominal wage growth ([3]) was not picking up as one would expect based on its historical relationship with standard indicators of economic activity and labour market slack. ([4])

Different reasons have been advanced by now to explain this, including low core inflation, "sticky" inflation expectations, a reduction in hours worked per employee, weak productivity developments, and structural labour market developments. In countries where un(der)employment remains high compared to pre-crisis levels, labour market slack continues to exert downward pressure on wage growth.

Subdued wage growth risks being a drag on private consumption, currently the main driver of growth. If wage growth is below consumer price inflation, real disposable incomes are eroded. Low wage growth in itself puts a break on inflation. Low price

inflation can also hamper rebalancing within the euro area by complicating real wage adjustment. These considerations have brought the issue of wage growth to the forefront of policy attention. In the context of the European Semester, the European Commission and the European Council have encouraged surplus countries to create conditions to promote higher real wage growth, while respecting the role of social partners. Faster real wage growth in the euro area as a whole is expected to help sustain domestic demand, reduce inequalities and ensure higher standards of living, thereby contributing to the realisation of the fair wage principle of the European Pillar of Social Rights.([5]) Some observers have called for stronger coordination of (nominal) wage dynamics between euro area Member States. ([6])

In this context, this section provides an overview of recent wage dynamics in the euro area, their link with economic slack and their implications for intra-euro area rebalancing. The section also looks into the set of instruments governments have at hand to influence wage setting.

I.2. Wage developments in the euro area: Setting the scene

Nominal wage growth is picking up in the euro area. Wages are estimated to have grown at 1.6% in 2017, up from 1.1% in 2016 (Graph I.1). Going further, wage growth is expected to reach 2.3% in 2018 (including as a result of a pick-up in inflation) and then slow down again to 2.0% in 2019. ([7])

At the individual country level, nominal wage growth has been positive but still moderate in most cases in recent years (Graph I.1). ([8]) Nominal wage developments remained particularly flat in those countries still characterised by high levels of unemployment, notably Greece, Spain, Italy, and Cyprus. Wage growth was even slightly negative in

Greece, Spain and Cyprus in 2016, but turned positive in 2017. In 2016, low wage growth (1% or below) was also observed in Belgium, France, and Luxembourg, which had experienced a deterioration of their external position and a loss of cost competitiveness during the crisis. In 2018, most euro area countries saw an acceleration of wage growth. Only in Greece, Spain, Finland, Cyprus, Portugal and Italy, nominal compensation growth is estimated to remain below 2% in 2018.

Graph I.1: **Nominal compensation per employee, 2016-18, annual % change**
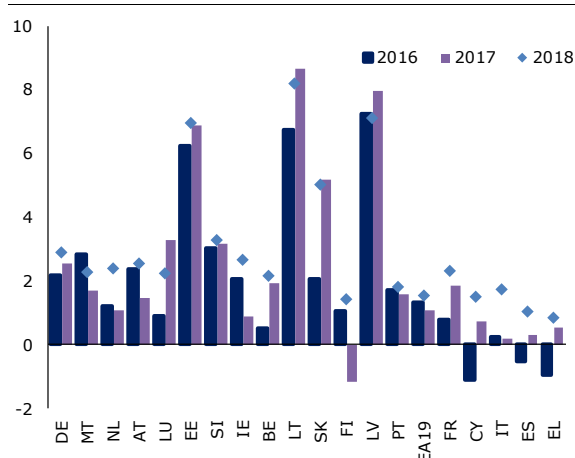
(1) Wages are measured by the indicator "Nominal compensation per employee", which is calculated as a total compensation of employees divided by total number of employees. The total compensation is defined as the total remuneration, in cash or in kind, payable by an employer to an employee in return for work done by the latter during the accounting period and it has two components: i) Wages and salaries payable in cash or in kind; and ii) Social contributions payable by employers. All data used are national accounts data. The indicators are based on national currency values. 2018 values are based on ECFIN's 2018 Autumn Forecast Aggregates are weighted averages. Countries are ranked in ascending order of the unemployment rate in 20167.
Source: European Commission, AMECO database.

Wages grew relatively slowly in Germany and the Netherlands, the two countries with the strongest current account surpluses in the euro area. In spite of declining unemployment, wage growth declined from 2.8% to 2.2% over the period 2014-2016 in Germany. In the Netherlands, nominal compensation grew at a relatively modest rate in 2016 and 2017 (at 1.2%), after negative observed growth in 2015. By 2018, wage growth is estimated to have accelerated in Germany and the Netherlands (to 2.9 and 2.4% respectively), but not to the extent that it compensates for the period of slow wage growth in previous years.

Wages grew faster in euro area Member States with the lowest wage levels, partially as a result of rapid

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([5]) see e.g. Annual Growth Survey 2018 (COM(2017) 690 final); 2018 Council recommendation on the economic policy of the euro area. Faster real wage growth in the euro area can also contribute to the realisation of the fair wage principle of the European Pillar of Social Rights (C(2017) 2600 final); and Annual Growth Survey 2019 (COM(2018) 770 final).
([6]) See e.g. Ragot, X. (2017) How to further strengthen the European Semester? In-depth analysis provided at the request of the Economic and Monetary Affairs Committee of the European Parliament.
([7]) European Commission (2018a), as above
([8]) See also European Commission (2018b), Labour Market and Wage Developments in Europe. Annual Review 2018, Directorate-General for Employment, Social Affairs and Inclusion.

catching-up of GDP per capita to the average. Annual growth of nominal wages lingered between 6-9% in Estonia, Latvia and Lithuania in 2016 and 2017. In Slovakia wage growth saw a temporary drop in 2016, but recovered to a steady 5.2% in 2017. Also in 2018, these countries continue to observe steady wage growth.

At the same time, purchasing power has increased, as real wages rose in most euro area countries over the period 2015-17, in spite of the uptick in inflation. The increase in real consumption wages (i.e. wages adjusted for the change in consumer prices) helped sustain aggregate demand. Real consumption wages fell only in Spain and Greece—due to a decline in nominal wages–-and in Italy, Belgium, and Finland where it was the result of consumer price inflation exceeding nominal wage growth.

Over the longer term, while real wage growth has been broad-based, it has not always kept pace with productivity growth. Cumulative growth in real compensation since 2000 amounts to 10% on average in the euro area (around 0.6% annually) (Graph I.2). The strongest growth was observed in countries starting from the lowest wage levels (Latvia, Lithuania, Estonia), where purchasing power roughly doubled over the considered period, partially as a result of rapid catching-up of GDP per capita to the EU average. Real wage growth in line with productivity supports sustained firm profitability and sustainable job creation, growth, and underpins increases in living standards.[9] On average in the euro area, real wage growth was slightly weaker than productivity growth over the period 2000-17 resulting in a slight decline in real unit labour costs of 1.7 ppt (Graph I.2). The largest gaps were observed in Ireland and Portugal. [10] A smaller gap is noted in Spain, Malta, Cyprus and Germany.

Even if inflation remained weak, the inflation component was the main contributor to wage growth in the EA. Growth of real wages has been trailing marginally behind productivity growth since 2012; and this is expected to remain the case over

the forecast period (with the exception of 2018). Hence, while nominal unit labour cost growth is estimated to have accelerated to 1.6% in 2018 (up from 0.7% in 2017) as a result of a pick-up in inflation; real unit labour costs are predicted to continue on their gradual decline in the euro area.

Graph I.2: **Cumulative growth in real compensation and real unit labour costs, 2000-17**
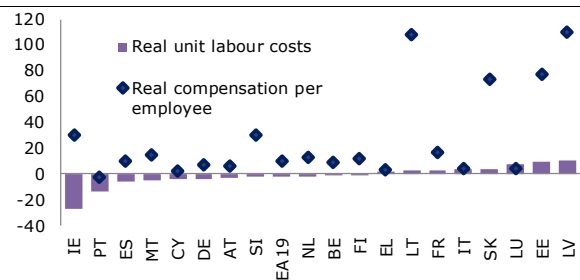
(1) Real compensation is measured as nominal compensation, deflated with private consumption prices. Real unit labour costs are defined as the ratio of real compensation per employee over GDP per worker (in this case, both deflated with the GDP price deflator).
Source: European Commission, AMECO database

The largest real unit labour cost reductions over 2015-17 were observed in Ireland, Cyprus, Malta and Finland. In contrast, real wage growth exceeded productivity growth significantly in the Baltic States, Slovakia, and Luxembourg, resulting in positive real unit labour cost growth.

I.3. Wage responsiveness to labour market slack

I.3.1. Stylised facts of subdued wage growth

Wage growth tends to reflect labour market conditions, as depicted by the Phillips curve. The Phillips curve relation predicts that wage growth will be higher in tight labour markets, and lower in the presence of substantial labour market slack. [11] A steeper Phillips curve reflects a stronger relationship between wages and labour market slack, in other words, that wage growth is more reactive to cyclical fluctuations in unemployment; conversely, a flatter curve implies a weaker response.

In 2016 and 2017, wage growth in the euro area remained almost one ppt below what would be expected based on its historical relationship with

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[9] Note that real unit labour costs are also a (rough) measure of the labour income share (labour income as a share of GDP), which has a positive relationship with aggregate demand to the extent that the marginal propensity to consume out of labour income is higher than the marginal propensity to consume out of capital income.

[10] The Irish case is particular as its real GDP grew by more than 25% in 2015 as a result of revisions in calculation methods.

[11] Phillips, A. W. (1958). The Relationship between Unemployment and the Rate of Change of Money Wage Rates in the United Kingdom, 1861-1957. Economica, 25, 283-299.

unemployment, as shown by simple cross-time scatter plots (Graph I.3). The aggregate picture hides considerable heterogeneity across countries (Graph I.4). [12] Still, in virtually all countries, wage growth in 2016 and 2017 was slower than or equal to what would be expected on the basis of its historical relationship with unemployment. Countries in which wage growth remained furthest below the historical relationship are Belgium, Spain, and Finland.

Different reasons contribute to explaining the observed subdued wage growth. These reasons include low core inflation, weak productivity developments, "sticky" inflation expectations, a reduction in hours worked per employee, and, especially in countries where labour resources remain underutilised, the effect of remaining "slack" in the labour market and pent-up wage deflation. [13]

Graph I.3: **Phillips curve for EA19 2000-18**
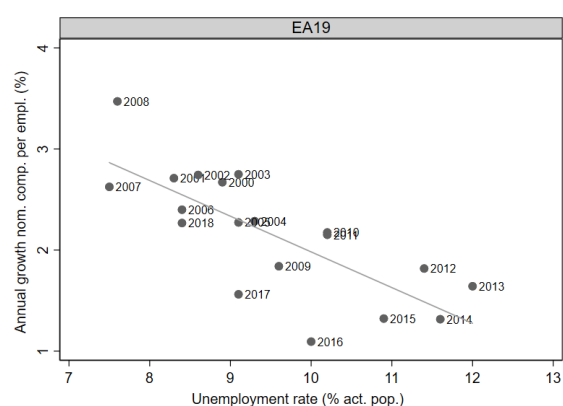
Source: European Commission, AMECO database

In what follows, these arguments will be reviewed in more detail. While the analysis focuses on the euro area, the findings are likely to apply to non-euro area countries as well. Many of the results

presented are drawn from early research, and further monitoring and analysis is needed to corroborate their robustness. Results are also likely to differ depending on the perspective that is taken, i.e. whether the euro area is considered on aggregate, or whether analysis zooms in on individual countries.

I.3.2. Traditional measures of slack, productivity and inflation

European Commission analysis focusing on the euro area confirms the important role of standard measures of slack in explaining wage growth but also that these measures are insufficient to explain recent developments. A regression which only includes the output gap, a traditional slack indicator, captures observed wage growth reasonably well for much of the sample period (Graph I.5, line PV1). [14] However, it fails to explain why the rapid narrowing of the output gap since 2014 has not been matched by higher growth in compensation per employee in 2015-2017. Using other measures of economic slack, such as the unemployment gap, leads to similar results.

Low productivity growth is weighing on wage growth. Productivity growth, typically an important driver of wage growth, has been sluggish in recent years. Whereas real productivity per person employed over the period 2004-2007 grew on average by 1.3% a year in the euro area, this slowed down during the crisis to around 0.3% over the period 2008-2012; to recover to 0.7% on average over the period 2013-2017. The shortfall of investment is likely to have reduced productivity growth during the crisis.

More recently, the structure of employment creation may have contributed to low productivity developments, as job creation has been particularly strong in lower-productivity sectors. [15] On the other hand, a decline in labour productivity growth has already been observed since the mid-1990s in the euro area. [16]

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[12] In some countries such as AT and SK, no negative relationship between unemployment and wage inflation is observed at all. This phenomenon has been noted earlier, e.g. by Bhattarai, K. (2016) Unemployment-inflation trade-offs in OECD countries. *Economic Modelling*, 58: 93-103.

[13] This implies that wages are growing slower during the recovery because they were unable to decline considerably during the crisis (to the value consistent with high unemployment) as a result of downward nominal wage rigidities (Yellen, 2014; Daly and Hobijn, 2015). See Yellen, J. (2014), "Labour Market Dynamics and Monetary Policy"; speech at the Federal Reserve Bank of Kansas City Economic Symposium, Jackson Hole, Wyoming; Daly, M.C., Hobijn, B. (2015) Why is Wage Growth so Slow? FRBSF Economic Letter 2015-01, Federal Reserve Bank of San Francisco.

[14] For more details on the underlying regression model, see Box II.1.

[15] ECB (2015) What is behind the recent rebound in euro area employment? Economic Bulletin, Issue 8, December 2015.

[16] Gomez-Salvador, R., Musso, A., Stocker, M., Turunen, J. (2006) Labour productivity developments in the euro area. ECB Occasional Paper No. 53, October 2006; Andrews, D., Criscuolo, C., Gal, P. (2017) The best vs the rest: the global productivity slowdown hides an increasing performance gap across firms. VoxEU, 27 March 2017.

Graph I.4: **Phillips curves for individual euro area countries (2000-18)**

Annual growth compensation per employee (%) (y-axis)

Unemployment rate (% act. pop.) (x-axis)
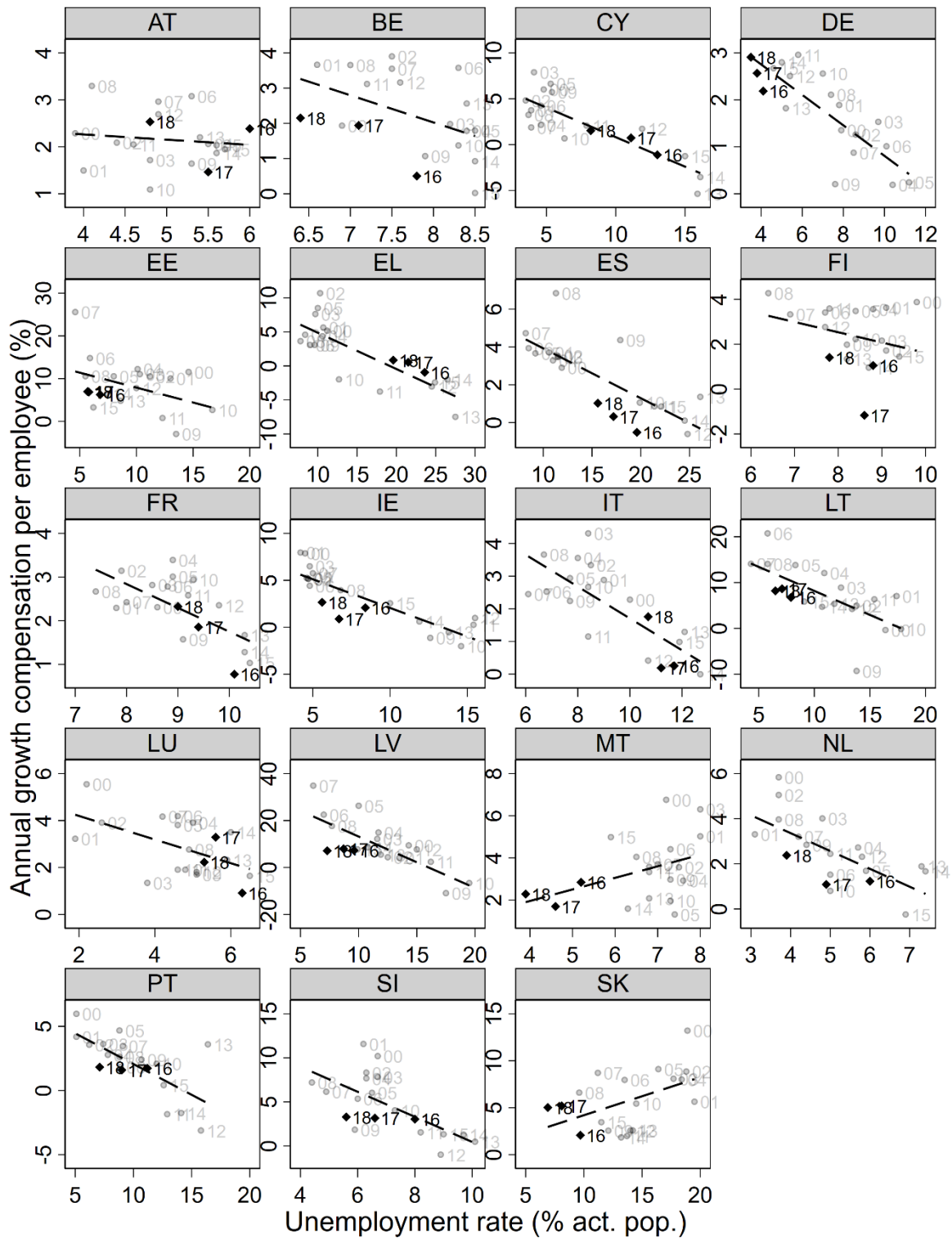
Adding productivity growth on top of the output gap as an explanatory variable in the regression enhances the overall model fit (Graph I.5, line PV2). The low level of productivity growth observed in the current recovery has been pushing wage growth down compared with the immediate pre-crisis period. However, this effect remains relatively small and reduces the gap between observed and estimated wage growth over the past three years only modestly. [17]

Nominal wage growth reflects past inflation and inflation expectations. Workers account for price developments in their wage demands to protect their purchasing power. Inflation has been low in recent years, not only because of weak wage growth, but also as a result of low energy and unprocessed food prices. Price inflation can have a lasting impact on wages, if inflation expectations are "sticky" and wage negotiations backward looking.

Graph I.5: **Compensation per employee: realised and estimated growth in the euro area**
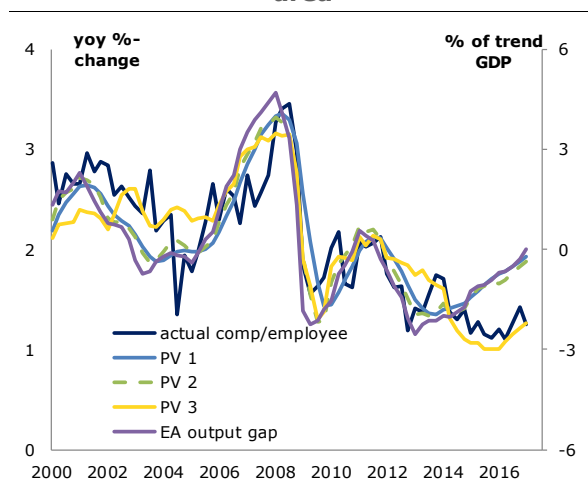
(1) PV1: comp/employee on constant and OG (Box II.2 reg. 1); PV2: comp/employee on constant, OG and productivity growth (Box II.2 reg. 2); PV3: comp/employee on OG, productivity growth, core inflation and SPF (Box II.2 reg. 3)
Source: Source: DataInsight, Commission calculations

Controlling for past inflation and inflation expectations leads to significant improvements in

the model fit. If, in addition to the output gap, backward and forward-looking inflation measures are included in the model (and no constant is included), both inflation variables are significant and help explain a considerable part of the low wage growth registered over the recent period. The gap between observed and fitted growth rates identified in the previous specifications largely disappears (Graph I.5, PV3). Adding a constant to the specification improves the model fit slightly, but comes to the detriment of the inflation expectations variable becoming insignificant. This latter finding supports the view that the constant actually captures a large share of the information otherwise provided by forward looking inflation variables, suggesting that inflation expectations in the euro area wage formation process have a strong sticky component.

To account for possible non-linearities, a time-varying parameter version of the wage Phillips curve has also been estimated. The results suggest visible changes in the estimated coefficient of the baseline model over time. In particular, the results point to an increasing tendency towards a more backward looking wage formation system during the first decade of the euro. The non-linear model similarly points to a slight flattening of the wage Phillips curve since about 2011. [18]

I.3.3. Broader measures of labour underutilisation

Traditional measures of slack such as the unemployment rate may underestimate the extent of underemployment in the post-crisis world. [19] Available data suggest that discouraged and underemployed or involuntary part-time workers constitute a significant part of the population in some countries of the euro area and may exert additional downward pressures on wages. The effect of these factors is not straightforward to identify empirically as a result of data availability

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[17] Schwellnus et al. (2017) find that over the past two decades, aggregate labour productivity growth in most OECD countries has decoupled from real median compensation growth, implying that raising productivity is no longer sufficient to raise real wages for the typical worker. This decoupling is explained by declines in both labour shares and the ratio of median to average wages. See Schwellnus, C., A. Kappeler and P. Pionnier (2017), Decoupling of wages from productivity – macro facts, OECD Economics Department Working Papers, No. 1373.

[18] Similar results have been reported in European Commission (2017), Labour Market and Wage Developments in Europe. Annual Review 2017, Directorate-General for Employment, Social Affairs and Inclusion

[19] See e.g. ECB (2017a) Assessing labour market slack. Economic Bulletin Issue 3; Coeuré, B. (2017), Scars or scratches? Hysteresis in the euro area, ECB, 19 May 2017; Ciccarelli, M. and C. Osbat (2017), Low inflation in the euro area. Causes and consequences, ECB Occasional paper series, No 181; European Commission, 2017, as above; IMF (2017) Recent wage dynamics in advanced economies: drivers and implications, Chapter 2, World Economic Outlook, August 2017; Bell, D., Blanchflower, D. (2018) Underemployment in the US and Europe. NBER WP 24927.

Box I.1: **Estimating wage growth using an augmented Phillips curve**

A new Keynesian wage Phillips curve (WPC) for the euro area is estimated,[1] taking in its standard specification the following form:

$$\pi_t^w = const + \alpha gap_t + \beta prod_t + \gamma \pi_{t-2}^c + \delta E_t \pi_{t+4} + \varepsilon_t$$

Where π^w_t denotes quarter-on-quarter wage growth measured by compensation per employee[2] and *gap* the level of the output gap based on trend real GDP published in DG ECFIN's AMECO database. *prod* denotes quarter-on-quarter changes in labour productivity defined as real output per employee, π_{t-2} is a backward-looking inflation measure (lagged by two quarters)[3] and $E_t \pi_{t+4}$ 1-year ahead inflation expectations obtained from the ECB's Survey of Professional Forecasters (SPF). ε_t is an independently and identically distributed error term.

Various specifications of the WPC in its broadest form are estimated. This includes specifications on the one hand relying only on the output gap or labour productivity growth as explanatory variables and more detailed ones which also reflect particular labour market situations or time variations in the constant using dummy variables. The regressions underlying the predicted relationships in Graph II.4 are presented in Table 1. [4]

Table 1:

p-values in italics	Reg. 1	Reg. 2	Reg. 3
Constant	0,51	0,49	
	0,00%	*0,00%*	
Output gap (level, %)	0,07	0,08	0,04
	0,02%	*0,01%*	*0,35%*
Labour productivity (qoq %-change)		0,13	0,21
		8,51%	*0,06%*
Core inflation (yoy %-change, 2 quarter lag)			0,10
			9,38%
Inflation expectations 1 year ahead (SPF1, %)			0,20
			0,14%
Sample period	*95Q2 - 17Q1*	*95Q2 - 17Q1*	*99Q1 - 17Q1*
R²	0,15	0,18	0,34
Adjusted R²	*14,22%*	*16,21%*	*31,42%*

Different robustness checks are carried out (but not reported here). Model specifications using the unemployment gap as an alternative measure of economic slack result in a deterioration of the overall fit as the variable is not highly significant. If the unemployment rate is used, results are comparable to the standard specification based on the output gap. A broader measure of the unemployment rate, i.e. one including underemployed part-time workers or discouraged workers, is available for a very limited time span covering only the period 2008 to 2017. The output gap is therefore retained as preferred slack variable as it provides a more compressive assessment of the state of the economy in the cycle. Moreover, it allows for more straightforward interpretations of the constant (i.e. it largely captures inflation expectations).

[1] See e.g. Galí, J. (2011) The Return of the Wage Phillips Curve, Journal of the European Economic Association, 9(3): 436-461.
[2] Although compensation of employees diverges somewhat from wages actively negotiated between social partners, it is the most encompassing measure of labour costs as it includes employees' remuneration as well as social contributions paid by the employer.
[3] Core inflation (measured in annual percentage changes of the HICP index excluding energy and unprocessed food as per the EC definition) is used as it leads to better results regarding model fit and regressor significance compared to headline inflation.
[4] For more details and results, see European Commission (2018c) Wage dynamics in Europe, background note prepared by the Commission for the EPC/EMCO Joint Seminar on Wage Developments and Dynamics of January 31 2018.

issues (notably long time series data on these broader measures). That being said, Commission analysis suggests that the additional explanatory power provided by these labour market measures is relatively low, although it could be more significant in some Member States where the increase in underemployed part-time workers since the crisis has been very large. [20]

[20] European Commission (2017), as above.

I.3.4. Structural labour market characteristics

While structural labour market reforms can contribute to sustainable job creation and growth, in the short term, they may (temporarily) exert downward pressure on wage growth. [21] Commission analysis suggests that structural unemployment in the euro area has declined over the period 2013-2017 by almost 1 ppt, helped by structural labour market reforms that have been undertaken. [22] This decline has been associated with a small temporary fall in wage growth. These results are in line with findings from other studies. [23]

Though the effects are difficult to quantify, some studies have posited that other ongoing structural changes in the labour market are exerting downward pressure on wages. Key drivers that have been referred to in the literature are globalisation, technological progress, declining unionisation, and the emergence of new forms of employment. Increased trade and globalisation have reinforced workers' exposure to international competition, and this may have a negative impact on real wages. [24] Some types of workers are particularly vulnerable as a result of ongoing trends such as the de-routinisation of jobs and skill-biased technological progress. IMF finds that institutional factors such as declining union density and coverage of collective bargaining agreements and the decentralisation of such agreements can weaken workers' bargaining power. [25] Their analysis suggests that automation may have weighed on nominal wage growth, although the impact has been limited. BIS provides suggestive evidence of the fact that the fall in pricing power of

workers (stemming from reduced employment protection, union density and union coverage) is a possible explanation for the flattening of the Phillips curve. [26][27] Another factor that has been blamed for exerting drag on wage growth is the increase in non-standard forms of work. Some researchers have pointed at the low quality of jobs created since the crisis in several advanced economies, with relatively high rates of (involuntary) temporary and part-time positions. [28] These non-standard forms of employment may be associated with lower bargaining power for workers. [29] Some have argued that these structural trends trigger a decoupling between real wages and productivity growth, reflected in a declining labour share. [30]

I.3.5. Trends in hours worked

A structural downward trend in hours worked per employee is likely to contribute to subdued wage growth as well as far as annual earnings are considered. Between 2000 and 2017, the annual hours worked per employee declined by more than 5% (Graph I.6). This does not just reflect cyclical conditions; there is also a long-term structural trend in lower hours worked. [31] Increased labour market participation of women and older workers,

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[21] Labour economics theory predicts that, under the assumption of imperfect competition, where firms set their prices as a fixed mark-up over their marginal cost and face a downward sloping demand curve in the short run, and workers' labour supply slopes upward, the increase of labour supply at a given wage will have a negative impact on real wages in the short run. In the longer run, however, firms will raise investment in order to take advantage of the cheaper work force (and/or because the central bank lowers the interest rate to bring inflation back to its target), and labour demand will increase proportionally, bringing real wages back to their original level (e.g. Carlin, W., Soskice, D. (2005) Macroeconomics: imperfections, institutions, and policies. Oxford University Press).

[22] see European Commission (2018c), as above.

[23] such as Duval, R., Furceri, D. (2016) The Effects of Labor and Product Market Reforms: The Role of Macroeconomic Conditions and Policies. Mimeo, International Monetary Fund.

[24] see e.g. for the US: Autor, D., Dorn, D., Hanson, G. (2013) The China Syndrome: Local Labor Market Effects of Import Competition in the United States. American Economic Review, 103(6): 2121-2168.

[25] IMF (2017) as above

[26] BIS (2017), 87th Annual Report, Box IV.A: Exploring the wage Phillips curve. Bank for International Settlements, Basel.

[27] The analyses by IMF and by BIS include countries outside the EU, which means that the results are not necessarily driven by EU countries. Moreover, the BIS report does not report detailed regression results, such that the magnitude of the identified impact is difficult to assess.

[28] Between the beginning of 2012 and Q2 2017, 4.4 million jobs have been created in net terms of which 29% were temporary contracts and 64% were part-time jobs. At the same time, a high share of non-standard labour contracts among newly created jobs is not unusual by historical standards, particularly in the early stages of a recovery.

[29] see e.g. European Commission (2017) as above and Haldane, A.G. (2017) Work, wages and monetary policy. Speech by A. G. Haldane, Chief Economist, Bank of England at National Science and Medium Museum, Bradford, 20 June 2017. At the same time, some of the structural changes reported in this paragraph were already observed in the pre-crisis period, so it is not clear that they would be able to explain the apparent decoupling between wages and the business cycle in the ongoing recovery.

[30] see e.g. for evidence from the US: Elsby, M.W. L., Hobijn, B., Sahin, A. (2013) The Decline of the U.S. Labor Share, Brookings Papers on Economic Activity 47(2), 1-63; Acemoglu, D., Restrepo, P. (2016). The Race between Machine and Man: Implications of Technology for Growth, Factor Shares, and Employment, NBER Working Paper No. 22252; Kehrig, M., Vincent, N. (2017) Growing Productivity without Growing Wages: The Micro-Level Anatomy of the Aggregate Labor Share, Economic Research Initiatives at Duke Working Paper No. 244..

[31] Alesina et al. (2006) show that annual hours per employed person were already on a decline in the 1960s (see Alesina, A., Glaeser, E., Sacerdote, B., 2005. Work and leisure in the US and Europe: Why so different? NBER Macroeconomics Annual, pp. 1–64)

who work less hours than prime age men on average, may contribute to this observation. However, the reduction in hours worked is also visible for prime age male workers, possibly reflecting, at least partially, better work-life balance opportunities. [32] The structural shift of employment in many economies from manufacturing to the service sector, where part-time employment is more common (and often involuntary), is likely to play a role as well. [33]

Graph I.6: **Trends in hours worked in the euro area, 2000-17 (index: 2000=100)**

Employment (based on persons)

Employment (based on hours worked)

Annual hours worked per employee
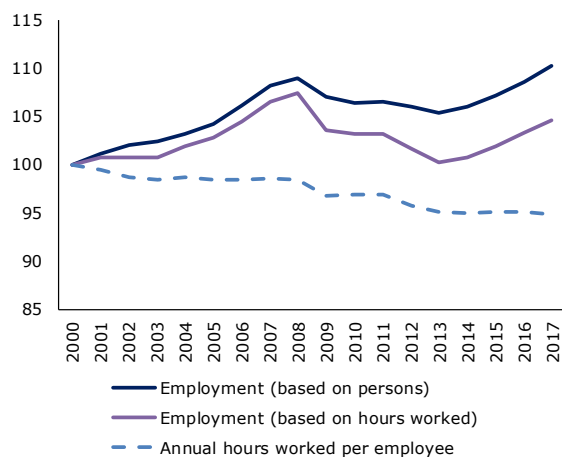
Source: European Commission, based on Eurostat [nama_10_a10_e]

I.3.6. Downward nominal wage rigidities

Wage moderation during the latest recovery may also partially be explained by downward nominal wage rigidities. Wage rigidities have long been considered a factor that may interfere with a smooth functioning of the labour market. Such rigidities can have different origins, including government regulations such as minimum wages, the use of fixed-term nominal wage contracts between employers and employees, and other behavioural factors that lead both employers and/or employees to focus on nominal rather than real wages.

Some have observed that wage growth was stronger than expected during the crisis, and weaker than expected at the onset of the recovery. This has been argued to be the result of nominal

wage rigidities or "pent-up" wage inflation: in the absence of downward wage flexibility, employers are unable to reduce wages in line with soaring unemployment during the crisis. When the economy recovers, wage increases are held back until the "pent-up" wage cuts are worked off by inflation and productivity growth. [34] Most of the evidence in favour of this argument has been based on US data. However, it is likely to be equally (if not more) relevant for the European context, where the existence of nominal wage rigidities has been documented extensively. [35]

Commission analysis indeed finds a positive (but not always significant) coefficient on the interaction between low inflation and economic slack, [36] indicating that in a low inflation environment, nominal wage rigidities cause wage growth to be higher during economic downturns than in a higher inflation environment. This brings about some inertia in wage growth when the economy picks up again, as firms make up for corrections not done during the crisis.

I.4. Wage dynamics and rebalancing in the euro area

Labour cost developments have an impact on cost competitiveness and may therefore have important implications for developments of the trade balance and the current account. [37] If not offset by productivity developments or matched in partner countries, wage shocks influence price competitiveness. All else equal, unit labour cost (ULC)-based REERs [38] increase (fall) in the event of shocks leading to higher (lower) unit labour costs, and theory predicts that this will lead to a deterioration (improvement) of the trade balance and the current account balance. Most empirical estimates indeed point to a negative impact of REER increases on the current account balance

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[32] Bodnár, K. (2018) Labour supply and employment growth. ECB Economic Bulleting, Issue 1/2018 – Article. pp. 35-59.

[33] European Commission (2017: Box I.1.1) shows that the structural reduction in hours worked per employee tends to accelerate during recessions.

[34] see Daly and Hobijn (2015), as above; Yellen (2014), as above.

[35] see e.g. Marotzke, P., Anderton, R., Bairrao, A., Berson, C., Tóth, P. (2017) Asymmetric wage adjustment and employment in European firms. ECB Working Paper No. 2103. Wage Dynamics Network, European Central Bank

[36] European Commission (2018c), as above

[37] See footnote 10

[38] The real effective exchange rate (REER) is a measure of a country's price or cost competitiveness relative to its principal competitors in international markets. It is calculated as a weighted average of bilateral exchange rates against currencies of competing countries, deflated using a cost deflator (such as unit labour costs) or a price deflator (e.g. the consumer price index). As a result, changes in the REER reflect not only exchange rate movements but also cost/price trends. A rise in the indicator means a loss of competitiveness.

over the medium term. [39] The overall impact of changes in labour costs on the current account depends on other transmission channels beyond price competitiveness and on general equilibrium interactions. Exogenous changes in wage rates or labour taxes can for example affect the current account balance through their impact on disposable income, domestic and import demand.

Since the establishment of the monetary union, and in particular in the run-up to the crisis, imbalances have developed within the euro area. In the initial stages of the monetary union, the decline in risk premia on interest rates led to a surge in net capital inflows in some countries of the euro area (such as Spain, Portugal, Greece, Ireland). This was followed by overheating and strong inflation dynamics, resulting in competitiveness losses, growing current account deficits and large negative net international investment positions. At the same time, other countries (such as Germany) increased and largely sustained their current account surpluses, even during the crisis (Graph I.7).

In theory, internal imbalances can be re-absorbed through the reaction of wages to cyclical conditions. If a shock drives output in a given country much above (below) that in other members of a monetary union, stronger (weaker) wage pressure leads to a deterioration (improvement) of price competitiveness and then to weaker (stronger) growth via an adjustment of net exports. In a currency union, however, there is no automatic adjustment mechanism in response to external imbalances. The adjustment to cyclical divergences may either work in favour of or against the correction of external imbalances.

In the pre-crisis period, the response of wages to tightness in the domestic labour market exacerbated the accumulation of external imbalances through higher inflation and falling net exports. Since the start of the crisis, imbalances have come down, helped by supportive labour cost

developments in the former deficit countries – partly reflecting productivity increases due to labour shedding rather than nominal wage adjustment. [40] Several among the latter (such as Italy, Spain, and Ireland) have succeeded in turning their current account deficit into a surplus by 2014. This observation is consistent with a causal link between competitiveness and the current account balance.

Graph I.7: **NULC in euro area deficit and surplus countries, 2000-2019, annual % change**
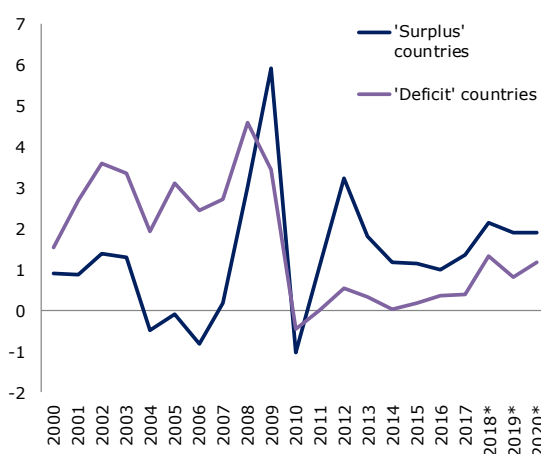
(1) Aggregate NULC growth rates reflect population-weighted averages. Figures for 2018-20 are based on ECFIN's Autumn 2018 forecast. Belgium, Germany, Luxembourg, the Netherlands, Austria and Finland are referred to as 'surplus' countries. 'Deficit' countries are all other euro area Member States. This classification is based on the current account situation around 2008. All surplus countries recorded a current account position balanced or in surplus over the 2000-2012 period (the only exceptions being DE and AT before 2002 and FI after 2010), while all deficit countries recorded a deficit between 2000 and 2012. This grouping of countries is in line with the methodology of the 2018 Alert Mechanism Report.
Source: Source: European Commission based on AMECO

The adjustment process has however been painful. The current account improvement partly reflected the consequences of a domestic demand contraction. The onset of the crisis triggered an increase in credit risk for countries that had been receiving substantial foreign capital inflows, resulting in a significant disruption in these inflows. This contributed to a closing current account deficit and at the same time to a contraction of domestic demand, which was associated with a reduction in labour cost growth and a strong increase in unemployment. At the same time, the net international investment positions in these

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[39] This suggests that typically, the so-called Marshall-Lerner condition is satisfied, i.e. import and export elasticities are large enough to compensate for the reduced relative local-currency price of imports associated with real exchange rate appreciations. Nevertheless, estimates of current account elasticities are notoriously uncertain due to well-known difficulties in estimating trade elasticities (see e.g. Imbs, J., Mejean, I. (2017) Trade elasticities. Review of International Economics, 25: 383-402). The semi-elasticity of the current account balance (measured as % of GDP) to the percentage change in the REER is estimated to lie between 0.1 and 0.7 (see IMF (2018), External Sector Report: Tackling Global Imbalances amid Rising Trade Tensions, Table 2)

[40] ECB (2014) Economic and Monetary Developments: Output, Demand and the Labour Market. Monthly Bulletin, January 2014.

countries remain negative and large and are generally associated with large stocks of private or government debt and constitute a vulnerability, pointing at a need for further rebalancing efforts.

The unit labour cost growth differentials between surplus and formerly deficit countries, observed since the crisis, are gradually winding down. This is the result of the recovery of wage growth from very low rates in formerly deficit countries coupled with weak productivity gains, while wage growth has remained moderate in surplus countries in spite of relatively tight labour market conditions.

The post-crisis reduction of most current account deficits has not been matched by significant progress in terms of reducing large surpluses. Countries with large surpluses like Germany and the Netherlands have actually seen their surpluses grow considerably since 2001. As a result of the simultaneous reduction of large deficits and the lack of correction in large surpluses, the euro area as a whole has gradually moved to a current account surplus exceeding 3% of GDP. This contributes to the aggregate surplus position of the Eurozone and (in combination with other factors) to low price inflation, making the intra-euro area rebalancing process more difficult. In a low inflation/high debt environment, it has put pressure on deficit countries to pursue deflationary policies to regain competitiveness and aggravated the employment and social costs of the adjustment.

From this perspective, stronger wage growth in these creditor countries would arguably support domestic demand and aggregate demand in the euro area, and contribute to the economic recovery and the rebalancing, while easing the competitiveness adjustment of deficit countries.

I.5. Policy instruments that influence wage developments

Although wage developments are mainly the result of the interaction between market forces and the institutions underpinning collective bargaining, governments can influence these dynamics in in a number of ways, including through the setting of minimum wages and government wages, the tax and benefit system, the steering of collective bargaining in the private sector via tripartite agreements and social pacts, or, where collective bargaining is regulated by law, the review of the legislated frameworks regulating wage setting in consultation with social partners. Structural

reforms can also influence wage and labour cost developments, albeit in a more indirect way. Since these different instruments interact in different ways with the rest of the economy, their effectiveness in steering wage developments and their impact on the rest of the economy varies as well. [41]

I.5.1. Minimum wages

A statutory minimum wage is a policy instrument that directly affects wages, particularly for workers in a weak bargaining position. [42] They set a floor to earned labour income, and compress the wage distribution from below. In some countries, statutory wage floors are combined with additional sectoral wage floors negotiated between social partners. Minimum wage policies have attracted a vigorous debate in the literature. A major issue of contention is their potential impact on employment. Some argue, based on a competitive labour market assumption where workers are paid according to their productivity, that imposing a wage floor will price low-skilled/low-productive workers out of the market. Others argue, based on a monopsonistic labour market assumption, that imposing a wage floor can actually expand employment, as firms will increase their output in response to a reduction of their profit margins per unit produced. [43] The empirical literature has found evidence in favour of both hypotheses, underlining the importance of the context (e.g. in terms of the level of the minimum wage compared to the rest of the wage distribution, and the proportion of the workforce that is covered by it), but seems to broadly converge on the conclusion that the aggregate employment effects of observed minimum wages increases have been minor, if significant at all (e.g. Neumark, 2017; Allegretto et al., 2011). [44] Slightly more negative but still modest effects have been found for employment

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[41] For instance, policies that help raising labour demand and employment are more likely to stimulate output in the own economy and in the rest of the euro area, see e.g. IMF (2015).

[42] OECD (2015) Focus on minimum wages after the crisis: Making them pay. Directorate for Employment, Labour and Social Affairs, Paris: OECD Publishing.

[43] For a review of the theoretical arguments and empirical evidence, see European Commission (2016), Labour Market and Wage Developments in Europe. Annual Review 2016, Directorate-General for Employment, Social Affairs and Inclusion.

[44] Neumark, D. (2017) The employment effects of minimum wages: some questions we need to answer. NBER Working Paper No. 23584; Allegretto, S. A., Dube, A. and Reich, M. (2011), Do Minimum Wages Really Reduce Teen Employment? Accounting for Heterogeneity and Selectivity in State Panel Data. Industrial Relations: A Journal of Economy and Society, 50: 205–240.

of specific groups such as low-skilled, young, and/or female workers. [45]

Minimum wage setting frameworks vary considerably across countries, with possible implications for wage developments. Some countries in the EU do not have a statutory minimum wage at all. [46] Where minimum wages exist, governments are typically formally involved in establishing the procedure of minimum wage setting, but their scope for influencing the level varies. In some countries, such as Estonia, the statutory minimum wage is mostly negotiated between social partners, with very little discretion from the government's side. At the other extreme, the minimum wage is largely set at the government's discretion in Bulgaria. In other countries, minimum wages are established in tripartite negotiations involving the government and the social partners; or upon the recommendation of experts and/or based on analysis that takes into account economic and social criteria, labour market conditions, and other relevant dimensions. [47]

Usually only a small proportion of the labour force is covered by the (increased) minimum wage and therefore directly affected. The minimum wage may however also have some more indirect spillover effects on wage growth further up in the wage distribution, for example because other workers might demand wage increases to preserve existing wage differentials [48] and/or because social partners use the minimum wage as a reference for sectoral wage negotiations. Positional income concerns and fair wage considerations may also play a role. [49] The empirical literature (mostly based on US data) has found evidence of small effects on wages beyond the quintiles that are directly affected by minimum wage increases. [50]

Other have found no spillover effects; or that they only matter in the short run. [51]

Minimum wage floors can also have indirect effects on the economy. For example, minimum wages can induce investment in (physical and/or human) capital to offset the increased cost of labour. Minimum wages can also cushion fluctuations in the aggregate demand during economic downturns, by helping to avert risks of wage deflation.

I.5.2. Institutional settings of collective bargaining frameworks

Different aspects of collective bargaining institutions may have a bearing on wage outcomes. Key dimensions are (a) the level at which collective agreements are concluded (at the national, regional, sectoral, or firm-level); (b) union density; and (c) provisions on who is covered by collective agreements (e.g. through rules on representativeness as a condition for extension or on the conditions for exemptions); [52] (d) the framework for coordinating wage bargaining across the economy; (e) the frequency at which wages are re-negotiated, including provisions on retro- and ultra-activity, [53] and possible indexation clauses. The level at which collective agreements are concluded and the size of the workforce for which they apply (through extension provisions) matter for the extent to which wages can respond to firm-level, sectoral and regional differences in

[45] Neumark, D., Wascher, W.L. (2007) Minimum wages and employment, Foundations and Trends in Microeconomics: 3(1-2): 1-182.

[46] Eurofound (2017) Statutory minimum wages in the EU 2017. Dublin: Eurofound.

[47] European Commission (2016) provides an overview of different observed minimum wage setting institutions and the ensuing implications for wage developments.

[48] Bossler, M. and Gerner; H.-D. (2016) Employment effects of the new German minimum wage. IAB Discussion Paper 10/2016.

[49] Falk, A., Fehr, E., Zehnder, C. (2006). Fairness perceptions and reservation wages—the behavioral effects of minimum wage laws. Quarterly Journal of Economics, 121(4), 1347-1381.

[50] Card, D., Krueger, A.B. (1995), Myth and Measurement: The New Economics of the Minimum Wage, Princeton University Press; Autor, D. H., Manning, A., Smith, C.L. (2016). The Contribution of the Minimum Wage to US Wage Inequality over Three

Decades: A Reassessment. American Economic Journal: Applied Economics, 8(1): 58-99; Arpaia, A., and Van Herck, K., (2017) Wage distribution spillovers from minimum wages increases in France, DG Employment and Social Affairs. Analytical Webnote 1/2017; Vodopivec, M. (2015) The employment and wage spillover effects of Slovenia's 2010 minimum wage increase. European Scientific Journal, Special Edition, July 2015: 82-109.

[51] Dickens, R., Manning, A. (2004) Has the national minimum wage reduced UK wage inequality? Journal of the Royal Statistical Society: Series A (Statistics in Society) 167(4): 613-626; Neumark, D., Wascher, W.L. (2008). Minimum Wages. Cambridge, MA: MIT Press.

[52] For an interesting analysis on how these rules affect bargaining, see e.g. Hijzen, A., Martins, P.S., Parlevliet, J. (2017) Collective bargaining through the magnifying glass: a comparison between the Netherlands and Portugal. IMF Working Paper WP/17/275.

[53] Retro-activity means that a collective agreement can be applied retro-actively. This can have significant implications in the case of firm liquidity constraints. While in some countries, retro-activity only applies to signatory firms, in other countries, it applies to all covered firms. Ultra-activity implies that collective agreements remain valid after their expiry date, in the absence of a new collective agreement. It is meant to ensure continuity, but can also act as a disincentive to renegotiate (by the partner expecting a worse bargaining position in new negotiations) (see Hijzen et al., 2017, as above; and OECD (2017) Collective bargaining in OECD and accession countries: the duration, ultra-activity and retro-activity of collective agreements. Paris: OECD Publishing).

productivity and labour market tightness. Union density can influence the bargaining power of workers in wage negotiations and as a result have a positive impact on wage outcomes. The extent to which unions internalise needs of "outsiders" (be it the unemployed or those on less favourable contract types) also matter. This is typically not under direct government control, but the government may exert some influence in the case of tripartite agreements. [54]

The frequency at which wages are re-negotiated has a relevant interaction with inflation. On the one hand, higher inflation makes more frequent renegotiations necessary to maintain purchasing power. On the other hand, frequent wage adjustments tend to make inflation more persistent. Similarly, a relevant role in this respect is played by the presence of ex-post wage indexation mechanisms enshrined in law or in collective contracts, and the legal framework and practice followed for negotiating and renewing contracts.

Theoretical predictions on the impact of the degree of centralisation are ambiguous. [55] Some have argued that decentralisation weakens the power of trade union and hence that it would result in lower wage demands. Others have argued that centralised wage negotiations are more likely to take into account possible negative externalities (e.g. on employment or on real wages if higher wage demands pass through to consumer prices), resulting in more moderate wage demands. Both views are reconciled in Calmfors and Driffill's (1988) integrated framework which argues that the highest wage levels are obtained when collective bargaining is done at an intermediate level (e.g. the sectoral level). [56] In an increasingly globalised world, however, these arguments may be losing relevance, as prices and wages are increasingly under pressure from developments abroad and

therefore more likely to closely follow productivity developments. [57]

There are important strategies for wage coordination beyond formal centralisation. Coordination can refer to horizontal coordination (across sectors), and this can be achieved in an explicit way (e.g. in the case of "peak-level coordination" involving bilateral or trilateral agreements or social pacts) or in an implicit way, for instance through regular interaction between sectoral trade unions or through "wage leadership" or "pattern bargaining", where some sectors base their negotiations on agreements made in other sectors. [58] Coordination can also refer to vertical coordination, such as in the case where lower level agreements can only improve upon conditions negotiated at higher levels. Some have argued that wage coordination reduces the sensitivity of inflation to domestic output, thus keeping inflation in check when unemployment is low, and reducing the inflation-dampening impact of high unemployment during economic downturns, [59] in line with the impact of nominal wage rigidities as discussed before.

More effective coordination between social partners helps achieving macroeconomic goals such as increasing resilience, stabilising inflation, tackling unemployment, and correcting external imbalances. [60] Governments can foster such coordination and good social partner relationships more broadly by supporting bi- and tripartite agreements, providing platforms for regular discussions between social partners and promoting a shared understanding of the main challenges. [61] The government can also influence bargaining through flanking measures such as tax concessions to support net wages at times of wage moderation.

[54] For example, Dolado and Bentolilla (1993) observe a positive link between the number of fixed-term contracts (the "outsiders") and the real wages (and hence the implied market power) of permanent workers (the "insiders").

[55] Borghijs, A., Ederveen, S., de Mooij, R. (2003) European Wage Coordination: Nightmare or dream to come true? European Network of Economic Policy Research Institutes Working Paper No. 20.

[56] Calmfors, L., and John Driffill, J. (1988), Bargaining structure, corporatism and macroeconomic performance, Economic Policy, 6, 13-61.

[57] Camarero, M., D'Adamo, G., Tamarit, C. (2016) The role of institutions in explaining wage determination in the Eurozone: a panel cointegration approach. International Labour Review, 155(1): 25-56.

[58] see e.g. European Commission (2011), Labour Market and Wage Developments in Europe. Annual Review 2011, Directorate-General for Employment, Social Affairs and Inclusion; Traxler, F., Blaschke, S., Kittel, B. (2001) National labour relations in internationalised markets: a comparative study of institutions, change and performance, Oxford University Press.

[59] Rovelli, R. (2016) Wage coordination in new and old EU member states. IZA World of Labor 2016: 222.

[60] see e.g. Ball, L., Romer, D. (1991) Sticky Prices as Coordination Failure. American Economic Review, 81(3): 539-552; Blanchard, O., Wolfers, J. (2000), The Role of Shocks and Institutions in the Rise of European Unemployment: the Aggregate Evidence Economic Journal, 110: 1–33.

[61] see Hijzen et al. (2017), as above.

Certain features of collective bargaining systems can contribute to building trust between social partners, such as the inclusiveness of bargaining parties, effective procedures for extensions and exemptions, built-in incentives for regular renegotiation, and mechanisms to generate ownership and accountability among social partners (e.g. by ensuring transparent access to information on negotiated working conditions and effective enforcement of the agreement through independent labour inspectorates). [62]

The question of which wage setting institutions are most compatible with a resilient economy has no clear-cut answer. From a resilience perspective, the focus is not necessarily on the level of wages but more on the speed of adjustment. Some authors have argued that a combination of national and firm-level bargaining seems attractive to ensure macro-flexibility. [63] Firm-level bargaining allows wages to adjust to firm-specific and local developments. On the other hand, national agreements (in which governments are often involved alongside social partners) can support adjustment in response to major macroeconomic shocks: by providing guidance for average wage growth, such agreements can avert wage deflation while taking into account the interaction between wage developments and (un)employment. [64] At the same time, other efficient forms of wage setting institutions can also be found, and details with regard to how bargaining regulations are operationalised matter a lot. Moreover, collective bargaining institutions are deeply rooted in countries' history and underlying social norms; hence, in order to succeed, trust between social partners might be more important than any particular bargaining structure.

Well-functioning collective bargaining systems also play an important role in mitigating inequality, and ensuring that the benefits from productivity growth are shared fairly. [65] It is important to ensure that wages are set in a transparent and predictable way according to national practices and respecting the autonomy of social partners. In this context, a stable industrial relations environment plays an important role in delivering the trust that is needed to adopt, both in good and in bad times, innovative bargaining solutions with the support of the social partners.

I.5.3. Public sector wages

Public employment [66] represents a considerable share of total employment and hence public wage dynamics can have relevant impacts on aggregate wage developments. Public wage dynamics may spill over to the private sector through different channels, and especially so in the presence of a large public sector. An increase in public sector wages makes government jobs more attractive—especially if there is already a positive public sector premium and other job characteristics (such as employment protection regulations) are more favourable too—crowding out employment in the private sector and exerting upward pressure on wages and productivity in the private sector. [67] By increasing the value of being employed in the public sector, higher wages strengthen the bargaining position of workers in the private sector and trigger imitation effects between public and private wages. [68] Public wage increases can also have a positive impact on demand, and as such foster private sector employment. On the other hand, if private wage increases are not supported by increases in labour productivity, they may exert upward pressure on unit labour costs. [69]

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[62] IMF (2016) Time for a supply-side boost? Macro-economic effects of labour and product market reforms in advanced economies, Chapter 3, World Economic Outlook, April 2016.

[63] Blanchard, O., Jaumotte, F., Loungani, P. (2013) Labor Market Policies and IMF Advice in Advanced Economies during the Great Recession, IMF Staff Discussion Note. SDN/13/02.

[64] Examples include the Wassenaar Agreement in the Netherlands in 1982; the Moncloa Pact in Spain in 1977, the Alliance for Jobs (Bündnis für Arbeit) in Germany in 1998; and the more recent 2016 Competitiveness Pact in Finland.

[65] The Right to Fair Wages is one of the 20 key principles of the European Pillar of Social Rights, which was launched on April 26 2017.

[66] The government wage bill represents around 10% of total GDP in Europe: 11% on average over the period 1999-2012 in the EU; slightly above 10% in the euro area in 2014 (see European Commission (2014) Government wages and labour market outcomes. European Economy Occasional Papers 190; and Pérez, J.J., Aouriri, M., Campos, M.M., Celov, D., Depalo, D., Papapetrou, E., Pesliakaité, J., Ramos, R., Rodríguez-Vives, M. (2016) The fiscal and macroeconomic effects of government wages and employment reform. ECB Occasional Paper Series No. 176).

[67] Helpman, E. (1976) Macroeconomic policy in a model of international trade with a wage restriction. International Economic Review, 17: 641-654; Algan, Y., Cahuc, P., Zylberberg, A. (2002). Public employment and labour market performance, Economic Policy, 17 (34), 7-66.

[68] Afonso, A., Gomes, P. (2008) Interactions between private and public sector wages. European Central Bank Working Paper Series No. 971; Ardagna, S. (2007). Fiscal policy in unionised labor markets, Journal of Economic Dynamics and Control, 21 (5), 1498-1534.

[69] Lane, P.R., Perotti, R. (1998) The trade balance and fiscal policy in the OECD. European Economic Review, 42(3-5): 887-895; Rovelli (2016), as above.

In practice, wage setting institutions in the government sector vary considerably across the EU. [70] A key distinction is that in some countries, government wages are mostly set by legislative action; while in others they are set by collective bargaining. As a consequence, governments have direct control on wage setting in the former case, while wage setting in the public sector results from interactions with wage formation in the private sector in the latter case. More generally, dynamic interactions between private and public wages can be quite complex depending on the specific characteristics of wage bargaining in both sectors which influence their leadership behaviour in wage setting. [71] For example, research has found that public sector wages exert a stronger impact on private wages the greater the government's involvement in collective bargaining, the more centralised and coordinated is collective bargaining, the larger the public sector and the lower the external openness to trade is. [72] In countries where government wages are set by collective bargaining, wages in the manufacturing sector have been found to be better aligned with productivity and more responsive to unemployment, possibly because bargaining processes are generally closer to the market than unilateral government decisions. [73]

I.5.4. Tax and benefits policies

While their impact is less direct and relatively complex, labour tax policies can influence wages through different channels. Personal income tax liabilities and social security contributions (whether payable by employees or by employers) [74]

generate a wedge between labour cost and take-home pay and can therefore drive up labour costs and/or drive down net wages and disposable income. The wage impact of a change in the tax wedge is country- and context-specific. [75] It depends on the relative responsiveness of labour demand and supply, and falls typically on the least elastic side of the market. [76] In the presence of downward nominal wage rigidities, labour tax reductions are likely to be passed on to the worker, as gross wages cannot be reduced. The institutional framework for wage negotiations and the interaction of taxation with other institutional factors (e.g. the tax treatment of unemployment benefits) also play a role.

Empirical evidence shows that the largest share of the tax burden on labour is borne by the employee in the form of lower wages. [77] This is observed to apply even more strongly to countries with more centralised bargaining systems and in countries where social security benefits are more tightly linked to contributions, presumably because labour unions internalise the benefits from income protection in their wage demands. [78] In other words, workers and labour unions are more likely to recognise the provided insurance as non-wage benefits in this case, moderating the impact on labour supply and wage demands.

Governments sometimes use fiscal devaluations (i.e. tax system adjustments as to increase the cost of imports relative to exports) as an instrument to regain competitiveness. In a currency union, economies cannot rely on nominal depreciations or devaluations to improve competitiveness. A fiscal devaluation can to some extent mimic a nominal

[70] For a survey of collective bargaining institutions in the public service and their effect on labour market outcomes see European Commission (2014).

[71] See e.g. D'Adamo (2014) for a review of wage spillovers between the public and the private sector in 10 European Union member states over the period 2000-2011.

[72] Lamo, A., Pérez, J. J., Schuknecht, L. (2012), Public or Private Sector Wage Leadership? An International Perspective. Scandinavian Journal of Economics, 114: 228–244; Lamo A., Perez J.J., Schuknecht L. (2013), Are government wages interlinked with private sector wages? Journal of Policy Modeling, 35(5), 697-712.

[73] Marzinotto, B., Turrini, A. (2017) Co-movements between public and private wages in the EU: what factors and with what policy implications? IZA Journal of European Labor Studies, 6(2).

[74] While the statutory incidence of a tax may be relevant for political and short-term economic reasons, it should not have an impact on wage levels over the longer term. See European Commission (2015) Study on the effects and incidence of labour taxation. Final Report. Working Paper No. 56, Taxation Papers; Kugler, A., Kugler, M., Herrera Prada, L.O. (2017) Do payroll tax breaks stimulate formality? Evidence from Colombia's reform. NBER Working Paper 23308.

[75] Melguizo, Á., González-Páramo, J.M. (2013) Who bears labour taxes and social contributions? A meta-analysis approach. SERIEs, 4(3): 247-271.

[76] Theory predicts that if labour demand is completely elastic, an increase in the tax wedge will fall fully on the worker in the form of a lower net wage. If labour demand is fully inelastic, it will fall fully on the employer in the form of higher labour costs. For any intermediate elasticity of labour demand, the costs will be shared between workers and employers; and the more elastic labour supply is, the lower the share of the tax burden will be borne by the worker (European Commission, 2015). The response to a change in the tax wedge can be asymmetric, e.g. if wages are downwardly rigid but can increase flexibly (Kugler et al., 2017).

[77] See European Commission (2015), as above; Gruber, J. (1997) The Incidence Of Payroll Taxation: Evidence From Chile, Journal of Labor Economics, 15(3): S72-S101; Ooghe, E., Schokkaert, E., Flechet, J. (2003) The Incidence of Social Security Contributions: An Empirical Analysis. Empirica, 30(2): 81-106.

[78] see Melguizo and González-Páramo (2013), as above; Ooghe et al. (2003), as above; Summers, L., J. Gruber, and R. Vergara (1993) Taxation and the Structure of Labor Markets: The Case of Corporatism, Quarterly Journal of Economics 58, 385–411.

devaluation: imports can be made more costly and exports cheaper by financing a tax cut on domestic production (e.g. by reducing the tax burden on labour) through the increase of the value-added standard tax (VAT) rate. [79] Earlier analyses by the European Commission and by the ECB conclude that fiscal devaluations can accelerate real exchange rate adjustments and thus contribute positively to regaining competitiveness, but the impact is likely to be small and short-lived. [80] As such, it cannot be used as a substitute for structural reforms that address fundamental problems underlying external imbalances and weak growth. Still, as it presents a shift towards more growth-friendly taxation, a fiscal devaluation can have wider economic benefits. [81]

Generous unemployment benefits (both in terms of their levels or replacement rates and in terms of their duration) are expected to raise workers' reservation wage, and therefore also wage demands. If not accompanied by cost-effective activation policies, they may have a negative impact on labour supply as well. [82] These factors may strengthen the bargaining power of unions and workers and lead to higher wages as a result. On the other hand, if workers incorporate in their wage demands the benefits from income protection provided by the social security system or from public goods provided with the help of labour taxes, the negative effects on labour supply, and the upward pressure on wage demands may be mitigated to some extent. [83]

I.5.5. Other structural reforms in product and labour markets

Changes in product market and labour market regulations may also have an indirect impact on wage formation. A well-known example in the area of labour market regulations are regulations on dismissal costs. Research has established that firms can compensate for the future expected costs of dismissal by reducing the entry wage of the worker, so that the expected cumulative wage bill from the employment relationship remains unaffected. [84] If this is the case, theory predicts that employment protection deregulation should trigger a proportional increase in wages. [85] On the other hand, a reduction in firing costs from high levels may lead to a temporary increase of unemployment, which might have short-run negative impacts on aggregate demand in periods of economic slack. [86] These effects may be mitigated by devising reform packages that support workers during transitions between different jobs, including with effective unemployment benefits and activation policies as per the "securiflex" model. Employment protection reforms can also be devised to reduce labour market segmentation, which can also have a positive impact on wage developments. [87]

Product market deregulation can foster competition and reduce mark-ups, although the full effects usually take time to materialise. By reducing consumer prices, and raising productivity and output, such reforms can have a positive impact on real wages. Creating favourable conditions for firm entry, exit and growth can also raise productivity (e.g. by promoting allocative efficiency).

Raising productivity is the most sustainable way to support wage growth and aggregate demand. In addition to labour and product market reforms, adequate investment in human capital, research and innovation can boost productivity and wage growth at the same time. Investment in human capital can moreover help mitigating the possible loss of bargaining power stemming from de-routinisation and skills-biased technological change, as skilled (unskilled) labour is more likely to be a complement to (substitute of) capital. [88]

[79] Hohberger, S., Kraus, L. (2016) Is fiscal devaluation welfare enhancing? Economic Modelling, 58: 512-522.

[80] See European Commission (2013) Study on the impacts of fiscal devaluation. Working paper 36, Taxation Papers; ECB (2011) Economic and Monetary Developments: Fiscal Developments. Monthly Bulletin, December 2011, box I2.

[81] In cases where fiscal devaluations would have negative impacts for equity, this can be addressed by focusing income tax cuts on lower income groups (European Commission, 2013, as above).

[82] With less generous unemployment benefits, an increase in unemployment benefit generosity is less binding.

[83] Rosen, S. (1986) 'The Theory of Equalising Differences', in O. Ashenfelter and R. Layard, eds., Handbook of Labor Economics I. Amsterdam: Elsevier; Summers, L. (1989) Some Simple Economics of Mandated Benefits, American Economic Review 79(2), 177–183.

[84] Lazear, E. P. (1988) Employment-at-will, job security, and work incentives. In: Hart, R.A. (ed.) Employment, Unemployment, and Labor Utilisation. Unwin Hyman: Boston.

[85] Garibaldi, P., Violante, G. L. (2005). The employment effects of severance payments with wage rigidities. The Economic Journal, 115(506), 799-832.

[86] e.g. Duval and Furceri (2016), as above.

[87] e.g. European Commission (2017), as above.

[88] Berman, E., Bound, J., Machin, S. (1998). Implications of skill-biased technological change: international evidence. The Quarterly Journal of Economics, 113(4), 1245-1279; Sala, H., Trivín, P. (2017). The Effects of Globalisation and Technology on the Elasticity of Substitution, IZA Discussion Papers 10898.

A case study using the Commission's global macroeconomic model suggests indeed that structural factors can have a significant impact on wage formation. The analysis shows important contributions of productivity-increasing investment and labour market rigidities to explaining wage developments in Italy and Spain. [89]

I.6. Conclusions

The euro area is entering its sixth year of uninterrupted economic growth, and is expected to continue growing, albeit at slightly slower pace. The impact of the recovery is also observed in the labour market, with employment surpassing pre-crisis levels since 2017 and unemployment rates approaching levels prior to the recession and set to decline to 7.5% by 2020.

At the same time, nominal wage growth [90] was not picking up until recently in line with what one would expect based on its historical relationship with standard indicators of slack. This note has set out different reasons that contribute to the observation of subdued wage growth. The analysis in Box I.1 illustrates the role of weak productivity developments, low core inflation, and "sticky" inflation expectations. In some countries, where unemployment remains high compared to pre-crisis levels, labour market slack and "pent-up" wage inflation continue to exert downward pressure on wage growth. Other structural changes such as downward trends in working hours per employee and the possible role of globalisation, technological progress and declining unionisation have been discussed as well.

In the post-crisis period, the adjustment of wages to diverging domestic cyclical developments across euro area countries has been supportive of external rebalancing. Nevertheless, this effect seems to be weakening in recent years, as a result of the recovery of wage growth from very low rates in net debtor countries coupled with weak productivity gains, while wage growth has remained moderate in surplus countries in spite of the recovery gaining pace. From this perspective, stronger wage growth in countries with a strong and persistent current account surplus would arguably support domestic demand and aggregate demand in the euro area, and contribute to the economic recovery and the

rebalancing, while easing the competitiveness adjustment of those countries that remain vulnerable as a result of large negative net international investment positions.

Wage growth in the euro area has accelerated in 2018, helped by the closure of the output gap, the surge in labour shortages in several Member States, and the gradual increase of core inflation that has started to feed into wage negotiations. Looking ahead, with growth slowing down amid economic uncertainty, wage growth is forecast to slightly decelarate again by 2019. In the absence of structural changes, sluggish labour productivity growth and the downward trend in hours worked per employee may as well continue to exert downward pressure on wage growth in the future. Developments related to increasing global competition (e.g. in the framework of global supply chains), the emergence of new forms of work, and the structural shift towards the service sector (with lower union density) are likely to continue, potentially weakening workers' bargaining power and therefore wage growth. Low union membership among young workers might as well further exacerbate the de-unionisation trend. [91]

Governments have some instruments at hand with which they can directly or indirectly influence wage developments, even though the brunt of wage formation results from the interplay of market forces. Wage growth is influenced by the presence of statutory minimum wages, the institutional settings of collective bargaining frameworks, policies regarding the setting of public sector wages, and tax and benefits policies. Other structural reforms in product and labour market can play a role as well, e.g. through their impact on non-wage labour costs (e.g. dismissal costs), segmentation, price mark-ups, innovation and productivity. Since these instruments interact in different ways with the rest of the economy, their effectiveness in steering wage developments and their impact on the rest of the economy varies greatly as well. Country-specificities play an important role in this context.

Raising productivity can support wage growth, the expansion of demand, and sustainable growth and job creation at the same time. This underscores the

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[89] See European Commission (2018c), as above.
[90] Measured in terms of nominal compensation per employee

[91] European Commission (2017), Fostering intergenerational fairness through social dialogue, chapter 5 of Employment and Social Developments in Europe 2017. Directorate-General for Employment, Social Affairs and Inclusion.

importance of productivity-increasing structural reforms, such as reforms that make labour markets more adaptable and responsive in order to improve allocative efficiency, reforms that make product markets more open and competitive, and reforms that improve the overall business environment, with stimulating conditions for firm entry, growth and innovation. Adequate investment in human capital, research and development is key as well, along with measures that ensure the efficient formation of skills in initial as well as post-compulsory education and training for individuals of all ages. These structural reforms not only strengthen the supply side of the economy, but can also boost demand through increased real wages and higher investment.

II. Determinants of economic resilience in the euro area: An empirical assessment of policy levers

This section investigates which structural characteristics matter most for a country's economic resilience. This is done econometrically by comparing the capacity to absorb and recover from common shocks across the euro area Member States. The section aims at identifying a set of factors as diverse and specific as possible in order to guide future policy actions. The results suggest that factors related to the well-functioning of markets matter most. For instance, creating environments that foster entrepreneurship increases the ability to adapt and recover from exogenous shocks. Price controls both amplify shocks and slow down the recovery. A higher stock of non-performing loans and a weaker competition in the banking sector affect negatively an economy's absorption as well as recovery capacity. Some structural factors such as economic openness appear to have different impact on the shock absorption capacity and the recovery capacity in the face of a common shock. Such findings reiterate the need to pursue vigorously policies and structural reforms including those that take advantage of synergies and complementarities such as between a well-functioning Banking Union and Capital Markets Union which increases risk-sharing and a further opening to international trade. Finally, the macro-econometric results also imply that more analysis is needed to understand better specific transmission mechanisms such as active labour market policies. ([92])

II.1. Introduction

The Five Presidents' Report highlights the importance of the notion of convergence towards resilient economic structures. ([93]) This is a necessary (but not sufficient) condition for the well-functioning of the Economic and Monetary Union and for promoting sustainable real convergence in the long run. Increasing the resilience of the economy will reduce the risk that a country deviates significantly from its real convergence path.

However, economic resilience is a very broad concept and attempts to narrow it down were done only recently. ([94]) Likewise, the empirical evidence about the determinants of resilience at country level is also rather scarce. ([95]) However, it is crucial to understand those to inform the policy-making and guide the structural reforms.

This section assesses empirically how different factors affect economic resilience at the level of the euro area Member States in order to identify policy levers that can be used to strengthen it.

Strengthening resilience entails acting on three elements: i) reducing the economies' vulnerability to shocks; ii) increasing their shock-absorption capacity; and iii) increasing their ability to reallocate resources and recover from the shocks. ([96])

This section focusses on the latter two elements, namely it aims at identifying the structural features of economies that make them able to weather the impact of adverse shocks both in the short- and medium-term. The factors affecting the first element have already been examined elsewhere ([97]) by identifying the short-term vulnerabilities and imbalances ([98]) that affect the likelihood that an economy gets hit by a shock.

([92]) This article has been prepared by Maya Jolles, Eric Meyermans and Bořek Vašíček. The authors wish to thank Dris Rachik for his help running the Bayesian model averaging (BMA) and an anonymous referee for useful comments.

([93]) See Juncker, J-C, in close cooperation with Tusk, D, Dijsselbloem, J., Draghi, M. and M. Schultz (2015), Completing Europe's Economic and Monetary Union.

([94]) See, for instance, Alessi, L., Benczur, P., Campolongo, F., Cariboni, J., Manca, A. R., Menyhert B. and A. Pagano (2018), 'The resilience of EU Member States to the financial and economic crisis. What are the characteristics of resilient behaviour?', *JRC Working Papers* JRC111606; Canton E., Mohl P., Reut A. and M. Ward-Warmedinger (2016), 'How to make the Economic and Monetary Union more resilient?', *Quarterly Report on the Euro Area*,,Vol. 15(3), pages 7-18; G20 (2017), 'Note on Resilience Principles in G20 countries'.

([95]) Sondermann, D. (2018), 'Towards more resilient economies: The role of well-functioning economic structures', *Journal of Policy Modeling*, Vol. 40, No. 1, pp 97-117

([96]) Giudice G., Hanson J. and Z. Kontolemis (2018), 'Economic resilience in EMU', *Quarterly Report on the Euro Area*, Vol. 17, No. 2, pp. 9-15 presents an extensive but non-exhaustive taxonomy of factors that could have an impact on the three building blocks of economic resilience. While the authors offer a broad framework, they do not empirically compare the relative importance of the different factors.

([97]) See, for instance, Röhn O., Caldera Sánchez A., Hermansen M. and M. Rasmussen (2015), 'Economic resilience: A new set of vulnerability indicators for OECD countries', *OECD Economics Department Working Papers* No. 1249. Hermanssen M. and O. Röhn (2015), 'Economic resilience: The usefulness of early warning indicators in OECD countries', *OECD Economics Department Working Papers* No. 1250.

([98]) Contrary to shocks which are exogenous, imbalances tend to be policy-driven and build up over time until they become unsustainable. A rich literature has aimed at identifying the progressive accumulation of imbalances.

This section is structured as follows. Sub-section 2 briefly describes the analytical framework used to estimate the impact of various factors affecting an economy's capacity to absorb and recover from common shocks. Sub-section 3 identifies factors that may potentially affect an economy's shock absorption and recovery capacity, including i) structural factors such as the diversity and openness of the economy, ii) factors affecting the functioning of labour, product and financial markets, iii) macro-economic conditions, and iv) factors affecting the quality of non-economic institutions such as governance. Sub-section 4 provides estimates of the significance of these factors. The last section draws some policy conclusions.

Finally, it is important to note that the subsequent analysis provides empirical results within the limits set by data availability and by the use of a reduced form econometric analysis. As such the analysis is less suited to provide a full understanding of the micro-economic transmission mechanisms that affect an economy's resilience such as active labour market policies that are specifically targeted to specific groups like the young, the low skilled and the long-term unemployed. Further analysis and development of this framework would be useful.
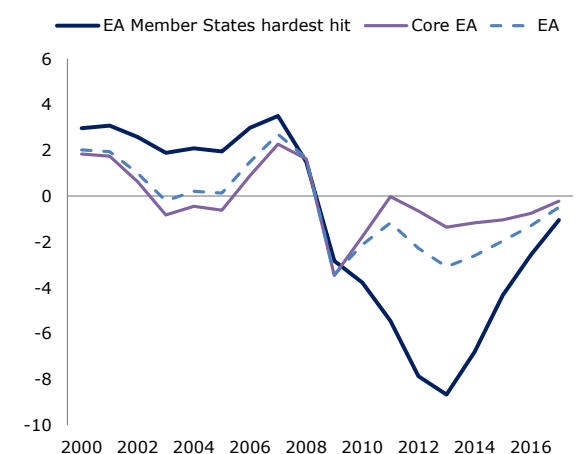
II.2. A framework for empirical analysis

Graph II.1 summarises the variety in cyclical behaviour among euro area Member States in terms of amplitude and persistence of the output gap. [99] While the output gap widened significantly at the onset of the Global Financial Crisis in all euro area Member States, it persisted at a much stronger pace in the Member States hardest hit by the crisis. To the extent that this was triggered by a common shock with the same intensity, this pattern may reflect differences in resilience.

The aim of this section is to investigate empirically the factors that may have contributed to these disparities. The *significance* and *relative importance* of these factors (detailed in sub-section II.4 below) is evaluated by comparing *the impact of* and *recovery from*

common shocks across the euro area Member States (for which sufficient data are available as well as a selected group of non-euro EU Member States) [100] over the period from 1998 to 2015. [101]

Graph II.1: **Output gap dynamics across the euro area**

(1) Core EA includes DE, AT, NL and FR. EA Member States hardest hit includes IE, ES, EL, CY and PT.
(2) The output gap measures the gap between actual GDP and potential GDP as percentage of potential GDP and is measured in this section as AMECO variable AVGDGP.
Source: Authors' estimates based on AMECO data.

For this purpose, an output gap autoregressive econometric equation is estimated in panel setting whereby each country's *absorption capacity* (measured by the response coefficient to the common shock in the equation) and *the speed of recovery* (measured by the response coefficient of the lagged output gap) depend on country specific structural characteristics (See Box II.1 for more details on the specification).

In reality, each economy is subject to both *idiosyncratic* and *common shocks*. Moreover, the shocks can be of different nature such as productivity shock, confidence shock or change in preferences. Importantly, shocks are not directly observable and have to be estimated. In this empirical framework, the resilience of Member States is tested in case of common shocks. Namely, an economy is more resilient than another if after being hit by a common shock it performs better. Given that the purpose of the analysis is to identify structural characteristics that make countries better weather adverse developments, it is necessary to draw on

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[99] Other measures could be used. For instance, Caldera Sánchez A., Rasmussen M. and O. Röhn (2016), 'Economic Resilience: What Role for Policies?', *Journal of International Commerce, Economics and Policy*, Vol. 7, No. 2 pp. 1-44, identify economic resilience as a lower occurrence of severe recession. Elbourne A, Lanser D., Smid B. and M. Vromans (2008), 'Macroeconomic resilience in a DSGE model', *CPB Discussion Paper* No. 96 use the level of expected discounted utility as a measure of resilience.

[100] I.e., BE, DE, IE, ES, FR, IT, LU, NL, AT, PT, FI, CZ, DK, HU, PL, SE and UK.
[101] The sample size is set by data availability.

the *cross-country experience*. This can be most easily done in case of *general common shocks*, i.e. shocks of the same size without identifying the exact nature of the shock. However, it can be assumed that most of the results hold also for idiosyncratic shocks. Box II.1 shows estimates of such general common shocks hitting the Member States between 1994 and 2017.

II.3. Factors affecting the shock absorption capacity and persistence of shocks

Previous research tested the significance of a range of broad factors (e.g. product market, labour market, taxation) that are most relevant for economic resilience without exploring the detailed factors that can be linked to concrete structural reforms. For instance, some authors report that a high level of product market regulation weakens industries' resilience to adverse shocks. [102] For the euro area Member States, it was reported that well-functioning labour and product markets and political institutions improve an economy's shock absorption capacity. [103] The analysis examining possible trade-offs between growth and economic resilience, did not find trade-offs as far as product and labour market reforms are concerned, but indicated that trade-offs may appear in the areas of financial market and macro-prudential policies. [104] Finally, some authors report that a low protection of temporary contracts, political stability, regulatory quality and pre-crisis fiscal space were found to be the most relevant for a swift recovery, whereas unemployment benefits and employment protection legislation do not seem to increase economic resilience. [105]

This section provides an assessment of factors at a more disaggregated level. The factors affecting economic resilience are classified in several categories - ranging from very broad structural factors such as the economy's openness to international trade and institutional characteristics like the level of corruption, to very specific characteristics including the regulation of labour

markets as well as short-term macroeconomic conditions such as interest rates. Here it should be noted that while there are many potential factors, they do not necessarily point in the same direction. In some cases the same factor can have positive impact on absorption while negative on recovery. Box II.2 briefly describes the indicators which are used to measure these factors. As previously discussed, it can be reasonably assumed that these factors have an impact on resilience in broad terms, i.e. they contribute to a country's capacity to weather adverse shocks irrespectively of the shock origin (idiosyncratic, common) and type.

II.3.1. Product markets

Competitive product markets are important drivers of economic resilience as well-functioning product markets generate more rapid adjustments also shifting the adjustment burden from quantities (i.e. output) to prices which has an impact on competitiveness.

Several factors affect the degree of competition in product markets [106] including *barriers to entrepreneurship* such as licenses and permit systems and administrative burdens, barriers to trade and investment such as differential treatment of foreign suppliers and barriers to FDI as well as state control such as price controls and government involvement in network industries.

More specifically, entrepreneurship framework conditions have a direct impact on the entry and exit of firms which is especially important during the recovery as it helps to reallocate resources. [107] State control, especially price controls and strict regulation of network industries and professional services may limit especially an economy's recovery capacity.

[102] Canova, F., Coutinho, L. and Z. Kontolemis (2012), 'Measuring the macroeconomic resilience of industrial sectors in the EU and assessing the role of product market regulations', *European Economy Occasional Papers* 112
[103] Sondermann (2018), *op. cit.*
[104] Caldera Sánchez A., Rasmussen M. and O. Röhn (2016), *op.cit.*
[105] Brůha J. and O. Kucharčuková (2017), 'An Empirical Analysis of Macroeconomic Resilience: The Case of the Great Recession in the European Union', Working paper series 10, Czech National Bank

[106] Following the classification of the OECD Product Market Regulation Indicator. See, for instance, Koske, I. et al. (2015), 'The 2013 update of the OECD's database on product market regulation: Policy insights for OECD and non-OECD countries', *OECD Economics Department Working Papers* No. 1200.
[107] See Andrews and Saia (2017), 'Coping with Creative Destruction: Reducing the Costs of Firm Exit', *OECD Economics Department Working Papers*, No. 1353.

Box II.1: Estimating absorption and recovery capacity in case of common shock.

A. Estimation of common shocks

The first step in the analysis of resilience is identification of adverse episodes, which were common to all countries in the sample (common shocks) in order to link cross-country divergences to their resilience rather than to different size of shocks hitting them. However, shocks cannot be observed and must be estimated. Specifically, the common shocks are estimated in a panel model describing real GDP growth (see e.g. Sondermann, 2018) as

$$dln(GDP_{i,t}) = \delta_t DUM_t + \rho_i DUM_i + v_{i,t}$$

for a sample from 1998 until 2015 and covering 17 countries ([1]), with GDP being real GDP, DUM_t a time dummy, DUM_i, a country dummy, and with v the stochastic term.

The common shock is captured by the standardised estimates of δ_t, while the idiosyncratic shock is captured by $\rho_i + v_{i,t}$. ([2]) The graph below shows estimates as by how much the common shock induced observed GDP growth to deviate from its trend growth.

Graph 1: Estimates of common shocks
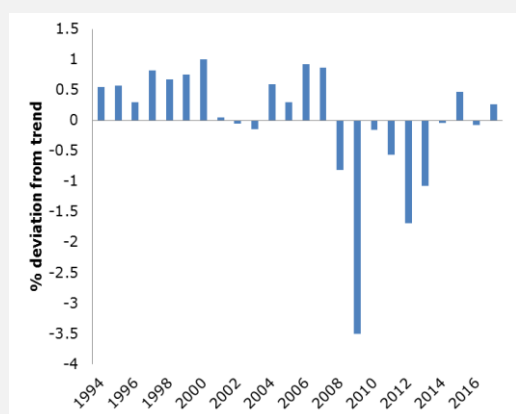
Source: Authors' estimates.

B. Specification of output gap dynamics

The following econometric equation is used to estimate the Member States' absorption and recovery capacity in response to a common shock

$Y_{i,t} = \beta\ SHOCK\_C_t\ + \sum_{l=1}^{k} \beta_l\ Z_{i,l,t}\ SHOCK\_C_t$ *impact of common shock + structural factors affecting its absorption*

$\quad + \alpha Y_{i,t-1}\quad + \sum_{j=1}^{k} \alpha_j\ Z_{i,j,t}\ Y_{i,t-1}$ *recovery from past output gaps + structural factors affecting recovery*

$\quad + \sum_{m=1}^{n} \gamma_{i,m} \left(Q_{i,m,t} - \bar{Q}_{i,m} \right) + u_{i,t}$ *impact macro-economic policy variables   + stochastic component*

with Y the output gap; Z the structural factors affecting absorption and recovery such as product market regulation; SHOCK_C a common shock; Q the macro-economic variables affecting output gap such as

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([1])   I.e., BE, DE, IE, ES, FR, IT, LU, NL, AT, PT, FI, CZ, DK, HU, PL, SE and UK.
([2])   Implicit assumptions estimating these common shocks are that common and idiosyncratic shocks are not correlated with each other and that shocks are exogenous. On endogenous shocks that emerge from within the system, see for instance Minsky, H. (1986), Stabilizing an Unstable Economy, Yale University Press and Wolf, M. (2015), The Shifts and the Shocks: What We've Learned--and Have Still to Learn-from the Financial Crisis, Penguin Books

(Continued on the next page)

interest rates; $\bar{Q}$ equilibrium value of macro-economic variable; and with i a country index, t time index, k number of structural factors and m number of macro-economic variables.

The contribution of each factor $Z_{i,j,t}$ to the absorption and recovery is measured by, respectively, $\beta_j \, Z_{i,j,t}$ and $\alpha_j \, Z_{i,j,t}$ having a positive or negative value and indicating whether they amplify/dampen the impact of a shock, or speed-up/delay the recovery. The total absorption and recovery capacity is measured by collecting all terms, i.e. $\beta + \sum_{l=1}^{k} \beta_l \, Z_{i,j,t}$ for the absorption capacity and $\alpha + \sum_{l=1}^{k} \alpha_l \, Z_{i,j,t}$ for the recovery capacity. The latter is expected to have a value between 0 and 1, a lower value indicates a faster recovery.

Several issues have to be taken into account when estimating the above equation. First, the explanatory variables may be strongly correlated with each other as they are often changed as part of a reform package (i.e. multicollinearity). Second, the explanatory variables may be correlated with the random component as for instance reforms are introduced or delayed in response to the state of the business cycle (i.e. simultaneity). [3] Third, the error terms of the equations do not have the same distribution as their variance may differ across Member States. In addition, they may also be cross-sectionally correlated as well as serially correlated. [4] Fourth, as common and idiosyncratic shocks are assumed to be orthogonal, the omission of the latter type of shocks in the regression does not induce a missing-variables bias. Fifth, to save on the degrees of freedom no country fixed effects have been included but the dependent and explanatory variables were demeaned.

Moreover, by construction the lagged output gap and shock should be uncorrelated. In period t the shock is by definition "news" (i.e. uncorrelated with any variable from the past including the lagged output gap as well as past "news"). Furthermore, time varying interactions between explanatory variables may call for the inclusion of both base variables separately to avoid a missing variables bias. See, for instance Aitken and West (1991) [5]. However, here it should be remembered that the dependent variable (i.e. the output gap) is on average equal to zero (over the business cycle). The explanatory variables, i.e. the shock and lagged output gap interacting with a broad set of factors, are also on average equal to zero. Including a factor on its own not interacting with the shock or lagged output gap (which is on its own different from zero) would then imply that "in equilibrium" the output gap would not be closed. As such, the regression analysis does not include base variables separately. Finally, a low significance level for a point estimate for a factor does not necessarily mean that the factor is irrelevant as a low level of significance may arise because of multi-collinearity or because the considered indicators vary only in very limited ranges over time and across countries (and regression analysis is based on variation of indicators).

C. Bayesian Model Averaging

Another issue related to estimation of aforementioned equation is model uncertainty. Namely, there are many potential explanatory variables. First, putting all of the potential variables into one regression might inflate the standard errors if irrelevant variables are included. Second, using sequential testing to exclude unimportant variables might deliver misleading results since there is a chance of excluding the relevant variable each time the test is performed. Bayesian model averaging (BMA) takes into account model uncertainty by considering the model combinations and weighting them according to their model fit. [6] The robustness of a variable in explaining the dependent variable can be expressed by the probability that a given variable is included in the regression. It is referred to as the posterior inclusion probability (PIP).

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[3] Problems of simultaneity have been addressed by taking 3-year average moving averages of the interaction variables, except for the instrumentalised variables that include short-interest rate, public debt, private debt and the real effective exchange. Note also, that the lagged dependent variable appear always in an interaction term rather than separately. Therefore, the regression is not a standard dynamic panel that would require use of GMM-type of estimators such as Arellano-Bond.

[4] These problems have been addressed by applying an appropriate generalised least squares estimator. However, as in this exercise the number of time periods is low compared to number of cross sections it will have to be assumed that covariance matrices of random components are constant over time. The latter assumption will affect the efficiency, but not consistency of the estimates.

[5] Aitken, L. and S. West (1991), Multiple regression: testing and interpreting interactions, Sage Publications.

[6] A vast literature uses model averaging to address these issues, in economics notably in the domain of determinants of economic growth (Fernandez et al., 2001, Feldkircher and Zeugner, 2009, Moral-Benito, 2011).

The impact of product market regulation on the economy's absorption and recovery capacity is not unambiguous. For example, on the one hand, more stringent product market regulation may lead to higher price mark-ups that allow firms to cushion the employment impact of price fluctuations initially. [108] On the other hand, however, more stringent product market regulation slows-down the recovery as it hinders the reallocation of resources by hindering, for instance, the entry of new firms. [109]

In addition, *deepening the Single Market* including the transposition and application of directives, impacts Member States' resilience as it strengthens opportunities to increase product diversification and price flexibility, while cross-border convergence towards best practices in terms of market openness, insolvency frameworks and business regulations may speed up the recovery. [110]

Finally, product markets affect resilience also in an indirect way because well-functioning product markets allow for a better transmission of monetary and fiscal policy impulses. [111]

II.3.2. Labour markets

The composition of the labour force represents a key structural feature of labour market as a high share in total employment of experienced high-skilled workers and self-employment creates a stronger capacity to absorb and adapt to shocks. [112] Self-

employment may also be a mechanism to escape unemployment when the economy gets hit by an adverse shock. [113]

Another important feature is flexibility of wages and prices. When wages and prices are rigid most of the adjustment falls on quantities, including output and employment – especially in the case of persistent shocks. Labour markets institutions have a direct impact on macro-economic adjustment. [114] However, their impact on absorption and recovery does not necessarily point in the same direction.

For example, out-of-work income support could help to stabilise aggregate demand if the shock would induce lay-offs - thereby tempering the impact of the shock on consumption and limiting hysteresis effects linked to persistent unemployment spells that would aggravate the long-run growth potential. [115] However, a too generous or protracted out-of–work income support may increase workers' reservation wage which in turn may hinder labour reallocation. [116] [117] In addition, the effective use of such schemes during a downturn is conditioned by the available fiscal space. [118]

Strict *Employment Protection Legislation* (EPL) [119] may temper the firing of labour in the face of an

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[108] See, for instance, OECD (2006), 'Understanding Policy Interactions and Complementarities, and their Implication for Reform Strategies', Chapter 6 in 2006 OECD Employment Outlook.

[109] See also, Duval and Vogel (2008), *op cit.* for additional empirical evidence. Canova, F., Coutinho, L. and Z. Kontolemis (2012), 'Measuring the macroeconomic resilience of industrial sectors in the EU and assessing the role of product market regulations', *European Economy Occasional Papers 112* report that a high level of PMR makes industries less resilient to adverse shocks.

[110] See, for instance, Jolles M. and E. Meyermans (2018), ' Economic resilience, the Single Market and EMU: a self-reinforcing interaction', *Quarterly Report on the Euro Area*, Vol. 17, No. 1, pp. 7-22, also emphasising that deepening of the Single Market should be complemented by a well-functioning Banking Union and the Capital Markets Union.

[111] Pelkmans J., Acedo Montoya L. and A. Maravalle (2008), 'How product market reforms lubricate shock adjustment in the euro area', *European Economy Economic Papers* No. 341.

[112] For instance, Liang, J. and S. Goetz (2016), 'Self-employment and trade shock mitigation', *Small Business Economics*, Vol. 46, No. 1, pp. 45-56, analysing data at the US regional level, report that the marginal impacts of Chinese import penetration on job losses are dampened in localities with higher self-employment rates, reflecting their stronger propensity to be flexible and absorb new knowledge when a shock hits the economy.

[113] Such endogeneity implies then that in the empirical analysis instrumental variables are used if the share of self-employment in total employment is included as explanatory variable.

[114] For instance, Blanchard and Wolfers (2000), 'The Role of Shocks and Institutions in the Rise of European Unemployment: The Aggregate Evidence', *NBER Working Paper* No. 7282, provide empirical evidence on the interactions between shocks and labour market institutions - albeit in their analysis the dependent variable is the unemployment rate.

[115] See, for instance, Meyermans, E. and P. Nikolov (2017), ' Long - term labour market effects of the Great Recession', *Quarterly Report on the Euro Area*, Vol. 16, No. 3, pp. 41-56..

[116] Apart from raising workers' reservation wage, out-of-work income support may also increase workers time for job search thereby improving job matching – which in turn may improve potential productivity.

[117] See, for instance, Bassanini and Duval (2006), 'Employment Patterns in OECD Countries: Reassessing the Role of Policies and Institutions', *OECD Economics Department Working Paper* No. 486 report a positive effect of unemployment benefits on the persistence of unemployment. But Brůha et al. (2017) *op cit.* do not find evidence that generous unemployment benefits make a difference.

[118] See, for instance, Hijzen, A., Kappeler, A., Pak, M. and C. Schwellnus (2017), 'Labour market resilience: The role of structural and macroeconomic policies', in *OECD Employment Outlook 2017*

[119] The OECD EPL indicator captures the strictness of the Employment Protection Legislation through 18 indicators that cover three broad areas: 1.Employment protection of regular workers against individual dismissal; 2.Specific requirements for

adverse shock which in turn may temporarily support employment and aggregate demand. However, it could also delay any necessary labour reallocation during the recovery phase. ([120]) A less restrictive EPL could on the other hand increase job turn-over as well as income insecurity, so that, in the absence of adequate unemployment benefits, aggregate consumption would be adversely affected by precautionary savings – slowing down the recovery. ([121])

Active labour market policies (ALMP) ([122]) also impact economic resilience especially during the recovery as they cover a whole range of policies that facilitate labour reallocation such as training of workers as well as guidance and counselling provided by public employment services (PESs). ([123]) Graph II.2 shows that there are notable differences across Member States in terms of expenditure on public employment services and training.

Collective bargaining is a key determinant of wage flexibility whereby both highly centralised and highly decentralised regimes strengthen the alignment of wages and productivity, while a high degree of coordination of bargaining can moderate wage increases. ([124]) At the same time, bargaining

could increase rigidities in adjustment to localised developments in case of excessive centralisation or being unable to smoothen wage adjustment over time and sectors in case of excessive decentralisation.

Graph II.2: **Expenditure on Public Employment Services (PES) and training 2015 (% of GDP)**
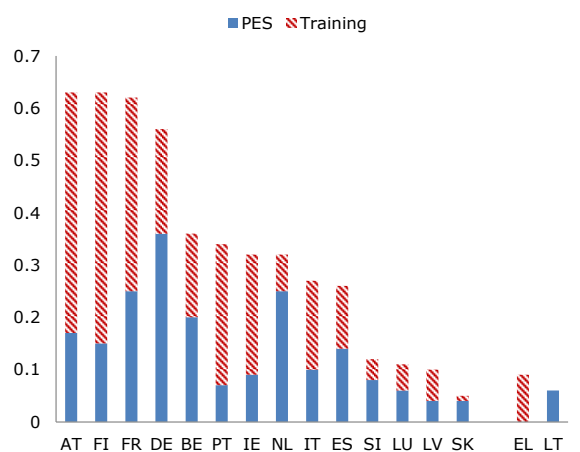
(1) Data for EL and LT missing.
Source: OECD:

Finally, *labour market duality* may hinder an economy's capacity to absorb and recover from a shock because of increased employment volatility. An excessive adjustment burden falls on workers at the margin of the labour market through the deregulation of temporary contracts, development of agency work and other contracts of limited duration. Indeed, the prevalence of fixed-term contracts (as opposed to highly protected permanent ones) is found to increase the response of unemployment to output shocks while decreasing its persistence ([125]). It is related to other aforementioned features such as EPL or collective bargaining.

II.3.3. Financial markets

Well-functioning financial markets help economic agents to smoothen their consumption and investment in the face of shocks. ([126]) However, several factors may limit this capacity whereby it is

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collective dismissals; and 3.Regulation of temporary forms of employment.

([120]) Duval and Vogel (2008), *op. cit.* show that strict labour and product market regulation initially may dampen the impact of a common shock but make it more long-lasting. In Biroli P., Mourre G. & A. Turrini (2010), 'Adjustment in the Euro Area and Regulation of Product and Labour Markets: An Empirical Assessment', European Economy - Economic Papers 2008 - 2015 428, Directorate General Economic and Financial Affairs (DG ECFIN), European Commission, the authors show that the EPL indeed dampens the adjustment and increases the persistence of the shock. EPL tends to lead to more nominal wage rigidity as shown in Holden. S. and F. Wulfsberg (2005), 'Downward Nominal Wage Rigidity in the OECD,' Memorandum 10/2005, Oslo University, Department of Economics. At a more granular level, Brůha et al. (2017), *op.cit.*, report that low protection of contracts positively impact economic resilience.

([121]) Hence, the need to explore the empirical significance of other drivers such as income support for the unemployed and access to credit markets. See, for instance, Koeniger, W. and J. Prat (2007), 'Employment protection and labour market turnover', VoxEU.

([122]) See, for instance, European Semester Thematic Factsheet, Active Labour Market Policies at https://ec.europa.eu/info/sites/info/files/european-semester_thematic-factsheet_active-labour-market-policies_en.pdf

([123]) Bassanini and Duval (2006), *op. cit.*, examine unemployment patterns, so not strictly at economic resilience, and found specific interactions across policies and institutions to be very robust, namely between unemployment benefits and public spending on active labour market programmes

([124]) For instance, Eurofound (2015), 'Pay in Europe in different wage-bargaining regimes', reports that a higher degree of coordination and centralisation tempers nominal unit labour cost growth but has no significant impact real unit labour cost.

([125]) Kosior, A., Rubaszek, M., and Wierus, K. (2016), 'The potential effects of labour market duality for countries in a monetary union.' *International Labour Review*, *155*(4), 509-534.

([126]) By channelling savings and borrowing across regions and over time - provided intertemporal budget constraints are respected.

important to distinguish between financial system *long-term characteristics from vulnerabilities*. [127]

For instance, a high *stock of non-performing loans* may hinder the absorption of shocks as it limits the banking sector to provide new loans. At the same time, a severe shock may adversely affect borrowers' ability to repay their debts. [128] In turn, this increase in non-performing loans weakens banks' lending capacity and thus also the economy's capacity to absorb shocks. [129] Graph II.3 shows strong differences in terms of non-performing loans (as percentage of total gross loans) across Member States as well as over time in some Member States. [130]

While the financial sector has the potential to help absorb shocks, it may itself be a source of shocks or intensify the amplitude of credit cycles. For example, excessive credit expansion followed by a housing bubble and burst and sudden reversal may lead banks to curtail lending and increase lending spreads. [131]

In case of the long-term characteristics of financial intermediation, it was found that a higher stringency of capital adequacy requirements for banks, greater reliance of a domestic banking system on deposits, and openness to non-domestic banks decrease the vulnerability to financial contagion. Access to multiple sources of funding may in turn reduce the persistence of the effects of shocks. [132]

Banking sector competition is a crucial structural variable that may improve the allocative efficiency

of capital as well as investment, which in turn may speed up the recovery. [133] However, beyond a threshold level of financial development the financial sector may ignite a reallocation of highly skilled from the real to the financial sector and give rise to excessive increases in mortgage credit which both are less conducive to economic resilience. [134]

Graph II.3: **Gross non-performing debt instrument**
(as % of total gross debt instruments)
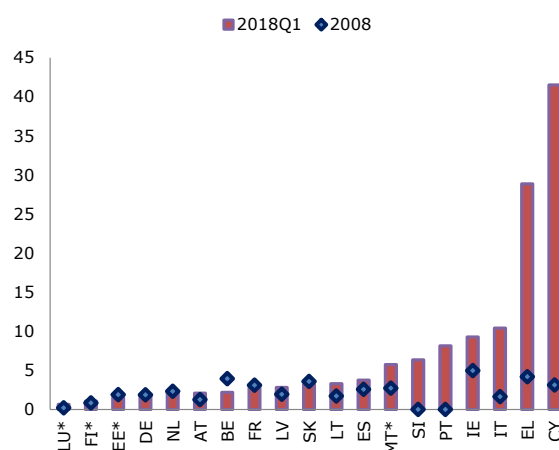
(1) Ratio of non-performing debt instruments (payments of interest and principal past due by 90 days or more) to total gross debt (total value of loan portfolio). Debt instruments include both loans and other securities (namely bonds). The data on NPL ratios are available only from 2014. The difference between these two ratios is mostly around 1 p.p.
Source: ECB (Consolidated Banking Data)

Finally, some types of international financial integration, such as international bank lending, tend to amplify contagion shocks and increase crisis risk. [135] In other words, an optimal balance between banking sector and capital market integration is required to withstand sudden reversals in financial flows (e.g. bank credit) by adjustments in other parts of the financial system (e.g. equity funding).

[127] Caldera Sánchez et al. (2016) report a trade-off between efficiency and crisis-risk with regards to financial market policies.

[128] See, for instance, Berti, K., Engelen, C. and B. Vašíček (2017), 'A macroeconomic perspective on non-performing loans (NPLs)', *Quarterly Report on the Euro Area*, Vol. 17, No. 1, pp. 8-21.

[129] In the econometric analysis this interaction has been taken into account using instrumental variables. In general, in this section variables are instrumentalised using lagged variables with lags up to 3 years. More specifically, for non-performing loans the instrumental variables include lagged output gap and other lagged financial variables such as public debt and household debt.

[130] Due to differences in national accounting, taxation, and supervisory regimes, these data are not strictly comparable across countries. Data retrieved from the Federal Reserve Bank of St. Louis covering for most Member Sates the full 1998-2015 period. ECB data on non-performing loans only start as of 2007.

[131] See, for instance, Kanngiesser, D., Martin, R., Maurin, L. and D. Moccero (2017), 'Estimating the impact of shocks to bank capital in the euro area', *ECB Working Paper Series* No 2077.

[132] Ahrend, R. and A. Goujard (2012), 'International Capital Mobility and Financial Fragility - Part 3. How Do Structural Policies Affect Financial Crisis Risk?: Evidence from Past Crises Across OECD and Emerging Economies, OECD Working Papers No. 966,

[133] In the econometric analysis, market power will be measured by the Lerner index which measures the difference between output prices and marginal costs. An increase in the Lerner index indicates a deterioration of the competitive conduct of financial intermediaries. Source, World Bank.

[134] See, for instance, Popov, A. (2017), 'Evidence on finance and economic growth', ECB Working Paper Series No. 2115.

[135] See, for instance the identification of structural policies that increase or decrease financial crisis risks in Ahrend and Goujard (2012) Ahrend, R. and A. Goujard (2012), "International Capital Mobility and Financial Fragility - Part 1. Drivers of Systemic Banking Crises: The Role of Bank-Balance-Sheet Contagion and Financial Account Structure", OECD Economics Department Working Papers, No. 902.

II.3.4. Structural factors

Diversification of economic activity [136] allows the economy to be more flexible in adapting to changing economic conditions thereby strengthening the capacity to absorb and recover from shocks. However, strong inter-linkages between economic activities or diversification in activities showing strong cyclicality such as manufacturing and construction may limit the gains from diversification. [137]

The economy's openness to international trade allows sharing some of the adjustment burden with the rest of the world as it strengthens economies' capacity to absorb and recover from shocks, especially, in the case of an idiosyncratic shock. However, when a common shock hits not only the domestic market but also export markets the absorption capacity may be tempered. In addition, trade openness may affect the effectiveness of other adjustment channels as it is, for instance, more difficult in a more open economy to stimulate domestic demand expansion as it spills out through the import channel. [138]

Closely related to a Member State's trade openness is its type of exports. For instance, Graph II.4 shows a positive correlation between trade openness and the degree of specialisation, suggesting that Member States with strong market openness have a strong specialisation in their exports, i.e. less diversified export portfolio. [139] More specifically, research suggests that inter-industry trade (as opposed to intra-industry)

specialisation may make economies more vulnerable to country specific shocks. [140]

Graph II.4: **Trade openness and export diversification (2015)**
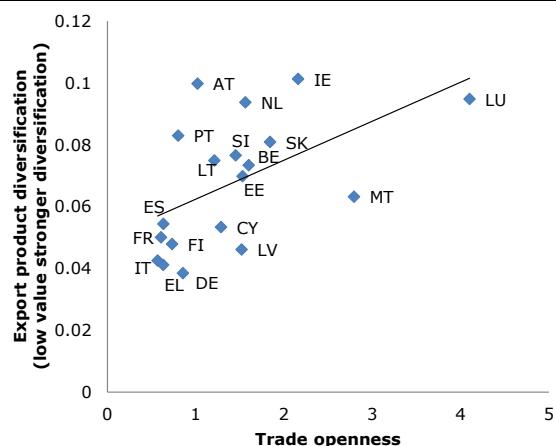
(1) Trade openness = (exports + imports)/ GDP in current prices. Export diversification as measured by Hirschman Herfindahl Index which is equal to sum of squared shares of each product in total export. A country with a perfectly diversified export portfolio will have an index close to zero, whereas a country which exports only one export good will have a value of 1 (least diversified).
Source: Authors' estimates based on AMECO and WB.

With stronger *income inequality* [141] leading to more income concentration at the top, the fall in aggregate demand may be smaller when hit by an adverse shock because high income earners have a lower propensity to cut their expenditures when their income decreases compared to income earners at the lower end. [142] At the same time, however, the adverse impact may get aggravated if lower income groups do not have savings or access to credit to absorb a negative shock. In addition, if higher income inequality would lead to fewer opportunities for training for the workers at the lower end of the income distribution, the recovery may also be adversely affected.

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[136] Several indicators have been proposed to measure diversification. See Wundt, B. (1992), 'Reevaluating Alternative Measures of Industrial Diversity as Indicators of Regional Cyclical Variations', *The Review of Regional Studies*, Vol. 22, No. 1, pp. 59-73. Here an indicator based on sectoral employment shares is used.

[137] See, for instance, Martin, R. (2012), 'Regional economic resilience, hysteresis and recessionary shocks', *Journal of Economic Geography*, Vol. 12, No. 1, pp. 1–32.. Moreover, the impact of diversification on growth potential is not unambiguous. On the one hand, diversification reduces specialisation in those activities in which Member States have a comparative advantage thereby lowering overall productivity growth. On the other hand, stronger resilience through diversity may create stronger incentives to innovate and invest which may improve potential growth.

[138] See, for instance, Spilimbergo, A., et al. (2008), 'Fiscal Policy for the Crisis', IMF Staff Position Note, SPN/08/01. Sutherland, D., et al. (2010), 'Counter-cyclical Economic Policy', *OECD Economics Department Working Papers* No. 760.

[139] As measured by the Hirschman Herfindahl Index.

[140] Krugman, P. (1981), 'Intraindustry Specialisation and the Gains from Trade', *Journal of Political Economy*, Vol. 89, No. 5, pp. 959-73

[141] Chen, T et al. (2018), ' Inequality and Poverty Across Generations in the European Union', IMF Staff Discussion Notes SDN/18/01 report that overall income inequality has remained broadly stable in the EU over the past decade but disparities in poverty and income inequality across generations have increased markedly.

[142] See, for instance, Carroll, C., Slacalek, J. and K. Tokuoka (2014), 'The Distribution of Wealth and the MPC: Implications of New European Data', *The American Economic Review*, Vol. 104, No. 5, pp. 107-111 using data for 15 European countries from the Household Finance and Consumption Survey report that spending of unemployed individuals and households earning low income and holding little wealth is more sensitive to shocks. This may be triggered by the fact that people at the lower end of the income distribution are often liquidity and credit constrained.

Box II.2: Data on factors.

The table below summarizes briefly how the structural factors examined in this section have been measured. Only structural factors with sufficient sample size (i.e. covering the 1998-2015 period) are shown. This excludes, for instance, indicators referring to insolvency regime, contract enforcement and the efficiency of the judiciary.

Table A: Indicators

Factor	Indicator	Source
COMMON SHOCK	Stochastic disturbance arising outside the economic system	Own estimates
OTPUT GAP	Gap between actual and potential gross domestic product at 2010 reference levels (AVGDGP)	AMECO
I. PRODUCT MARKETS		
Prodcut Market Regulation (PMR)	See text below. Index scale of 0-6 from least to most restrictive.	OECD
II. LABOUR MARKETS		
A. Employment policies	aggregate of items below	
- public employment services (PES)	PES and administration - Public expenditure as a percentage of GDP	OECD
- employee training	Training - Public expenditure as a percentage of GDP	OECD
- start-up incentives for unemployed	Start-up incentives - Public expenditure as a percentage of GDP	OECD
- out-of-work support	Out-of-work income maintenance and support - Public expenditure as a percentage of GDP	OECD
B. Employment protection legislation (EPL)	Employment protection. Index scale of 0-6 from least to most restrictive.	OECD
C. Wage bargaining level	The predominant level at which wage bargaining takes place. Ranging from 1 = predominantly local or company level to 5 = predominantly central or cross-industry level	ICTWSS database
D. Wage bargaining coordination	coordination of wage-setting. Ranging from 1 = fragmented to individual firms or plants to 5 = maximum coordination	ICTWSS database
III. FINANCIAL MARKETS		
A. Non-performing loans	Bank nonperforming loans to gross loans (%) Ratio of defaulting loans (payments of interest and principal past due by 90 days or more) to total gross loans (total value of loan portfolio). The loan amount recorded as nonperforming includes the gross value of the loan as recorded on the balance sheet, not just the amount that is overdue. (GFDD_SI_02)	World Bank retrieved via FRED

Factor	Indicator	Source
B. Competition in banking sector	Lerner index A measure of market power in the banking market. It compares output pricing and marginal costs (that is, markup). An increase in the Lerner index indicates a deterioration of the competitive conduct of financial intermediaries. (GFDD_OI_04)	World Bank retrieved via FRED
IV. STRUCTURAL FACTORS		
A. Trade openness	(exports + imports) / GDP in current prices	based on AMECO
B. Export diversification	Hirschman Herfindahl Index It is the sum of squared shares of each product in total export. A country with a perfectly diversified export portfolio will have an index close to zero, whereas a country which exports only one export will have a value of 1 (least diversified).	World Bank Trade Indicators
C. Employment diversification	Sum of squared deviation of sectoral employment share from 1 divided by number of sectors	Own estimates
D. Inequality	Gini coefficient of equivalised disposable income - EU-SILC survey [ilc_di12]. Scale form 0 to 100, with 0 perfect equality and 100 perfect inequality.	Eurostat
V. MACRO-ECONOMIC CONDITIONS		
A. Nominal interest rate	Nominal short-term interest rates (ISN)	AMECO
B. Real effective exchange rate	Real effective exchange rates, based on unit labour cost	AMECO
VI. INSTITUTIONAL QUALITY		
A. Government Effectiveness	Reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. The data ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance.	World Bank Worldwide Governance Indicators (WGI) project
B. Regulatory Quality	Reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. The data provided ranges from approximately -2.5 (weak) to 2.5 (strong) performance.	World Bank Worldwide Governance Indicators (WGI) project
C. Control of Corruption	Reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.The data provided ranges from approximately -2.5 (weak) to 2.5 (strong) performance.	World Bank Worldwide Governance Indicators (WGI) project

The OECD PMR has three levels of sub-aggregation, i.e. state control (which includes public ownership and Involvement in business operations), barriers to entrepreneurship (which includes complexity of regulatory procedures, administrative burdens on start-ups and regulatory protection of incumbents) as well as barriers to trade and investment (which includes explicit barriers to trade and investment and other barriers to trade and investment). [1] In turn, these sub-indicators can be disaggregated further. Multicollinearity between these indicators and insufficient degrees of freedom may lower the efficiency of the point estimates in the regression analysis.

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[1]   The OECD product market regulation (PMR) indicators have been published for most OECD countries every 5 years between 1998 and 2013 – for SI, SK as of 2008 and for CY, LT, LV and MT as of 2013. Missing years have been interpolated. Index scale of 0-6 from least to most restrictive.

II.3.5. Macro-economic conditions

Macro-economic conditions also affect the economy's absorption capacity. First, the fiscal stance affects an economy's capacity to respond to adverse shocks in aggregate demand. A strong structural fiscal balance ([143]) (in combination with a sustainable public debt level) creates room for counter-cyclical public measures and automatic stabilisers in the case of a temporary shock. ([144])

Second, the private sector debt level may also affect an economy's capacity to withstand shocks as a high private debt may not only limit the capacity to borrow to smoothen consumption over time, but it may also be so high that it pushes the private sector into pro-cyclical deleveraging, i.e. the so-called balance sheet recession. ([145])

Third, the way changes in the interest rate are transmitted will also affect the absorption capacity. In case of an adverse common shock, interest rates would likely be cut ([146]) but such cuts may have a different impact on domestic interest rates if financial markets are fragmented and the monetary transmission channel is impeded.

Finally, nominal and real (effective) exchange rate depreciations may create room to increase net exports. However, in a currency union the nominal exchange rate of the common currency will primarily respond to developments at the level of the currency union as a whole. By contrast, real effective exchange rates may respond to domestic conditions such as nominal unit labour costs – which often show a strong rigidity. ([147]) Its impact on economic resilience will then also depend on the economy's structural features such as the size of its tradable and non-tradable sectors.

II.3.6. Institutional quality

Several empirical studies report that institutional quality ([148]) has an important impact on both macro-economic stability and potential growth. ([149])

However, determining causality in this context is not always clear-cut. ([150]) For instance, OECD (2013) ([151]) argues that while a strong correlation can be found between perceived corruption and output level, this relationship is difficult to assess because corruption may compensate for the shortcomings of regulatory systems that dampen economic growth.

II.4. An econometric analysis of the absorption and recovery capacity: Illustrative results

II.4.1. The empirical method

The empirical analysis in this section is based on an unbalanced data set ([152]) that covers more than 20 explanatory variables as potential determinants of resilience for a period ranging from 1998 until 2015. These variables interact with the lagged dependent variable, i.e. the lagged output gap, (to identify determinants of recovery capacity) as well as the common shock variable (to identify determinants of shock absorption capacity) so that in principle more than 40 explanatory variables can be included in the regression equation underpinning the empirical analysis - as described in Box II.2. This poses then a problem of degrees of freedom and multicollinearity.

To deal with these problems the following strategy was implemented. First, several panel regressions were performed using a prior beliefs rooted in economic theory to select the relevant factors affecting shock absorption and recovery. However, this approach has its limitation as some indicators

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([143]) Measured by AMECO indicator UBLGBP: Net lending (+) or net borrowing (-) excluding interest of general government adjusted for the cyclical component: Adjustment based on potential GDP

([144]) However, for instance, Guerini et al (2017), 'The Janus-Faced Nature of Debt: Results from a Data-Driven Cointegrated SVAR Approach', *LEM Papers Series* 2017/04, argue that increases in public debt may crowd-in private investment. Hijzen et al. (2017), op. cit., show that automatic fiscal stabilisers contributed to labour market resilience during the Great Recession

([145]) Koo, R. (2014), The Escape from Balance Sheet Recession and the QE Trap: A Hazardous Road for the World Economy.

([146]) Provided monetary authorities' room for manoeuvre is not constrained by the zero lower bound.

([147]) For more details on developments in nominal unit labour cost see Vanderplas, A. (2018), 'Wage dynamics in the EMU', *Quarterly Report on the Euro Area*, Vol.. 17, No. 3

([148]) Institutional quality is often measured by the World Bank Governance Indicators which covers six dimensions of governance including regulatory quality, rule of law, and control of corruption (which are also part of the subsequent analysis).

([149]) See, for instance, Acemoglu, D., Johnson, S. and J. A. Robinson (2005), 'Institutions as a Fundamental Cause of Long-Run Growth,' in: Aghion, P. and S. N. Durlauf (eds.), *Handbook of Economic Growth*, Volume 1A.

([150]) Edward L. Glaeser, E., La Porta, R., Lopez-de-Silanes, F. and A. Shleifer (2005), 'Do Institutions Cause Growth?', *NBER Working Paper* No. 10568 report findings for a reverse causality suggesting that growth and human capital accumulation lead to institutional improvement and not the other way around.

([151]) See OECD (2013), 'Issues Paper on Corruption and Growth'.

([152]) See Box 2 for more details on data sources.

may show a strong degree of collinearity at their lowest level of disaggregation as is the case of the product market regulation indicator, which includes at its lowest level of disaggregation, for instance, indicators measuring administrative burdens on corporations, sole proprietor firms and in services sectors. Next, a Bayesian model averaging (BMA) technique was applied that allows identifying the most robust variables (in this case, determinants of resilience) from a very large pool of potential factors based on statistical selection criteria - as explained in Box II.3. This method allows testing even large set of variables at a more disaggregated level (for example, one can test not only the main structural characteristics of the labour market but numerous fairly detailed features thereof) and provides the ranking of relative importance of such variables.

II.4.2. Factors' impact on resilience

This sub-section aims at reporting on the factors that have been identified as the most significant in explaining economic resilience, in terms of contribution to an economy's shock absorption capacity (Graph II.5) and to recovery capacity respectively (Graph II.6) using the panel regressions [153] and Bayesian Model Averaging (BMA). Box II.3 reports detailed results of panel regression both at aggregated (Table A) and more detailed level of disaggregation for product market regulation and active employment policies (Table B), and results of BMA with ranking the most relevant factors selected from the entire pool of potential determinants (Table C). Below, the individual factors are presented according to the classification followed in sub-section II.3, while Box II.2 describes how these factors have been measured.

Product markets: The estimation results suggest that increased *state control* such as stronger regulation of network industries and price setting has an unambiguous negative impact on both the absorption and recovery capacity.

Stricter barriers to *entrepreneurship* affect both dimensions of resilience adversely – albeit at a low level of significance. [154] However, a further disaggregation of this indicator suggests a trade-off between absorption and recovery for its different components - as reported in Table B. For example, the estimates suggest that stricter regulation of start-ups is particularly detrimental to the recovery but may strengthen the absorption capacity – indicating that making it easier to replace existing firms by new firms may lower output on impact but give a growth impetus during the recovery.

Graph II.5: **Factors affecting absorption capacity of common shocks**
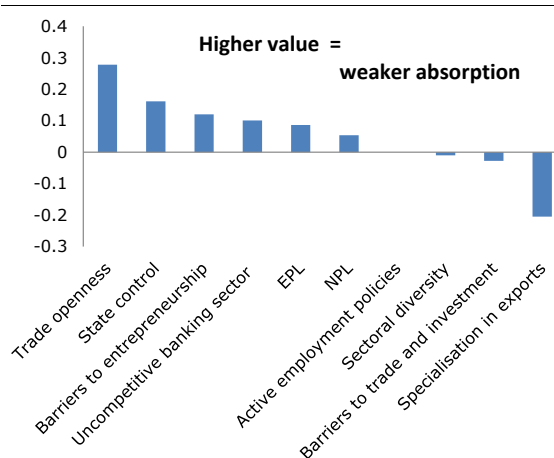
(1) Estimates based on variant V5 of Table B in Box II.3, and evaluated for the period 2008-2014. (2) The scale on the Y-axis measures the ppt. change in the output gap.
Source: Authors' estimates.

The estimates suggest against expectations that stricter *barriers to trade and investment* such as differential treatment of foreign suppliers and barriers to FDI [155] may weaken the impact of a common shock and speed up the recovery. Although the former effect does not show a high level of significance, this finding is to be interpreted with care as the effects of trade barriers on economic resilience, like on growth [156], are not

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[153] For each of the factors shown in this and the following graphs, the impact on the absorption and recovery is estimated by multiplying the point estimate (of variant V5 in Table B of Box 2) with the 2008-2014 sample average. In this unbalanced dataset some years may be missing for some countries when estimating the average. For instance, the Lerner index measuring bank completion is not available for IE and FI as of 2011. In case of missing data, the average is calculated over the available data.

[154] Interpreting the point estimates in Table 3 of Box II.3 it should be remembered that the OECD product market regulation indicators have a scale form 0 to 6, i.e. from least to most restrictive.

[155] More specifically, such regulation refers to less favourable tax treatment of foreign suppliers, discrimination in public procurement as well as special government rights in the case of acquisition of equity by foreign investors. For more details, see Koske, I. et al. (2015), *op cit.*

[156] See Rodrik, D. and Rodriguez, F (1999) 'Trade Policy and Economic Growth: A Skeptic's Guide to the Cross-National Evidence', NBER Working Paper No. 7081, the authors warn

straightforward. One interpretation could be that during shock absorption, low barriers to FDI may intensify competition and make FDI more responsive to local economic conditions, thereby amplifying the impact of a shock. For the recovery phase, the estimated dampening effect of lower barriers is more puzzling and may reflect econometric issues. [157] Furthermore, while a differential treatment of foreign suppliers may speed up the recovery as it favours local suppliers it has also negative feedback on potential output growth as it adversely affects the efficient allocation of resources across the euro area and limits recovery via exports. In any case, this ambiguous finding on the impact of barriers in trade and investment on economic resilience calls for further research.

Labour markets: The estimation results show only a limited impact of employment policies on both shock absorption and on the recovery. The estimates suggest that *employment protection legislation* and *active labour market policies* have only a small impact on the economy's absorption and recovery capacity while research reported elsewhere suggests that spending on active labour market policies responding strongly to cyclical increases in unemployment may promote a quick return to work in the recovery. [158] The analysis applied in this section, which focusses mainly on aggregated variables, seems to be less suited to capture the rich dynamics of active labour market policies targeted at specific groups of workers, such as long-term and youth unemployed. [159] However, the BMA analysis reveals that detailed features of the labour markets, namely out-of-work support and employee training rank high (in terms of posterior

inclusion probability) in terms of reducing the impact of a shock. [160]

Graph II.6: **Factors affecting recovery capacity from common shocks**

(1) Estimates based on variant V5 of Table B in Box II.3, and evaluated for the period 2008-2014.
(2) The scale on the Y-axis measures the ppt. contribution of a specific factor to the total recovery speed.
Source: Authors' estimates.

Financial markets: The estimates for the financial sector support the hypothesis that an increases in the share of *non-performing loans* in total gross loans [161] and a weakening in the *banking sector competition* [162] affect negatively an economy's absorption as well as recovery capacity.

Structural factors: The estimation results show that *sectoral diversity in domestic production* had a rather small impact on resilience during the sample period considered in this section. However, diversification in exports or its corollary – international trade specialisation - has an opposite significant effect on the capacity to absorb shocks and on the capacity to recover. The econometric results suggest that stronger specialisation (in terms of products) in exports strengthens the capacity to absorb a common shock, but weakens the capacity to recover. Indeed, specialisation allows for a better exploitation of comparative advantages and

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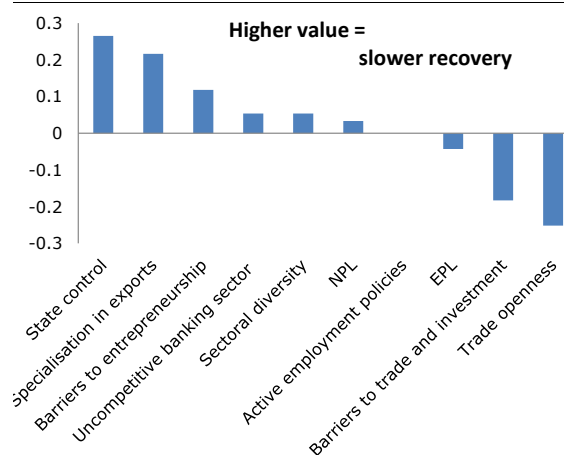against expecting an unambiguous relationship between trade openness and growth.

[157] Such as a lack of variability of these indicators over time and missing variables.

[158] For instance, OECD (2017), 'Chapter 2. Labour market resilience: The role of structural and macroeconomic policies' in OECD Employment Outlook 2017, reports that after one year, an increase in active labour market spending of 1% of GDP would reduce the unemployment rate by almost 2 percentage points compared with less than half a percentage point for public spending overall.

[159] For instance, the components of labour market policies such as training, public employment services and out-of-work support show a low significance. This low level of significance may be triggered by multicollinearity between the disaggregated components of labour market policies (that move in tandem) as well as by the use of instrumental variables. This calls then for analysis at more disaggregated level – which is beyond the scope of this section.

[160] However, such ranking does not give an indication of its total impact on absorption or recovery - which is equal to the point estimate multiplied with the value of the variable.

[161] Covering defaulting loans with payments of interest and principal past due by 90 days or more.

[162] As measured by the Lerner index measuring the difference between output prices and marginal costs. An increase in the Lerner index indicates a deterioration of the competitive conduct of financial intermediaries. See https://fred.stlouisfed.org/tags/series?t=lerner+index%3Bworld+bank.

economies of scale, which in turn creates room to lower prices. As such, when export markets are hit by a common shock it would be easier to offset the decrease in external demand by price adjustments when exports are specialised. By contrast, during the recovery when all export markets are rebounding, opportunities for exports increase because overall demand increases. In other words, during the absorption period the estimation results suggest that it is price effects that affect exports (so that specialisation matters), while in the recovery period it is scale effects (so that specialisation is less important). Besides, in a context of disintegration of the value chain across countries, an export specialisation (in terms of products) could also confer an advantage in case of common shocks, based on the position in the value chain. The parts of the value chains that are less substitutable (for instance a part that is so technologically complex that few countries produce them) would therefore be less sensitive to common shocks. [163]

The economy's openness to international trade also seems to have an opposite impact on shock absorption and on the recovery capacity, which also confirmed by the BMA analysis. In case of a common shock the openness of the economy will amplify the impact of the shock (i.e. weaken the absorption) because the shock does not only affect adversely the domestic market but also the export markets. [164] Such adverse outcomes may then be tempered by policies and reforms that strengthen the economy's absorption capacity, including through prudent fiscal policies and better functioning automatic fiscal stabilisers as well as through a well-functioning Banking Union and Capital Markets Union which increase risk-sharing. However, stronger openness as well as a more diversified export portfolio may speed-up the recovery. [165]

Finally, in terms of *institutional quality,* the estimates from the panel regression, suggest that good governance strengthens the economy's recovery

capacity significantly, but it weakens the absorption capacity – which may suggest that with an ineffective administration zombie firms remain longer in business which lowers the impact of the shock, but slows down the recovery. The BMA results confirm that good governance which includes quality of public and civil services, and independence from political pressures, as well as the quality of policy formulation and implementation ranks high among the factors that speed-up the recovery. This suggests that broad institutional characteristics of a country can determine its capacity to withstand adverse shocks alongside the structural characteristics of economic nature.

II.4.3. Member States' performance

Member States' overall shock absorption and recovery capacities are represented in Graph II.7 and Graph II.8 respectively.

Graph II.7 shows Member States' overall capacity to absorb a common shock – which combines the impact of all individual factors in a country. Member States recording a high value for this parameter will experience a stronger output loss when hit by a common shock than Member Sates recording a low value.

Graph II.7: **Shock absorption capacity in case of common shock**

(1) Estimates based on variant V5 of Table B in Box II.3, and evaluated for the period 2008-2014.
(2) The scale on the Y-axis measures the ppt. change in the output gap.
Source: Authors' estimates.

[163] See for instance Timmer M., Los B., Stehrer R. and G. De Vries (2013) 'Rethinking competitiveness: The global value chain revolution', *VoxEU.*
[164] Important to note that the latter adverse mechanism would not occur in case of a country-specific shock.
[165] Here it should be remembered that while diversification improves the absorption capacity it limits a country's potential to specialise in those goods and services it has a comparative advantage, suggesting a trade-off between stability and potential growth. In turn, stability may increase the incentives to invest and innovate, which increases potential growth.
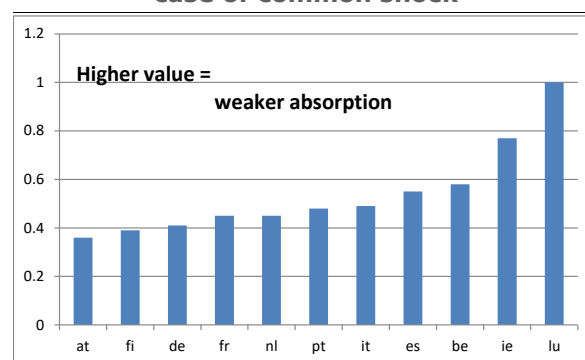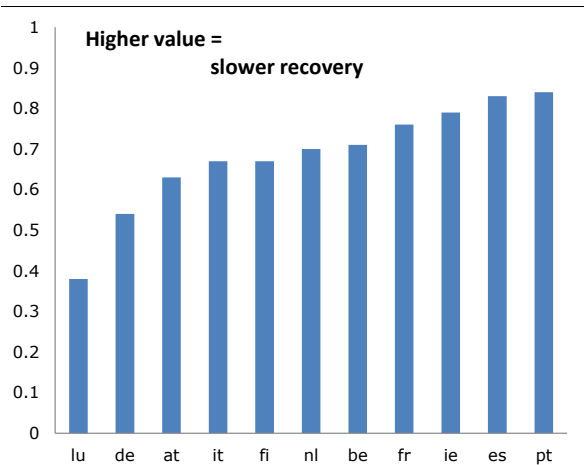
Graph II.8: **Recovery capacity in case of common shock**

(1) (1) Estimates based on variant V5 of Table B in Box II.3, and evaluated for the period 2008-2014. (2) The scale on the Y-axis measures total recovery speed.
Source: Authors' estimates.

The chart suggests that Luxembourg experienced the strongest impact when hit by a common shock. In the case of Luxembourg, this reflects to a large extent its strong openness to international trade and the fact that a common shock not only adversely affects its domestic market but also its export markets. Ireland also recorded a weak absorption capacity for a common shock but here it was primarily a combination of trade openness and relative high level of non-performing loans. Austria and Finland showed a strong absorption capacity for common shocks reflecting partly their weaker trade openness and relative stronger exports specialisation.

Graph II.8 shows Member States' overall capacity to recover from a shock. While Luxembourg has the weakest capacity to absorb a common shock, it has the strongest capacity to recover – this is to a large extent due to its strong openness to trade. By contrast while Portugal does withstand common shocks better than several other Member States it requires more time to recover – as its lower openness to international trade limits the impact of the common shock but makes it more difficult to recover.

II.5. Conclusions and policy implications

This section investigated the empirical significance of a selected set of structural factors that affect the euro area economies' capacity to absorb and recover from a common shock. Its value added is that it is a first attempt to assess at a more disaggregated level the impact of individual factors on resilience.

Nevertheless, some results suggest that further empirical research is needed. For instance, the reduced form macro-econometric approach is less suited to capture the rich dynamics between active labour market policies that support the most vulnerable workers and the economy's capacity to withstand shocks. Nor is it well suited to capture the impact of labour market dualism on resilience.

If Member States of the euro area display similar performances in terms of the absorption and recovery from common shocks then common policy tools such as the common monetary policy become more effective. Such convergence would not only provide stronger stability in terms of income and employment, but it would also strengthen the long term growth potential as it limits hysteresis effects linked to, for instance, long unemployment spells and the underutilisation and underinvestment of capital.

The empirical analysis highlighted that there are notable differences among the euro area Member States (for which sufficient data are available) in terms of both absorption and recovery capacity. It also showed that performances in terms of these two capacities are not necessarily fully in sync with each other. For example, the panel regression results suggest that in case of a common shock strong openness to international trade weakens the absorption capacity as export markets are also adversely affected by the common shock; but it may induce a faster recovery due to the same strong openness to international trade.

Such findings suggest then that the economies more open to international trade should pursue more vigorously policies and reforms that strengthen the economy's absorption capacity, including through prudent fiscal policies and better functioning automatic fiscal stabilisers as well as through a well-functioning Banking Union and Capital Markets Union which increase risk-sharing.

While Member States may be hit by common shocks that are beyond their control, it is primarily within Member States that reforms to foster convergence to resilient economic structures should start.

At national level, a well-functioning business environment has a key role to play to promote

economic resilience. More specifically, creating environments that foster entrepreneurship increases the ability to adapt and recover from exogenous shocks. The administrative burdens on startups are particularly detrimental to the recovery, which calls for streamlining administrative procedures for start-ups in countries that are still performing badly on this. Price controls both amplify shocks and slow down the recovery. Even so, increases in the share of non-performing loans in total gross loans and a weakening of competition in the banking sector affect negatively an economy's absorption as well as recovery capacity. But as the euro area economies are interconnected, there are some spillover effects that justify complementarities between the EU and national policies to increase economic resilience.

Some EU policy priorities have a direct impact on significant drivers of shock-absorption and recovery. The policy levers are no longer only purely national. Namely, the measures aimed at improving the functioning of the Single Market in areas such as the regulation of network industries shall also positively affect the recovery capacity. Another dimension of the Single Market, which particularly affects the amplification of shocks, is the financial system. The EU non-performing loans reduction package (March 2018) and diverse proposals of the Capital Market Union represent initiatives that strengthen resilience of the EU financial systems, and consequently have a positive impact on macroeconomic resilience of the EU, the euro area and individual Member States.

Box II.3: **Econometric results.**

Staring from the specification discussed in Box II.1, the reference regression (labelled V1 in Table A) is specified in terms of aggregate factors including the indicator measuring total product market regulation, employment protection legislation and labour market policies, non-performing loans and competition in the banking sector, openness to international trade, export diversification and diversification of production.

Several variants of this reference regression have been estimated. First, the interaction between factors and the nature of the shock is further explored (Tale A), next the aggregate indicators are further disaggregated (Table B and C). This stepwise approach is dictated by concerns of multicollinearity and lack of degrees of freedom when too many explanatory variables would be included in an equation. As such, due regard should be given to possible omitted variables biases interpreting the estimation results of each of the variants.

I. Panel regression results

Table A below shows a selected set of estimation results for an unbalanced sample covering the 1998-2015 period for euro area Member States for which sufficient data are available as well as a selected group of non-euro EU Member States. (¹)

Table A: Panel regression – Interaction variants

Dependent variable : Output gap

Factors	V1 Base	V2 Shock asymmetry	V3 Recovery asymmetry	V4 Factors sample average	V1 Base	V2 Shock asymmetry	V3 Recovery asymmetry	V4 Factors sample average
	ABSORPTION (interaction with shock)				RECOVERY (interaction with lagged output gap)			
Shock (absorption) lagged output gap (recovery)	0.01	0.05	0.02	0.05 ***	0.63 ***	0.74 ***	1.17 ***	1.12 ***
	(0.36)	(1.58)	(0.76)	(2.91)	(4.04)	(3.89)	(4.80)	(7.09)
I. Product markets								
- Product Market Regulation (PMR)	0.11 **	0.24 ***	0.11 **	0.07	0.04	0.05	-0.14 *	0.05
	(2.30)	(2.63)	(2.04)	(0.99)	(0.68)	(0.75)	(-1.75)	(0.71)
II. Labour markets								
- Employment policies	0.00	-0.00 *	0.00 ***	0.00 ***	-0.00 ***	-0.00 **	-0.00 ***	-0.00 ***
	(1.62)	(-1.73)	(2.63)	(2.70)	(-4.51)	(-2.26)	(-4.78)	(-6.77)
- Employment protection legislation (EPL)	0.05 **	0.04	0.06 **	0.03	-0.03	-0.05	-0.04	-0.11 ***
	(2.02)	(0.87)	(2.13)	(0.81)	(-1.04)	(-1.62)	(-0.84)	(-3.21)
III. Financial markets								
- Non-performing loans	0.01 ***	0.01	0.01	0.02 ***	0.01 **	0.00	0.01 **	-0.01
	(3.31)	(1.35)	(1.56)	(3.38)	(2.57)	(0.92)	(2.07)	(-1.06)
- Bank competition (Lerner)	0.56 ***	0.32	0.60 ***	0.90 ***	0.34 ***	0.30 **	-0.13	-0.23
(high value for low competition)	(4.32)	(1.56)	(4.37)	(3.26)	(3.04)	(2.26)	(-0.66)	(-0.98)
IV. Structural Factors								
A Trade openness	0.24 ***	0.49 ***	0.25 ***	0.22 ***	-0.19 ***	-0.21 ***	0.04	-0.35 ***
	(13.31)	(5.04)	(10.04)	(6.20)	(-6.93)	(-6.34)	(0.41)	(-8.81)
B. Export diversification	-3.21 ***	-3.14 ***	-3.44 ***	-3.47 ***	2.19 ***	2.44 ***	1.56 *	4.85 ***
(Hirschman Herfindahl Index, 0 to 1, with 1 least diversified)	(-7.48)	(-3.93)	(-7.38)	(-4.98)	(4.38)	(3.70)	(1.81)	(6.87)
C. Employment diversification	0.89	-3.33	0.68	0.90	0.22	-0.38	-3.18 *	-2.43 **
	(1.01)	(-1.34)	(0.75)	(0.81)	(0.20)	(-0.29)	(-1.72)	(-2.34)
Correction for negative shock (use of slope dummy)								
Shock (absorption) lagged output gap (recovery)		-0.04				-1.00 ***		
		(-0.66)				(-2.78)		
- Product Market Regulation (PMR)		-0.24 **				0.45 ***		
		(-2.10)				(3.80)		
- Employment policies		0.00 ***				0.00 **		
		(2.83)				(2.06)		
- Employment protection legislation (EPL)		0.06				0.01		
		(1.07)				(0.16)		
- Non-performing loans		0.00				-0.01		
		(0.30)				(-1.01)		
- Bank competition (Lerner)		0.56				0.66 **		
(high value for low competition)		(1.65)				(2.53)		
- Trade openness		-0.27 ***				-0.19 *		
		(-2.63)				(-1.88)		
- Export diversification		-1.00				-0.11		
(Hirschman Herfindahl Index, 0 to 1, with 1 least diversified)		(-0.89)				(-0.09)		
- Employment diversification		4.81 *				4.76 *		
		(1.75)				(1.73)		
V. Macro-economic conditions								
A. Short-term interest rate	-0.31 ***	-0.36 ***	-0.38 ***	-0.35 ***				
	(-6.47)	(-6.47)	(-7.11)	(-9.24)				
B. Nominal effective exchange rate	0.16	-0.11	0.64	-1.46				
	(0.17)	(-0.10)	(0.63)	(-1.54)				
Diagnostic statistics								
Number of observations	232	232	232	232				
Number of explanatory variables	20	29	29	20				
Adjusted R-squared	0.848859	0.853605	0.856770	0.855470				
Durbin-Watson	1.63	1.72	1.69	1.75				

Note: slope dummy = 1 if negative shock, =0 if positive shock. Mutiplying the slope dummy with the explanatory variable provides an asymmetric response .
Shock asymmetry: only asymmetric resposne for absorption; recovery assymetry: only asymmetric resposne for recovery.

(¹) I.e. BE, DE, IE, ES, FR, IT, LU, NL, AT, PT, FI, CZ, DK, HU, PL, SE and UK. For the other euro area Member States the data on product market regulation did not cover a sufficient long period; some EL data on labour market policies not available.

Focussing on variant V1 of Table A, as explained in the main text, most of the point estimates have the expected sign. While this variant assumes a symmetric impact of the factors for a negative as well as positive common shock, variant V2 in Table A allows for an asymmetric impact – making use of slope dummies. [2] Comparing these regression results, suggests, for instance, that stricter product market regulation and stronger openness to international trade improves the absorption capacity when the economy is hit by a negative common shock. [3] Variant V3 shows regression results assuming asymmetry in the recovery which suggests, for instance, that stricter product market regulation delays the recovery. [4] Variant V4 shows point estimates for time-invariant interactions whereby the reference regression (V1) is re-estimated setting the structural factors equal to their sample average. Except for the diversification of the employment composition the qualitative nature of the estimates does not change.

Table B provides some evidence on further disaggregation of the aggregates in variant V1 of Table A. A further disaggregation of the product market regulation indicator shows that some of its components show some significance (see Variant V5 in Table B). This is especially the case for state control (which includes price regulation and regulation of network industries) which shows a positive point estimate for its interaction with the lagged output gap indicating that stronger state control slows down the recovery. Nevertheless, the indicator related to barriers to trade which includes barriers to FDI and different treatment of foreign suppliers, shows a significant negative sign suggesting that stricter regulation in this field would speed up recovery.

At an even stronger level of disaggregation, Variant V6 in Table 1 shows that looking at the detail of barriers to entrepreneurship the complexity of regulatory procedures has a significant negative impact of absorption capacity, while the administrative burdens on start-ups significantly slows down the recovery. Nevertheless, a high administrative burden also tempers the absorption capacity. The latter may indicate that as it takes more time to get non-profitable firms out of business, this may temporarily support employment and thus also aggregate demand. A further disaggregation of the barriers to trade and investment (variant V7), confirm also that a differential treatment of foreign suppliers strengthen the shock absorption potential. Finally, further disaggregating of the state control dimension (variant V8) suggests significant adverse impact of price control on absorption and recovery capacity, while stricter regulation of network industries shows a negative adverse impact on the absorption capacity.

The impact of non-performing loans and lack of competition in the banking sector [5] is significant for both the absorption and recovery capacity: a deterioration in these variables significantly amplifies the impact of the shock and significantly delays recovery. [6]

Employment protection legislation (EPL) has a significant impact on the absorption capacity in most variants, but does not show any significant interaction with the recovery capacity. Moreover, while variants 6 to 8 suggest that labour market polices as a whole have a significant impact on the absorption and recovery capacity, Variant V9 suggests that a further disaggregation of labour market policies does not show significance except for public employment services that speed up the recovery. [7]

The positive sign of the point estimate of the openness to international trade interacting with the common shock suggests that stronger openness amplifies the impact of the common shock, as a common shock not only adversely affects the domestic market but also export markets. The negative sign of the point estimate of the interaction between openness to international trade and the lagged output gap shows that a stronger openness to international trade speeds up recovery, as it allows the economy to gain more from a recovery in its export markets. [8] The negative value of the point estimate of the interaction between the diversity of

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[2]   The slope dummy = 1 if negative shock and =0 if positive shock.
[3]   In order to save on the degrees of freedom, two variants with a slope dummy were estimated separately, i.e. V2 with slope dummy interacting with factors affecting the absorption, and V3 with slope dummy interacting with factors affecting the recovery.
[4]   A similar asymmetric result for PMR is for instance also reported in Duval and Vogel (2007), op cit.
[5]   As measured by the Lerner indicator which is equal to he difference between output prices and marginal costs (relative to prices).
[6]   Here it should be remembered that there may be reverse causality, in the sense that a deep downturn may generate an increase in non-performing loans, while in turn this increase may adversely affect the recovery. Reverse causality may also arise for the measure of bank competition as a deep downturn in combination with a financial crisis may affect bank competition. Such potential reverse causality has been addressed using instrumental variables.
[7]   Such result may be due to multi-collinearity between the factors.
[8]   Estimating how trade openness would affect the absorption of a country-specific shock would be beyond the scope of this section.

Box (continued)

exports and the common shock suggests that less diversification lowers the impact of a common shock. However, a more diversified export market increases the recovery speed.

Table B: Panel regression – Disaggregation variants

Dependent variable: output gap

	V5 PMR disaggregated	V6 Entrepreneurship barriers disaggregated	V7 Trade and investment barriers disaggregated	V8 State control barriers disaggregated	V9 Labour market policies disaggregated	V5 PMR disaggregated	V6 Entrepreneurship barriers disaggregated	V7 Trade and investment barriers disaggregated	V8 State control barriers disaggregated	V9 Labour market policies disaggregated
	ABSORPTION (interaction with shock)					RECOVERY (interaction with lagged output gap)				
Shock (absorption) lagged output gap (recovery)	-0.02 (-1.01)	-0.03 (-1.35)	-0.02 (-0.67)	-0.03 (-1.28)	0.02 (0.85)	0.42 ** (2.14)	0.25 (1.26)	0.47 ** (2.26)	0.37 ** (1.98)	0.68 *** (4.20)
I. PRODUCT MARKETS										
Prodcut Market Regulation (PMR) - aggregate (Index scale of 0-6 from least to most restrictive)					0.11 ** (2.04)					0.03 (0.57)
A. Barriers to entrepreneurship (aggregate)	0.07 (1.45)		0.03 (0.55)	0.03 (0.55)		0.07 (1.40)		0.07 (1.24)	0.06 (1.29)	
- Administrative burdens on startups		-0.11 *** (-2.93)					0.23 *** (6.81)			
- Complexity of regulatory procedures		0.09 *** (4.55)					-0.01 (-0.57)			
- Regulatory protection of incumbents		-0.11 * (-1.70)					-0.04 (-0.63)			
B. Barriers to trade and investment (aggregate) (Index scale of 0-6 from least to most restrictive)	-0.07 (-1.43)	-0.11 ** (-2.10)		-0.08 (-1.37)		-0.53 *** (-7.20)	-0.40 *** (-5.37)		-0.46 *** (-6.10)	
- Differential treatment of foreign suppliers			-0.46 *** (-3.86)					-0.25 * (-1.79)		
-barriers to FDI and other barriers			0.06 (1.50)					-0.24 *** (-5.49)		
C. State control (aggregate) (Index scale of 0-6 from least to most restrictive)	0.08 * (1.70)	0.20 *** (3.12)	0.16 *** (3.12)			0.12 ** (2.36)	-0.01 (-0.24)	0.10 * (1.79)		
- price control				0.04 * (1.91)					0.08 *** (3.19)	
- network industries				0.05 *** (2.86)					0.02 (0.71)	
II. LABOUR MARKETS										
A. Employment policies - aggregate	0.00 *** (2.89)	0.00 *** (4.70)	0.00 *** (3.20)	0.00 *** (3.20)		-0.00 *** (-3.03)	-0.00 *** (-4.78)	-0.00 ** (-2.23)	-0.00 ** (-1.97)	
- public employment services (PES)					0.00 (1.10)					-0.00 *** (-3.45)
- employee training					0.00 (0.56)					0.00 (1.34)
- start-up incentives for unemployed					-0.00 (-0.06)					0.01 ** (2.00)
- out-of-work support					-0.00					-0.00 (-0.16)
B. Employment protection legislation (EPL)	0.03 (1.06)	0.06 * (1.74)	-0.05 (-1.17)	0.06 ** (2.22)	0.05 * (1.95)	-0.02 (-0.54)	-0.02 (-0.58)	-0.02 (-0.64)	0.01 (0.41)	-0.03 (-1.29)
III. FINANCIAL MARKETS										
A. Non-performing loans	0.01 ** (2.44)	0.01 *** (3.31)	0.01 (1.17)	0.01 ** (2.33)	0.01 *** (3.10)	0.01 * (1.94)	0.01 ** (2.08)	0.01 ** (2.34)	0.01 * (1.93)	0.00 (1.43)
B. bank competition (Lerner) (high value for low competition)	0.64 *** (4.90)	0.20 (1.35)	0.49 *** (3.71)	0.73 *** (5.26)	0.55 *** (3.61)	0.34 *** (2.69)	0.10 (0.82)	0.28 ** (2.22)	0.41 *** (2.86)	0.35 *** (2.89)
IV. STRUCTURAL FACTORS										
A. Trade openness	0.23 *** (8.64)	0.19 *** (6.31)	0.19 *** (6.36)	0.24 *** (9.70)	0.24 *** (13.55)	-0.21 *** (-6.32)	-0.17 *** (-4.98)	-0.22 *** (-5.72)	-0.18 *** (-5.37)	-0.20 *** (-7.41)
B. Export diversification (Hirschman Herfindahl Index, 0 to 1, with 1 least div)	-2.80 *** (-5.35)	-1.47 *** (-2.81)	-1.46 ** (-2.21)	-3.41 *** (-6.46)	-3.28 *** (-7.00)	2.96 *** (5.35)	2.00 *** (3.31)	3.24 *** (4.84)	1.99 *** (3.01)	2.55 *** (4.72)
C. Employment diversification	-0.12	0.12	1.17	0.51	0.55	0.73	3.48 **	0.81	2.03	-0.14
V. MACRO-ECONOMIC CONDITIONS										
A. Nominal interest rate	-0.38 *** (-8.59)	-0.35 *** (-8.99)	-0.36 *** (-8.22)	-0.40 *** (-7.85)	-0.37 *** (-6.79)					
B. Real effective exchange rate	-0.31 (-0.32)	-0.78 (-0.87)	0.15 (0.14)	0.17 (0.17)	-0.10 (-0.10)					
Adjusted R-squared	0.857984	0.869837	0.860613	0.861976	0.852311					
Durbin-Watson	1.66	1.76	1.67	1.64	1.66					
Number of observations	232	232	232	232	232					
Number of explanatory variables	24	28	26	26	26					

Finally, the point estimates suggest that nominal interest rates tempered the size of output gap significantly, but no significant impact of changes in the real effective exchange rate was found. ([9])

II. BMA results

Table 2 below shows results of the variable selection by means of the Bayesian model averaging (BMA) as described in Box II.1. As the BMA routine ([10]) requires balanced sample, the sample in Table 1 was balanced using linear interpolation.

([9])   Additional estimates not shown in Table B suggest that increases in income inequality significantly weakens both absorption and recovery capacity. Good governance strengthens the economy's recovery capacity significantly, but it weakens the absorption capacity - the latter suggesting that with an ineffective administration zombie firms remain longer in business which lowers the impact of the shock, but slows down the recovery.

([10])   The estimation was performed by BMS package described in Zeugner, S. and M. Feldkircher (2015), 'Bayesian Model Averaging Employing Fixed and Flexible Priors: The BMS Package for R', *Journal of Statistical Software,* Vol. 68, No. 4, pp. 1-37.

The BMA allows for variable ranking by means of their posterior inclusion probability (PIP). PIP captures the extent to which one can assess how robustly a potential explanatory variable is associated with the dependent variable (output gap). Variables with a high PIP can be considered robust determinants of the dependent variable. Hence, BMA is employed to detect the robust determinants of resilience from the list of 40 potential ones. The variables are all those included in the panel regression in Table B plus several additional, typically more disaggregated, variables. In order to include the largest possible set of variables, the BMA selection is performed separately for absorption and for recovery phase. Out of these 40 variables for each phase, Table C shows only those where PIP was higher than 0.1 and considered as robust those with PIP higher than 0.2 (these are discussed below). The post mean (SD) is the mean (standard deviation) of the estimated coefficients averaged over all models (this includes models where the variables was not included, the coefficient is zero in this case).

The results feature several variables that were included in Table B but also a few additional ones (majority of the variables has the expected sign). The negative coefficient of *the short-term interest rate* suggests that accommodative monetary policy have decisive role when economy is hit by the shock and it needed to speed up the recovery. *Employment diversification* has at first sight counter-intuitive positive sign (i.e. the higher diversification, the higher impact of shock and the slower recovery). Whereas employment diversification could strengthen resilience in general, at the same time it limits country's opportunities to specialize in those activities where it has a comparative advantage. This second effect seems to clearly dominate here. *The trade openness* has different impact in each phase. Whereas it slows down the shock absorption, it speeds up the recovery. This suggests that in case of common shock, the more open economies are more affected as their trading partners are affected as well. However, in the mid-term more open economy can rely on export as additional sources of recovery.

The absorption phase is further facilitated by specific features of exports, namely by high *export market penetration* ([11]) and *specialization of exports*. On the contrary, it is hindered by high levels of *public debt*, which prevents more active used of fiscal policy. The recovery in turn facilitated by several variables representing state involvement in the economy. Namely, while *quality of regulation* speeds up the recovery, *the state control of economy* slows it down. Interestingly, *the public ownership* (which is a subcomponent of the state control variable) speeds-up the recovery. Finally, a notable difference with the panel regression is that the BMA ranks high out-of-work support and training during absorption.

Table C: Bayesian model averaging

Absorption	PIP	POSTmean	PostSD
ST interest rate	0.94	-0.04	0.01
Export market penetration	0.75	-0.01	0.01
Specialisation of exports	0.70	-2.97	2.23
Employment diversification	0.56	0.94	0.94
Trade openness	0.21	0.04	0.09
Public debt	0.20	0.00	0.00
Out-of-work support	0.12	-0.01	0.04
Employee training	0.12	-0.05	0.16
Gini - disposable income	0.10	0.00	0.01

Recovery	PIP	POSTmean	PostSD
Regulatory Quality	0.34	-0.10	0.14
ST interest rate	0.24	-0.01	0.01
Employment diversification	0.23	0.05	0.80
Public ownership	0.21	-0.04	0.08
State control	0.21	0.07	0.14
Product market regulation (PMR)	0.19	0.08	0.19
Start-up incentives for unemployed	0.19	0.25	0.55
Trade openness	0.18	-0.02	0.05
Governance	0.13	-0.03	0.08
Bank competition	0.12	0.07	0.22
% change REER	0.11	0.06	0.21
Corruption	0.10	-0.01	0.05

Note: PIP is post-inclusion probability indicating that the variable belongs to the true model.
Post-mean (SD) is the average estimated coefficient (standard deviation) across the models.
Lagged output gap and shock showed high PIP, both should be understood as technical variables covering variables not included in analysis.

([11]) Export Market Penetration measures the share of the actual number of export relationships (at the country product level) in the maximum possible number of export relationships a country can form given the number of its exports. A low value indicates potential for expansion.

III. Assessing Prudent NIIP and Current Account Positions

This chapter presents prudential benchmarks or reference values for the net international investment position (NIIP) in order to help assess external sustainability. The results suggest that while stock imbalances persist in some EU countries, external sustainability risks continue to abate. The empirical findings also demonstrate that the NIIP outperforms other stock indicators for assessing external sustainability. Moreover, the results suggest that low-income countries face external sustainability risks at 'less negative' NIIP levels than richer countries. An application to EU countries illustrates the resulting country-specific prudential benchmarks for the headline NIIP and its debt component, which can complement the Commission's macroeconomic surveillance toolbox.

In the EU, several net debtor countries still have legacy NIIPs that surpass prudential benchmarks. But the balanced current accounts in most of these countries imply that they are on track to return their NIIPs to prudent levels by the mid-2020s. In contrast, EU creditor countries do not run external sustainability risks. Yet they continue to run current account surpluses that exceed the level required to stabilise their NIIPs at current levels. ([166])

III.1. Introduction

Current account imbalances have shifted since the great recession, but stock imbalances persist in Europe. The large current account deficits recorded before 2010 have corrected in most cases. Nonetheless, net international investment positions (NIIPs) remain large and negative in a number of countries. The NIIP measures the aggregate difference between total foreign assets and liabilities held by all sectors in an economy. These wide NIIP imbalances have been an important factor in the balance-of-payments adjustments since 2007, as they reflect large private- and public-sector liabilities in debtor countries. By ca. 2015, these debtor countries had weathered their sudden stops and stabilised their stock imbalances; and balance-of-payments risks continue to abate since. The question remains, though, where these stocks will, and should evolve to. Is current account adjustment on the right track for debtor countries, or should they run higher surpluses?

In contrast to current accounts, the academic literature provides little guidance for assessing NIIPs. The bulk of it focuses on the extent to which a negative NIIP can be considered risky in view of sudden stops. Early warning approaches to assess external sustainability have a relatively long tradition, ([167]) but only with more recent data advances have net foreign assets, and the NIIP in particular, emerged as a possible early-warning indicator. Authors such as Catão and Milesi-Ferretti (2014) suggest prudential lower-bound thresholds for NIIPs, beyond which countries may face significant external sustainability risks. ([168]) Via its MIP scoreboard, the Commission is among the few policy institutions that apply a quantitative 'alert threshold' for the NIIP at -35% of GDP. ([169])

This chapter proposes a methodology for estimating country-specific prudential benchmark values for indicators of external sustainability, with emphasis on the NIIP. The prudential benchmark indicates from what level of the indicator, a closer look at external sector developments may be warranted. Although conceptually simple, the results are broadly in line with those from earlier research on the subject, and outperform more complicated risk indicators such as short-term debt liabilities. The benchmarks are made country-specific by taking into account the country's income per capita. Debt-equity composition, however, is also an important qualifier.

([167]) For instance, Kaminsky, G., S. Lizondo, and C. Reinhart, (1998), Leading indicators of currency crises, IMF Staff Papers, 45(1), 1-48.

([168]) Catão, L.A.V., and G.M. Milesi-Ferretti (2014), "External liabilities and crises", Journal of International Economics 94(1), 18-32.

([169]) The NIIP is one of 14 macroeconomic indicators in the Scoreboard for the Macroeconomic Imbalance Procedure. The alert threshold for the NIIP derives from the first quartile over a sample for EU countries 1995-2007. See also European Commission (2012): Scoreboard for the surveillance of macroeconomic imbalances, Occasional paper 92.

Prudential NIIP benchmarks complement the Commission's macroeconomic assessment toolbox, but do not replace tested approaches like the MIP scoreboard. The prudential benchmarks are one among several new external benchmarks to complement the Commission's analytical and qualitative reviews of NIIP and current account balances.[170] Note that the concept of an NIIP prudential benchmark focuses on the prudential aspect of external sustainability. It is thus inherently one-sided, as it denotes an NIIP below a certain value as potentially "unsustainable" from a debtor's perspective. The Commission is currently also working on two-sided benchmarks for assessing NIIPs that can be relevant for both debtors and creditors. Together, these stock benchmarks complement the Commission's tools for external sustainability assessment, but do not replace the existing set of external indicators, most notably the ones used in the economic reading of the MIP scoreboard.

Country-specific NIIP benchmarks directly imply the current account required to reach them. Such a "required current account" benchmark can widen the array of macroeconomic analysis tools employed in the Commission's macroeconomic surveillance. For countries with an NIIP below the prudential benchmark, the latter can be interpreted as a target level that directly implies what current account balance is needed to converge towards it. For countries that are safely above the benchmark, external sustainability is of a lesser concern, and there is little academic research on where their NIIPs should converge to. The most common approach (as used by the Commission, and the IMF) is to compute the current account balance that would allow such countries to stabilise their NIIPs over the medium term. [171] The "required current account" illustrated in this chapter combines these two concepts, and denotes the current account required to stabilise the NIIP *above* the prudential benchmark over the medium-to-long term.

Gauging from the data, although EU stock imbalances remain pronounced, most debtor countries are on track to reach the benchmark until the mid-2020s. The NIIPs of several EU countries remain too negative. However, most of them now run current account surpluses that should allow them to bring their NIIPs to the more prudent levels within ten years. In contrast, most 'surplus countries' display an NIIP that is strongly positive, with their surpluses contributing to further increase their net foreign asset positions. Finally, a few core euro area countries run current account balances that are likely to keep their NIIPs at moderate levels.

III.2. Prudential benchmarks for the NIIP

The purpose of this approach is to identify an NIIP level that signals external sustainability concerns. The benchmark consists of a reference value for the NIIP signalling that external debt could be excessive. The benchmark can be constructed on the basis of the signalling approach, i.e., screening indicators for levels that can be associated with episodes of macroeconomic instability.

The choice of the prudential benchmark is based on its signalling power. Following similar univariate approaches (as, e.g., for the Commission's S0 indicator [172]), the benchmark for each indicator is the one that maximises its "signal power". The optimal benchmark value should signal external sustainability concerns without triggering excessive false concerns. The data sample comprises 66 advanced economies and emerging economies for the period 1980-2015.[173]

The method can be used to validate the choices made in the MIP scoreboard. The method identifies an unconditional benchmark for the NIIP at -25% of GDP, which is close to the indicative threshold from the MIP scoreboard.[174] Table 1 shows that the NIIP has a fairly good signal power as an external sustainability indicator,

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[170] These indicators have been developed within a workstream on stock imbalances, in the LIME Working Group of the Economic Policy Committee (EPC), and found broad support from EPC Members in 2017.

[171] For a Commission approach, see Salto and Turrini (2010, "Comparing alternative methodologies for real exchange rate assessment"; European Economy - Economic Papers 427. For a summary of the IMF approach see Phillips, S., L. Catão, L. Ricci, R. Bems, M. Das, J. Di Giovanni, D.F. Unsal, M. Castillo, J. Lee, J. Rodriguez and M. Vargas (2013), "The external balance assessment (EBA) methodology", IMF Working Paper 13/272.

[172] Berti, K., M. Salto and M. Lequien (2012), "An early-detection index of fiscal stress for EU countries", European Economy, Economic Paper 475.

[173] External episodes are identified according to the methodology of Catão and Milesi-Ferretti (2014), which define such episodes as those with large use of IMF resources and/or a "D" rating by Standard&Poors.

[174] The estimation is based on an algorithm that guarantees the identification of a global maximum for the signal power despite a multiplicity of local maxima.

compared to the alternatives in the Table, and provides a balanced compromise between alerting to potential problems without excessively raising unjustified concerns. (175) Moreover, NIIP benchmarks appear to be fairly robust to the choice of the estimation sample, with estimates lying between -9% and -43% of GDP for a large set of possible samples. (176)

Table III.1: **Benchmarks for gauging sustainability risk**

	Benchmark	Signal Power	% false alerts	% missed episode starts	# episodes	St.dev. Benchmark	AUROC
NIIP	**-25**	**0.34**	**0.22**	**0.45**	**46**	**8**	**0.72**
NENDI	**-16**	**0.39**	**0.20**	**0.41**	**46**	**4**	**0.73**
NIIP/income	**-83**	**0.48**	**0.18**	**0.35**	**45**	**9**	**0.77**
NENDI/income	**-78**	**0.55**	**0.29**	**0.16**	**45**	**4**	**0.79**
NIIP - FDI	12	0.11	0.28	0.61	46	7	0.49
Net Pf.+OI debt	-29	0.31	0.33	0.36	46	5	0.69
Net ST debt	-83	0.14	0.00	0.86	7	114	0.50
ST debt liab	12	0.23	0.15	0.61	13	40	0.58
Debt liab	25	0.10	0.04	0.86	46	11	0.52
Reserves	6	0.23	0.39	0.38	46	2	0.63
NIIP/VIX	-55	0.39	0.43	0.19	28	13	0.74
NIIP/imports	-131	0.41	0.33	0.26	46	26	0.77

(1) The event sample used (dependent variable) includes elevated risk episodes as defined in Catão and Milesi-Ferretti (2014), for 66 countries, 1980-2015. 'Benchmark' denotes the optimal benchmark that maximises the signal power. 'Signal power'=1-prob(false alerts)-prob(missed episodes). '% missed episodes' = share of episodes starts that have not been signalled, as a ratio of total episode starts. '% false alerts' = share of "no extreme event" observations that have been wrongly signalled as an external episode. '# episodes'= number of observations in the sample where an episode starts. This compares to 'no extreme event' observations totalling between 1750 and 1850 per indicator. The assessment of benchmark uncertainty is based on 500 random draws with each case omitting 20% of the countries in the sample. 'St.dev. benchmark' denotes the standard deviation of the benchmark over these 500 random draws, and thus illustrates the uncertainty regarding the threshold estimation for a particular indicator. 'AUROC' is a commonly-used statistic to assess an indicator's signalling quality irrespective of where the benchmark is set. The closer the AUROC is to one, the better the indicator's signalling quality. **Source:** Author's estimates.

An important question, though, is whether there are indicators that have more information content for alerting against external sustainability problems than the NIIP. For this purpose, Table III.1 tests several other external stock indicators alongside the NIIP. These are (all as % of GDP):

- *Net Pf.+ OI debt:* Net portfolio investment debt (Pf.) comprises debt securities, while net other

investment (OI) mainly holds loans and deposits.

- *NIIP – FDI:* Stripping out net direct investment from the NIIP leaves "Net Pf. + OI debt", plus portfolio equity shares and mutual funds, reserves and financial derivatives.

- *NENDI:* "NIIP excluding non-defaultable instruments" is defined here as NIIP minus net direct investment and net portfolio shares. NENDI thus comprises "Net Pf. + OI debt", plus reserves, financial derivatives, and mutual funds (see below for further detail)

- *Net ST debt:* net short-term debt comprises all short-term debt components of "Net Pf. + OI debt".

- *ST debt liab:* Gross short-term (portfolio and other investment) debt liabilities, i.e. the gross equivalent corresponding to "Net Pf. + OI debt".

- *Debt liab:* Gross debt liabilities, which are the counterpart to "Net Pf. + OI debt"

In addition, III.1 comprises several interaction terms:

- *NIIP/income:* NIIP divided by relative income per capita (see below)

- *NENDI/income:* NENDI divided by relative income per capita (see below)

- *NIIP/VIX:* NIIP divided by the VIX index that proxies global financial risk aversion

- *NENDI/income/VIX:* interaction term between NENDI/income and the VIX index

- *NENDI/trade openness:* Higher trade openness entails a higher ratio of current account volatility to GDP volatility, and thus enables faster NENDI and NIIP changes.

The NIIP can be usefully complemented by a comparable indicator focusing on net debt, namely the NIIP excluding non-defaultable instruments (NENDI). Among the headline indicators, NENDI is the only one that slightly outperforms the signal power of the NIIP. The NENDI strips out direct investment and portfolio

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(175) In contrast, the MIP threshold of -35% of GDP was not based on a signalling exercise, but merely reflects the first quartile of EU NIIPs between 1995 and 2007.

(176) This is the confidence interval determined on the basis of two times the standard deviation of all benchmarks obtained from random perturbations on the sample. The range -45 to -22 results from adding +/- two times 'St.dev. Threshold' to 'Threshold' in Table IV.1.

shares from the NIIP, and thus comprises purely arms-length debt, as well as any other component that may theoretically be subject to default, such as insurance, mutual funds, and derivatives. The NENDI benchmark is somewhat smaller than the NIIP, although they are not significantly different from each other. This implies that an NIIP beyond -35% spells an elevated risk, but this risk is stronger if NENDI is also beyond -15% of GDP.

Country-specific benchmarks for the NIIP are better indicators of external sustainability concerns. The one-size-fits-all benchmarks of roughly -35% for NIIP and -15% for NENDI are unlikely to be the most efficient reference values for rich and developing countries alike, since the financing capacity of an EU country is typically higher than that of an emerging economy. Graph III.1 shows that for countries with higher income per capita, external episodes occur at more negative NIIP levels than they do for poorer countries. Conversely, Graph III.1 also shows that many richer countries did not experience any sustainability concerns despite of NIIPs beyond -35% of GDP for a long period. Consequently, Table III.1 also explores the benchmarks that arise when the NIIP and NENDI are conditional on income per capita. [177] Indeed, the signal power of the such-adjusted NIIP and NENDI exceeds that of all other indicators and conceivable interaction terms.

When conditional on income per-capita, NIIP prudential reference values vary considerably across EU countries. For the aggregate euro area, the benchmark lies at -70% of GDP, while for the richest EU countries, it lies considerably beyond that level. For the EU countries with the lowest per-capita income, the benchmark is closer to -30% of GDP.

The only alternative indicator with comparable signal power is income-adjusted NENDI, which mostly represents net debt. [178] It is thus

of particular relevance whether both NIIP and NENDI exceed their reference values or not. Table III.2 shows that in the majority of external episodes, both indicators were beyond the benchmark. There have been occasions when in "normal" times both indicators exceeded their benchmarks, but these times typically preceded external sustainability concerns, arising within 5-years.

Table III.2: **Combined signal power of income-adjusted NIIP and NENDI**

	% of external episodes	% of "normal" observations
Both indicators beyond threshold	60%	14%
Only NENDI/income beyond threshold	0%	1%
Only NIIP/income beyond threshold	20%	22%
Both indicators within threshold	20%	63%

(1) Left column shows external episodes based on the definition by Catão and Milesi-Ferretti (2014), for 66 countries, 1980-2015. Right column refers to "normal" observations. For each column, percentages denote in how many cases income-adjusted NIIP and/or income-adjusted NENDI were beyond the NIIP/income benchmark from Table IV.1.
Source: Author's estimates.

A number of additional robustness checks confirm that income-adjusted NIIP benchmarks perform better than most other indicators, and are relatively robust:

- *Robustness to alternative event definitions*: In addition to external sector stress, the same indicators are also tested for fiscal stress, as well as elevated risks in banking sectors and foreign currency markets. [179] The income-adjusted NIIP benchmark shows less signal power for these alternative definitions, but still exceed the signal power of alternative balance-of-payments indicators.

- *Alternative definition of signal power:* The benchmarks for income-adjusted NIIP (and NENDI) would not change by more than 15 pp of GDP if one were to moderately alter the importance given to the 'missed events' vs. 'false alert' probabilities.

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[177] More precisely, "NIIP/income" divides the NIIP by the relative income indicator used by the IMF as in Phillips et al. (2013). This indicator is defined as GDP in PPP divided by the number of working-age (15-64) persons, normalised by the arithmetic mean of the same indicator for Germany, Japan and the US. I.e., relative income of 100% means income per capita equal to the average over those three countries. Under this measure, the relative income of the aggregate euro area is at 70%.

[178] Interestingly, the benchmarks for both are fairly close and do not differ significantly (for the euro area aggregate, they are at -70% for the income-adjusted NIIP and -66% for income-adjusted

NENDI, respectively). In this respect, a single benchmark can be used for assessing both the NIIP and the NENDI.

[179] Fiscal stress refers to the data set used in Berti, K., M. Salto and M. Lequien (2012), "An early-detection index of fiscal stress for EU countries", European Economy, Economic Paper 475. Currency events stem from the dataset by Laeven L., and F. Valencia (2012), "Systemic Banking Crises Database: An Update", IMF Working Paper 12/163.

- **Overall, the results compare well with what has been found in recent literature.** In particular, the results corroborate the findings of Catão and Miles-Ferretti (2014), which stress the importance of relative income, as well as the debt-equity composition, in both univariate and multivariate approaches. [180]

III.3.   The required current account

The prudential NIIP levels can be seen as target values that imply what current account is necessary to reach them. Computing such target-derived 'required' current account benchmarks is conceptually straightforward. In general, the NIIP at the end of a year t ($NIIP_t$) is given by the previous year's level ($NIIP_{t-1}$), plus the current account balance (CA_t), the capital account balance (KA_t), and other changes. The other changes (OTH_t) comprise valuation changes and some statistical effects, which tend to be unpredictable for most countries of the world. [181] For the computation of required current accounts, such other changes are thus disregarded and OTH_t set to zero.

$$NIIP_t = NIIP_{t-1} + CA_t + KA_t + OTH_t$$

The capital account balance must be taken into account in the analysis of EU countries, mostly due to the structural funds. The capital account balance is usually very close to zero for most countries, although values beyond +/- 1 pp of GDP may occasionally be recorded. There is one important exception, though: Within the EU, several Member States are important net recipients of structural funds. This concerns in particular Member States that joined after 2003, which mostly display persistent capital account surpluses in excess of 1 pp. of GDP. This 'structural' capital account surplus therefore has to be taken into account for computing the required current account balance. Consequently, the required current account balance can be defined as the average current account to GDP ratio $\overline{ca}$ that will reach target NIIP to GDP ratio T years ahead $niip_{t+T}$, based on the current $niip_t$, expected average nominal growth p.a. g, a 'structural' capital account balance $\overline{ka}$, and a structural valuation effect $\overline{oth}$ that is expected to be zero. Given an NIIP target value $niip_{t+T}$, the computation of the current account required to reach it ($\overline{ca}$) is thus straightforward.

$$\overline{ca} = \left(niip_{t+T} - \frac{niip_t}{(1+g)^T}\right)\frac{g/(1+g)}{1-1/(1+g)^T} - \overline{ka} - \overline{oth}$$

A remaining question is over what timeframe such an NIIP target should be reached. Individual country characteristics determine when, and if, NIIPs should or will surpass its benchmark. For the purpose of cross-country comparisons, the objective is not to find the optimum time frame, but rather the 'typical' time period for such NIIP adjustments. The required current account to reach the benchmark within a 'typical' timeframe allows for gauging whether a country's current account reflects fast or slow adjustment. There is, however, scant literature on the evolution of NIIPs during external adjustment episodes, and no papers with a focus on the length of the adjustment timeframe. Fidora, Schmitz and Tcheng (2017) identify stable NIIP adjustment episodes be relatively uniformly distributed between 2 and 7 years, with a median length of 4.3 years for advanced countries. [182] In many cases, this adjustment mostly commences near the middle of intensive external episodes, which according to the Catão and Milesi-Ferretti (2014) definition last mostly between 2 and 11 years, with a median of five years. Ding, Schule and Sun (2014) point out 16 persistent NIIP adjustments after external episodes, that commenced between 2 years prior and 3 years after the start of an external episode (with a median of 1

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[180] The signal power of NENDI/income in Table is only moderately lower their more complicated approach, although one has to note that the Catão and Milesi-Ferretti (2014) approach excludes 'outliers' such as Ireland, Luxembourg, and Iceland, whereas the estimates in Table IV.1 do not. Note that the benchmarks for NIIP/income and NENDI/income do not significantly change if Ireland, Luxembourg, or Ireland are excluded from the sample. The relatively low standard deviation of these indicators over sample variations ("St.dev. threshold") illustrates this feature.

[181] Recent contributions point to predictable valuation effects for the US and countries with largely dollarised assets and/or liabilities, but not for EU countries. Cf. Gourinchas, P. O., & Rey, H. (2013). External adjustment, global imbalances and valuation effects, NBER working paper 19240. However, several corporate financial centres within the EU have displayed protracted negative valuation effects for some periods. In particular this concerns the Netherlands, where it may be related to share buybacks – see also Eggelte, J., R. Hillibrand, T. Kooiman, and G. Schotten (2014), "Getting to the bottom of the Dutch savings surplus", DNB Occasional Studies 12(6), De Nederlandsche Bank.

[182] Fidora M., M. Schmitz, and C. Tcheng (2017), Reducing large net foreign liabilities, ECB working paper 2074. Note, however, that NIIP adjustments mostly start only several years after the start of an external episode. During the early periods NIIPs as % of GDP often worsen, as GDP declines, and current account deficits are slow to adjust.

(1) Large red labels denote episodes based on the definition by Catão and Milesi-Ferretti, 2011). Small red labels denote observations four years prior to an episode. Grey labels denote "normal" observations. NENDI is defined NIIP as % of GDP, minus net FDI and portfolio equity shares. Income per capita is defined as in Phillips et al. (2013) as PPP income per working-age person, expressed as % of the arithmetic average of Germany, Japan, and the US. Data sample: available data for 66 countries 1980-2015, corresponding to 2118 observations for NIIP, and 2107 observations for NENDI.
**Source:** Author's estimates.

year), and lasted between 7 and 20 years (with a median of 10).

Graph III.3 **shows how NIIPs behaved in successful adjustment episodes**. [183] Nine years after an episode, the median country returns its NIIP to the same position as five years prior to the episode, both in absolute and "prudential gap" terms. While not all countries saw sustained NIIP increases after such an episode, the box plots in Graph III.2 show that they did on average. For more than ¾ of the episodes examined, the NIIP declined more than 13 pp of GDP in the five years prior to the event. At the time of the episode, 80% of the countries in the sample had NIIPs beyond the prudential benchmark. During the initial years following such an episode, most NIIPs remain stable at low levels, while after 4 years, the distribution widens. Nine years past, the median country has returned its NIIP to the event level, although there remains a quarter of cases in which the NIIP is at least as negative as during the such an episode.

Comparing the gaps to prudential benchmarks also suggests NIIP adjustments focusing on the period between 2 and 9 years after an episode. Graph III.2, (right panel) shows the distribution of the gap between NIIP and benchmark. Nine years after an episode, the distribution of these gaps resembles the pre-episode distribution. This suggests that NIIPs typically require roughly a decade to recover. Yet, note that a quarter of the successful adjustment countries in Graph III.2 did not display an NIIP above the prudential benchmark for years past such an event. The distributions in Graph III.2 cover episodes from advanced and emerging countries, with various exchange rate regimes. There are not enough observations from advanced economies to draw robust conclusions on adjustment time in an EU or euro area context. Overall, the 'typical' timeframe for NIIP adjustment can thus be assumed as ten years or less, although longer time periods are not unusual.

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[183] The distributions in Graph IV.2 cover 40 external episodes for countries with successful adjustment. Here 'successful' denotes external episodes that were not followed by another external episode for a decade.

Graph III.2: **NIIP before and after the start of an external episode**

NIIP minus NIIP at episode start

NIIP minus prudential threshold
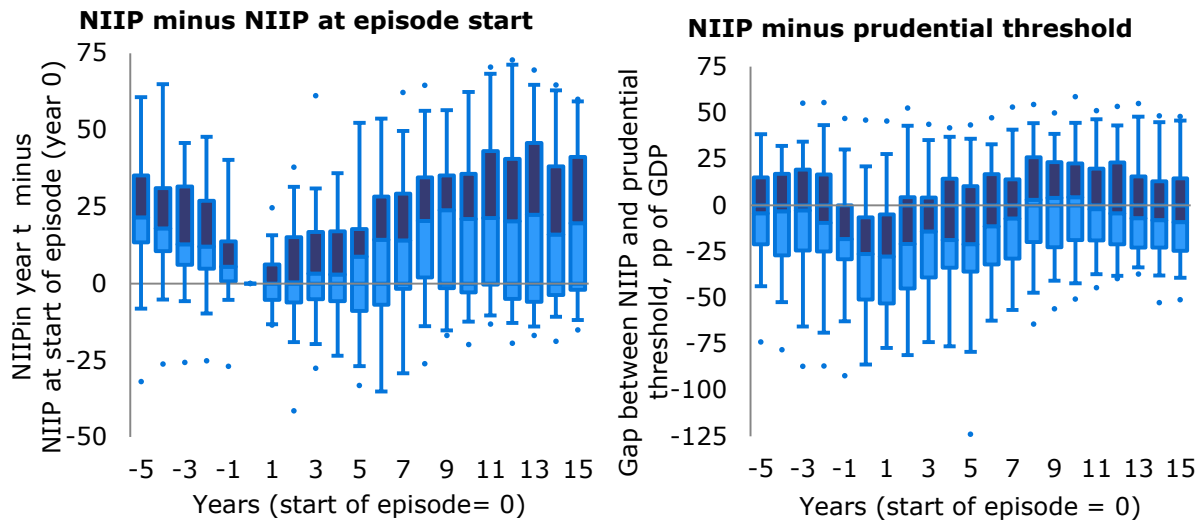
(1) Left and right panel depict NIIP minus reference value for the 5 years leading up to, and the 15 years following, the start of an external episode as defined as in Catão and Milesi-Ferretti (2014). Distribution only displays 40 non-repeated episodes i.e., those not followed by another one within ten years. Left panel shows NIIP minus the NIIP at the time of the event. Right panel shows NIIP minus concurrent prudential benchmark. Dots denote maximum and minimum observation in each year. Light blue box denotes the range between the second quartile and the median, dark blue box the range between the median and the third quartile. Border between boxes denotes median. 'Whiskers' represent the 5% to 95% interval.
Source: Author's estimates.

In view of a roughly ten-year timeframe for NIIP adjustment, the following four "required current account" benchmarks are considered:

Current account required to stabilise the NIIP (rCAs): This indicator should provide the 'structural' current account that is required to stabilise the NIIP over the medium to long term. The Commission's regularly updated "T+10" forecasts provide nominal GDP projections ten years ahead. Based on these income projections, and assuming stable capital account balances, the NIIP-stabilising current account can be computed in a straightforward manner (see equation above). [184]

Current account required to halve prudential gap in ten years (rCAp20): For countries with NIIPs beyond the prudential benchmark, this provides the average current account balance (as % of GDP) required to halve the distance between current NIIP and the benchmark within ten years. [185] While the discussion above suggests a shorter time frame, an analogy with the Commission's S1 indicator for fiscal debt would suggest a time frame of 15 years to reach the benchmark. Yet the benchmark NIIP level is subject to some estimation uncertainty, thus it could be deemed appropriate if a country's NIIPs tends towards the vicinity of the benchmark within those 15 years. In view of these considerations, the rCAp20 used here is defined as the average current account balance (as % of GDP) required to halve the gap between headline and the prudential benchmark within ten years. Broadly, this corresponds to the current account required to eliminate ¾ of the prudential 'gap' within fifteen years.

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[184] Similar approaches mostly focus on stabilising NIIP a shorter timespan: For instance the Commission indicator introduced in Salto and Turrini (2010) aims to stabilise the NIIP as % of potential GDP over three years. Yet the crisis has shown that at a given point in time, even potential growth may not accurately reflect the medium- top long-term income prospects. Such short-term changes matter in particular during an external adjustment phase. In order to smoothen out such short-term swings, the approach here focuses on ten-year GDP projections.

[185] The expected benchmark is based on expected relative income ten years ahead, based on the Commission T+10 projections, IMF projections (for US and Japan), and UN population projections (for working age population). Note, however, that apart from expected real GDP for the country in question, these indicators change slowly, and thus the expected benchmark expected ten years ahead for EU countries differs little from the benchmark estimate for 2016.

	NIIP	NENDI	Prudential NIIP benchmark	Head-line CA	Cycl. adj. CA	Av. capital acc.bal. 2014-16	rCAs: CA to stabilize NIIP over 10Y	rCAp20: CA to halve pru. gap in 10Y	rCAp10: CA to close pru. gap in 10Y	rCA: higher of rCAs & rCAp10
BE	49	58	-78	1.2	1.5	-0.1	1.6			1.6
BG	-51	27	-34	4.2	5.5	2.5	-3.7	-2.9	-2.3	-2.3
CZ	-25	28	-55	0.3	1.4	1.7	-1.5			-1.5
DK	56	16	-81	8.1	7.7	-0.2	2.2			2.2
DE	54	40	-81	8.5	9.1	0.0	1.6			1.6
EE	-37	20	-50	2.0	3.5	1.3	-3.6			-3.6
IE	-185	-239	-117	4.7	8.4	-1.9	-6.9	-3.6	-0.4	-0.4
EL	-137	-128	-46	-0.5	-4.5	2.4	-5.5	1.2	5.9	5.9
ES	-86	-62	-61	1.9	1.5	0.4	-2.6	-1.4	-0.2	-0.2
FR	-16	-32	-74	-2.3	-2.5	0.0	-0.5			-0.5
HR	-71	-26	-37	2.6	2.6	0.7	-3.1	-1.4	0.1	0.1
IT	-15	-15	-63	2.6	2.4	0.1	-0.2			-0.2
CY	-125	-138	-54	-5.7	-4.6	0.3	-4.0	-0.1	3.8	3.8
LV	-58	-9	-43	1.9	4.2	2.6	-5.1	-5.1	-5.1	-5.1
LT	-43	-15	-48	-1.1	1.0	2.2	-2.3			-2.3
LU	23	-3536	-165	4.7	4.9	-1.5	0.8			0.8
HU	-59	-11	-45	5.0	6.4	3.1	-5.2	-4.5	-3.9	-3.9
MT	47	216	-62	7.9	13.3	1.4	1.0			1.0
NL	76	-17	-87	7.9	8.0	-1.8	2.3			2.3
AT	5	-9	-79	2.1	2.1	-0.2	0.2			0.2
PL	-62	-23	-44	0.4	0.9	1.8	-4.3	-4.1	-3.8	-3.8
PT	-105	-66	-48	0.5	0.8	1.1	-3.7	-0.6	2.7	2.7
RO	-50	-8	-36	-2.4	-1.8	2.0	-4.2	-4.4	-4.2	-4.2
SI	-35	-21	-53	7.0	7.8	0.2	-1.6			-1.6
SK	-58	-13	-49	0.2	0.8	1.2	-3.4	-5.2	-5.6	-3.4
FI	7	7	-74	-1.3	-1.9	0.1	0.1			0.1
SE	17	-7	-88	4.9	5.7	-0.1	0.7			0.7
UK	24	19	-73	-4.4	-3.8	-0.1	0.9			0.9

Table III.3: **Stock and flow benchmarks as % of GDP, 2016**

(1) All values for 2016, as % of 2016 country GDP.
(2) NENDI denotes NIIP minus net FDI and net portfolio equity shares. The 'Prudential NIIP benchmark described above serves as a reference value for NIIP and NENDI alike. Headline CA denotes the 2016 current account balance as % of GDP (as reported from national account statistics). 'Cycl. Adj. CA' denotes the cyclically corrected current account balance according to the Commission methodology. 'rCAp10' denotes the CA required to reach the prudential benchmark by 2026 (only for countries where the NIIP was below the prudential benchmark in 2016), while rCAp20 displays the CA required to have the gap between NIP and the prudential benchmark within 10 years. These rCA benchmark levels are based on the Commissions "T+10" nominal output projections, and assume the capital account balance to stay at the median level observed during 2014-16. 'rCA' denotes the maximum over rCAs and rCAp10, ie. the required current account to increase the NIIP towards the benchmark, or stabilise it above it, over the next ten years. For reference, 'av. capital acc. bal' displays each country's average capital account balance over 2014-16.
Source: Author's estimates.

Current account required to reach prudential benchmark (rCAp10): The vast majority of countries that had crossed the prudential benchmark had experienced an external episode or other external pressure within a decade. The need to reach prudential NIIP levels may therefore be more pressing than suggested by the twenty-year timeframe above. To this end, Table III.3 also displays the current account required to reach the prudential benchmark within ten years.

Required current account: This is a combined indicator. For a debtor country below the benchmark, it is the current account required to reach the prudential benchmark within ten years. However, for countries with a 'safe' NIIP within the benchmark, this figure merely represents the

current account required to stabilise the NIIP. Hence, it is given by the higher of rCAs and rCAp10. [186]

III.4.   Results for EU Member States

Table III.3 **shows the 2016 NIIPs for EU Member States and compares them with the country-specific prudential reference values.** The prudential benchmarks for the NIIP are similar to the ones for the NIIP excluding non-defaultable instruments (NENDI). Thus both NIIP and NENDI can be gauged against the single country-specific benchmark indicated in Table III.3.

- **In Greece, Ireland, Cyprus, and Portugal, both NIIP and NENDI exceeded the benchmarks in 2016**, while Spain had a NENDI very close to it.[187] Moreover, Bulgaria, Latvia, Lithuania, Hungary, Romania, Poland and Slovakia display NIIPs that are close to, or up to 20 pp of GDP beyond the benchmark. However in all these cases, FDI plays an important role for external liabilities, and NENDI is thus at least 20 pp. of GDP narrower than the prudential benchmark. In the same vein, Croatia's NIIP remains more than 30 pp. beyond the benchmark, but by 2016 its NENDI had already returned to its 'safe' side.

- **NIIPs beyond the prudential benchmark are a legacy from the pre-2008 period.** Graph III.3 shows that NIIPs have actually improved in most, but not all, Member States that were close to or beyond the benchmark in 2010. The improvement was particularly strong in small and open economies. In several larger and more closed economies, the adjustment made a longer-lasting dent on nominal GDP growth, and partly therefore NIIP as % of GDP evolved less dynamically. In Greece and Cyprus, a strong GDP decline combined with more persistent current account deficits led to a worsening of the NIIP until 2014/15. Note that

almost all EU countries with financial assistance programmes during 2008-2015 had a NENDI exceeding the benchmark in 2010. [188] Several other Central and Eastern European countries also substantially adjusted their current account balances and NIIPs in the wake of the financial crisis, though without resorting to financial assistance. Most of the latter countries had NIIPs close to, or beyond the benchmark before 2010, but NENDIs within the benchmark's 'safe' range. By 2016 already, the NIIP improvement in three of these countries (Czech Republic, Estonia, Slovenia) left them with NIIPs within the benchmark.

- **All other EU Member States have NIIPs that are 40 pp or more above their prudential benchmark**. For them, the benchmark suggests limited external vulnerability over the medium term, even if they were to run strong current account deficits.

In cyclically adjusted terms, only Greece and Cyprus run current accounts significantly below the level that would return the NIIP to the prudential target within ten years. Based on current output projections, Greece and Cyprus would remain beyond the prudential benchmark for more than two decades. Note, however, that i) the extent of the Greek output gap amplifies any methodological uncertainties regarding the cyclical adjustment of the Greek current account, and ii) Cyprus hosts a significant offshore sector that affects the NIIP, and its current account. Apart from Greece and Cyprus, only Portugal runs a current account that would return the NIIP to its prudential reference value between ten years and fifteen years. The current accounts of all other net debtor Member States, if kept stable, would suffice to reach the prudential benchmark in less than a decade.

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[186] Note that current account balances are not directly under the control of the policy maker. The purpose of the required current account is to be a reference value to assess external sustainability, not a direct policy target.

[187] Note that the Cypriot and Irish NIIP are subject to some statistical effects stemming from the offshoring of aircraft and ships in these countries. Adjusting their NIIPs and NENDIs with estimates of such effects renders these indicators closer to the benchmark for both countries, but does not suggest that both countries are yet safely above it.

[188] During 2008-2015, the following Member States received financial assistance involving EU facilities: Hungary, Romania, Latvia, Greece, Ireland, Portugal, Cyprus, as well as Spain (which was not subject to an IMF-funded programme). Among these countries, only Romania's NENDI had never crossed the benchmark before 2008.

Graph III.3: **NIIP change 2010-16, for Member States close to or below the benchmark**
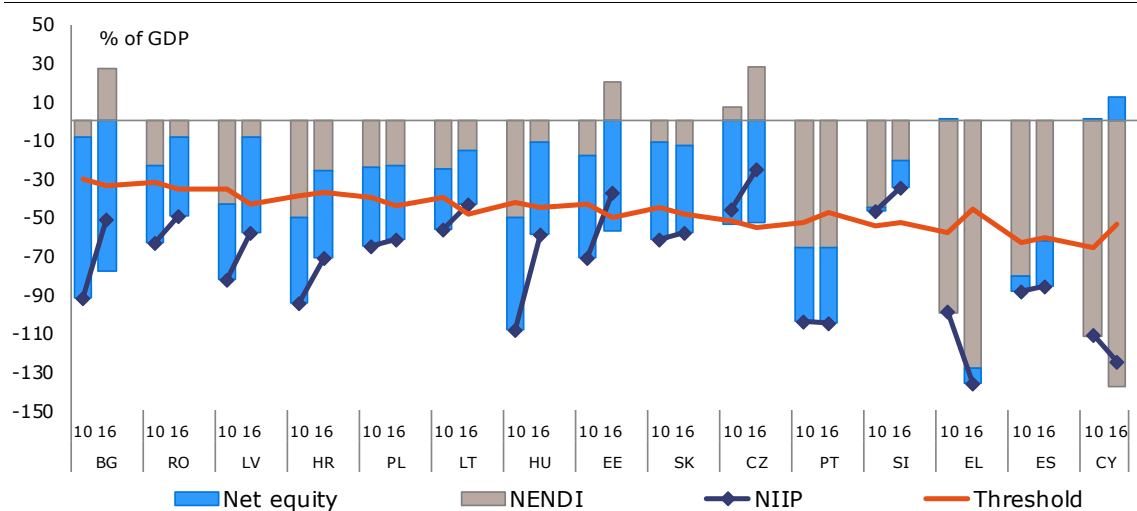
Source: For NIIP, NENDI, and Net equity: Eurostat IIP. Net equity is defined as net direct investment plus net portfolio investment shares. NIIP excluding non-defaultable instruments (NENDI) is defined as NIIP minus Net equity. The benchmark is the income-adjusted country-specific NIIP benchmark from Table IV.3. Note that this graph excludes Ireland, whose NENDI change 2010-16 considerably exceeds the scale.

France, Finland, and the UK run cyclically adjusted current account deficits that undershoot the NIIP-stabilising current account by 2 pp. Still, the NIIPs of these three countries are fairly close to balance, and thus remain considerably above prudential levels. Even if current accounts persist at their cyclically adjusted deficits for France and Finland, both countries are not likely to bring their NIIPs in the vicinity of the prudential benchmark over the medium term. The UK's deficit falls short of the required current account by more than 3 pp. But its gross IIP is characterised by large foreign currency assets, combined with a flexible exchange rate regime. This is exemplified by the 2015-16 British NIIP improvement in the wake of a currency depreciation.

All other Member States run current accounts that are significantly above what any benchmark suggests. By 2016, most Central and Eastern European Member States ran current account surpluses that exceeded either benchmark by 4 pp or more. Most of these Member States may even afford to run current account deficits in order to reach their prudential targets, as they are net recipients of EU funds, and thus benefit from a positive capital account balance. Among these countries, several countries with moderately negative NIIPs emerged from external adjustment episodes by running particularly high surpluses. In Bulgaria, Estonia, Latvia, Hungary, and Slovenia, cyclically adjusted surpluses exceed the rCA by

seven to ten pp. of GDP. Graph III.4 shows that these are among the EU countries whose cyclically adjusted current account balances were the farthest above the required current account in 2016. The more moderate surpluses of the Czech Republic, Croatia, Lithuania, Romania, and Slovakia range between two and five pp. above their rCA.

Moreover, there are the familiar creditor countries, whose NIIPs are strongly positive: Belgium, Denmark, Germany, Netherlands, and to some extent Sweden. Of these, Belgium's current account is roughly at its rCA, whereas in the four other creditor countries, the cyclically adjusted current account exceeds the rCA by 5 pp of GDP or more.

Spain, Italy, and Austria run current accounts that are between one and three pp. above their rCA. Both the Italian and the Austrian cyclically adjusted current account are somewhat above their NIIP-stabilising levels, while the Spanish current account is slightly above the level that would allow its NIIP to reach the prudential benchmark within ten years. Finally, the NIIPs and current accounts of Malta, Ireland, and Luxembourg are particularly affected by the presence of large corporate, transport and financial sectors – something that also extends to the Netherlands and Cyprus to some degree. In these cases, comparing the headline NIIP to the prudential reference value might not be appropriate. Several of these countries publish estimates that adjust current

accounts and NIIPs for these globalisation effects. It might be more suitable to compare such-adjusted current accounts to an rCA based on such-adjusted NIIP estimates. Note that while using these adjusted estimates would affect the magnitude of the gaps visible in Table III.3, they do not lead to different conclusions whether their current account balances are below, close to, or above the rCA.

Graph III.4: **Cyclically adjusted vs. required current accounts, 2016**
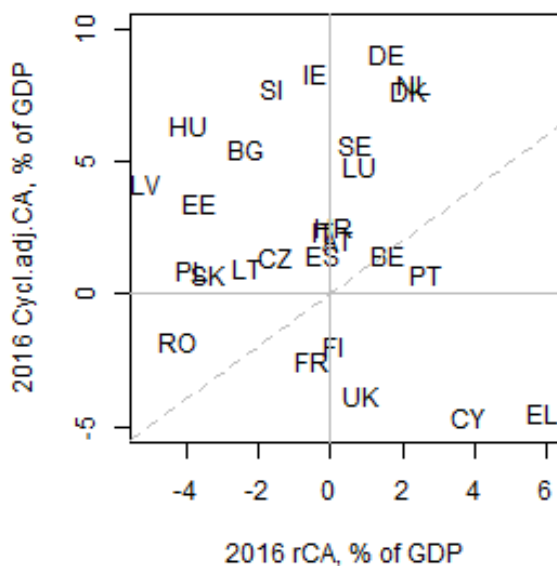
Source: Commission services calculations, as in table IV.3. Readings above the 45-degree line indicate cyclically adjusted current account balances that are above the required current account benchmark (vice versa for observations below). The distance from the 45-degree indicates the extent of the gap between the cyclically adjusted and the required current account.

III.5. Conclusion

This chapter introduces country-specific prudential benchmarks for the NIIP and NENDI, a comparable indicator focusing on net debt. Compared to one-size-fits-all benchmarks such as in the MIP scoreboard, the country-specific benchmark allows for a finer level of detail, although it is also subject to certain statistical caveats in the case of offshore financial centres. The NIIP benchmark, and the "required current account" derived from it, can complement the Commission's toolbox for assessing external flows and stocks. They provide additional insight for the assessment of external sustainability, and

are meant to be read in conjunction with existing tools.

The prudential benchmark for the NIIP implies a country-specific 'required current account' benchmark, that would allow a country to reach the prudential benchmark within ten years, or stabilise its NIIP above it. The prudential NIIP benchmark and required current account complement do not replace the Commission's toolbox for external sustainability assessment. They are one among several new benchmarks that the Commission is applying in macroeconomic surveillance.

The benchmarks allow for some general conclusions about EU Member States: 15 Member States currently have NIIPs that are close to, or beyond, prudential reference values. Yet if they manage to keep current account balances close to their current levels, most of them are on track to reach their respective prudential levels within a decade or less.

There are several Member States that run persistent high surpluses beyond their current account benchmarks. Germany, the Netherlands, Denmark and Malta (the latter with some caveats), have high NIIPs, but run cyclically adjusted current account surpluses that are at least 5 pp. of GDP above the level required to stabilise them. In the wake of external adjustment, several smaller Member States continue to improve their negative NIIPs at fast speed. Their cyclically adjusted current account surpluses are either more than 5 pp. above the NIIP-stabilising benchmark (Estonia and Slovenia), or more than 5 pp. above the level required to reach the prudential benchmark within ten years (Bulgaria, Latvia, Hungary). In all of these Member States, the NIIP has been predominantly composed by equity as of 2016. Their NENDI, which reflects the NIIP excluding equity, is already well within prudential levels.

IV. Cyclical patterns of residential construction

The large and frequent swings of residential construction investment have an important bearing on the business cycle. This chapter surveys the cyclical pattern of residential construction investment in the euro area and selected Member States over almost five decades. It uses a standard econometric framework to identify main drivers of residential construction in the short- and longer term. In the long run, residential construction investment is mostly driven by real per capita disposable income developments, and in some Member States also by demographic developments. In the short run residential construction activity responds positively to increasing house prices as well as falling unemployment. Following the housing boom and bust a decade ago, residential investment has bottomed out around 2015 and is now swiftly catching up with disposable incomes. Positive labour-market developments and increasing house prices should continue to underpin residential construction activity in the near term. This picture is confirmed by additional indicators of near-term developments in residential construction such as building permits and confidence in the construction sector. This suggests a positive contribution of expanding residential construction to GDP growth this year. However, residential construction growth may have peaked in some Member States where the residential construction cycle is already more advanced. [189]

IV.1. Introduction

Residential construction investment represented only about 6% of GDP in the euro area on average in 2000-2017. However, the quite pronounced ups and downs in residential construction activity are intimately linked to GDP cycles in advanced economies. E. Leamer even titled articles on US residential investment 'Housing is the business cycle' and 'Housing really is the business cycle'. [190] The housing boom and bust as trigger of the Great Recession has reinforced the interest in understanding the cyclical mechanics of residential construction and its links to GDP.

Much of the literature on the interaction of residential construction and GDP focuses on the US, for which there is broad agreement that the residential construction cycle leads the business cycle. [191] One source of shocks to residential

investment is monetary policy, as residential construction is found to be particularly strongly impacted by monetary policy shocks. [192] Shocks to residential construction activity may propagate in the economy through interlinkages with other sectors and affect GDP over and above the weight of the residential construction sector. Input-output tables for the US show for instance that the construction sector buys much more from the rest of the economy than the other way round. [193] Drops in construction demand therefore swiftly spread to other sectors. House price developments are also set to affect household demand through wealth effects.

For the euro area, the evidence on a leading role for residential construction investment in the business cycle is less clear cut. Musso, Neri and Stracca (2011) [194] find that residential construction leads the business cycle in the euro area. Álvarez and Cabrero (2010) [195] point out that this is the case in Spain and Germany, but not

[189] This chapter was prepared by Björn Döhring. The author would like to thank João Leal for help with reviewing the literature, Andras Chabin for assistance in setting up the estimations and Reuben Borg, Jean-Charles Bricongne, Oliver Dieckmann, Laura González Cabanillas, Evelyne Hespel, Bertrand Marc, Nicolas Philiponnet and Andreas Reuter for useful comments.

[190] Leamer, E. (2008), 'Housing is the business cycle, in Housing, Housing Finance and Monetary Policy. A symposium sponsored by the Federal Reserve of Kansas City' *Revised and updated for the Encyclopedia of Finance*, 2010. Leamer, E. (2014), 'Housing really is the business cycle: What survives the lessons of 2008-09?', *Journal of Money, Credit and Banking*, supplement to Vol 47(1).

[191] E.g. Leamer (2014) op. cit, Gjerstad, S. and Smith, V. (2010), 'Household expenditure cycles and economic cycles, 1920-2010', *Chapman University Economic Science Institute Working Paper*. Papers that have attempted to explain this theoretically point to interrelations of different types of capital, e.g. Fisher, J. (2007), 'Why Does Household Investment Lead Business Investment over the Business Cycle?', *Journal of Political Economy* 115(1), 141-168 as well as Davis, M. and Heathcote, J. (2005), 'Housing and

the Business Cycle', *International Economic Review* 46(3), 751-784. Kohlscheen, E., A. Mehrotra and D. Mihaljek (2018), 'Residential investment and economic activity: evidence from the past five decades', *BIS Working Paper* No 726 look at a panel of OECD countries.

[192] Erceg, C. and Levin A., (2006), 'Optimal monetary policy with durable consumption goods', *Journal of Monetary Economics* 53(7), 1341-1359.

[193] Boldrin, M., Garriga, C., Peralta-Alva, A. and Sánchez J. (2013), 'Reconstructing the Great Recession', *Federal Reserve Bank of St. Luis*, Working Paper 2013-006.

[194] Musso, A., Neri, S. and Stracca, L. (2011), 'Housing, consumption and monetary policy: How different are the US and the euro area?', *Journal of Banking and Finance* 35(11), 3019-14.

[195] Álvarez, L. and Cabrero, A. (2010), 'Does housing really lead the business cycle?' *Banco de España Documentos de Trabajo*, N° 1024.

in France and Italy. Kydland, Rupert and Šustek (2016) also find no leading properties of residential investment with respect to GDP in France or Belgium. [196]   Concerning the propagation of shocks to construction, the ECB (2009) [197] points to the inputs from other sectors as well as the high labour intensity in the construction sector, which implies relatively large employment effects of construction cycles. By contrast, wealth effects of house price developments do not seem to play a role in the euro area. [198] Finally, the dynamics of the housing sector and its links to overall economic activity vary across countries, reflecting structural features such as land availability, the structure and functioning of the banking sector, the tax treatment of housing and mortgages and local planning systems. [199]

This chapter first examines past cycles of real residential construction investment [200] in euro area Member States in terms of their frequency, amplitude and links with GDP (section 2). In section 3, a standard error-correction model is developed to identify the trend- and cyclical drivers of residential construction investment. The model is used in section 4 to analyse the residual 'investment gap' and examine the drivers of residential construction investment in recent years. The model also allows conditional forecasts for residential construction for 2018. These are cross-checked with high-frequency indicators not covered in the model. Section V.5 concludes.

IV.2. Past residential construction cycles and GDP growth

Drops of residential construction activity are frequent and often deep. Since 1970, there have been 50 episodes of annual GDP contracting for at least one year in the 12 euro area Member States [201] for which long series of annual data are available. This compares to 91 episodes of annual residential construction investment decreasing for at least one year. The standard deviation of GDP growth in these countries since 1970 is 3.0. It is 7.8 for construction investment and 11.5 for residential construction. Counted from trough to trough, the average cycle in residential construction lasts 6 years (median 5), compared to the average business cycle which lasts 11 years (median 9).

The length of the upswing in residential construction investment and the length of the subsequent downturn are positively correlated [202], and downturns can be long-lasting. Following the excessive housing investment in the euro area in the run-up to the 2008 crisis, it took until 2014 before residential construction investment bottomed out.

Graph IV.1: **Number of 12 MS with a drop in construction / residential investment**
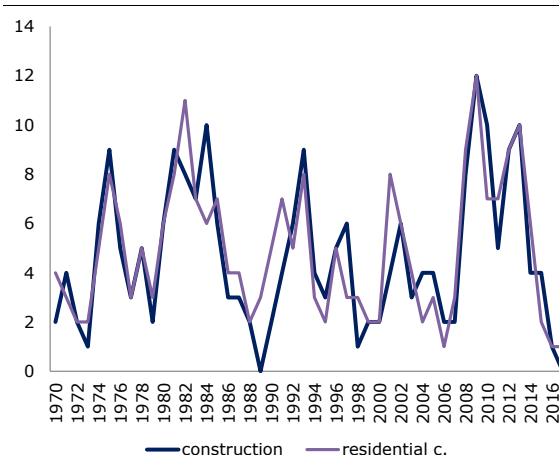
GDP contractions are almost always associated with a drop in residential investment ('associated' includes a few cases where the drop in residential investment is in the year before or after the contraction of GDP). The link between drops in residential construction and drops in GDP is more complex, as suggested by the larger number of contraction episodes in residential construction. Nonetheless, among the 55 episodes before the Great Recession where residential construction in a

[196] Kydland, F., Rupert, P. and Šustek, R. (2016), 'Housing Dynamics Over the Business Cycle', *International Economic Review* 57(4), 1149-1177. See also Ferrara and Vigna, O. (2009), 'Cyclical relationships between GDP and housing market in France: Facts and factors at play', *Banque de France Document de Travail*, N° 268 find the same for France and for Italy Bulligan, G. (2010), 'Housing and the Macroeconomy: The Italian Case', in: O. de Bondt et al (eds), Housing Markets in Europe, A Macroeconomic Perspective, Springer, Berlin, Heidelberg.
[197] *ECB Monthly Bulletin*, May 2009, box 6.
[198] Balta, N. and Ruscher, E. (2011), 'Household savings and mortgage decisions: the role of the "down-payment channel" in the euro area', *European Economy*, Economic Papers 455.
[199] ECB (2003): Structural factors in the EU housing markets, Frankfurt.
[200] This differs from studies that look at housing cycles in terms of house prices, e.g. Philiponnet and Turrini (2017), Bracke (2013). As we study the link to real GDP, focussing on volumes seems appropriate.

[201] i.e. BE, DE, IE, EL, ES, FR, IT, LU, NL, AT, PT and FI.
[202] This feaure is also present in house prices. Cf. Bracke, p. (2013), 'How long do housing cycles last? A duration analysis for 19 OECD countries', *Journal of Housing Economics* 22, 213-230.

Member State dropped by at least 5%, half are associated with a drop in GDP and almost all others with a substantial slowdown compared to previous years' GDP growth rates. In 2008-2009, housing investment dropped by more than 5% in all examined Member States except Austria, and GDP dropped across these countries in 2009.

Graph IV.1 depicts the number of Member States (among the 12) in which residential construction contracted in a given year. It points to fairly synchronised housing downturns in 1975, 1982, 1993 and 2001. In 2009, residential construction investment contracted in all 12 Member States, followed by another widespread contraction during the sovereign debt crisis.

Quarterly growth of residential construction in the euro area since 1995 appears to be coincident with GDP growth rather than leading it (Table IV.1). Residential construction is leading employment, which is considered a lagging variable with respect to GDP. In line with the findings by Álvarez and Cabrero (2010) [203], building permits lead residential construction as well as GDP by two to four quarters, reflecting the time lapse between the authorisation to start building and the registration of the actual construction activity in national accounts. This makes building permits useful for forecasting short-term fluctuations in residential construction and possibly also GDP. Neither the construction confidence indicator from DG ECFIN's business surveys nor its forward-looking components (order books and construction expectations) appear to be leading indicators of residential construction growth.

Table IV.1: **Correlations in quarterly growth rates**

target	indicator	leads					
		t-5	t-4	t-3	t-2	t-1	t
GDP	RC	0.09	0.26	0.31	0.40	0.40	0.63
	permits	0.24	0.40	0.39	0.40	0.36	0.31
E	RC	0.22	0.39	0.23	0.26	0.17	0.24
RC	conf	0.15	0.26	0.27	0.34	0.41	0.45
	exp	0.12	0.26	0.25	0.23	0.34	0.42
	permits	0.30	0.42	0.30	0.48	0.30	0.38

RC: residential construction; E: employment; conf: constr. confidence; exp: constr. expectations

Source: AMECO, Eurostat, BCS and own calculations.

IV.3. Drivers of residential construction investment

In view of the large swings in residential investment and their influence on GDP, there is an obvious interest in understanding the drivers of residential construction.

Housing is special in several respects. A house is both an asset and a consumption good; its use value depreciates slowly; compared to financial assets its sale is costly, but it can easily be used as collateral. Moreover, housing markets are subject to a number of regulations and policy incentives. In already densely populated areas, the supply of land is limited and its use often tightly regulated, which may make housing supply inelastic and amplify price swings. Tax deductibility of mortgages is used in some Member States to foster home ownership. Piazzesi and Schneider (2016) [204] survey the literature that deals with the specificities of housing and provide a comprehensive approach to modelling households' demand for housing and housing supply.

The present chapter focuses on a limited set of drivers of residential investment in an error-correction framework, broadly following Carnot et al (2011). [205] It includes demographic developments, disposable income and real interest rates as main determinants of housing demand in the long run. The real interest rate is included in the long-run relation as it affects households' intertemporal decisions between (housing) investment and consumption. Over a shorter time horizon, house prices are considered as (the expectation of) higher prices increase the value of a house as an asset as well as the supply of houses. The cost of mortgage credit also affects affordability, as most households have to incur debt to acquire a house. [206] Moreover, the unemployment rate is considered as a proxy of the uncertainty of households' income streams.

[203] Op. cit.

[204] Piazzesi, M. and Schneider, M. (2016): Housing and macroeconomics, Handbook of Macroeconomics, Vol. 2B, pp. 1547-1640 (ch. 19).

[205] Carnot, N., Koen, V. and Tissot, B. (2011), Economic forecasting and policy, Springer.

[206] Due to limited data availability, the monetary side of the model is somewhat underdeveloped. Ideally one would consider mortgage rates rather than bond yields, possibly for various maturities depending on the mortgage structures prevailing in different countries.

The data set includes real residential construction investment (RC), real disposable income per capita (RDIPC - nominal disposable income per capita deflated with the private consumption deflator), population (POP), the real interest rate (R – the 10 year bond yield deflated with the GDP deflator), the unemployment rate (U) and real house prices (HPI – deflated with the deflator of private consumption). Except the house price index, which is taken from the database constructed by Philiponnet and Turrini (2017) [207], all data are extracted from the AMECO database for 1960 to 2017, for the euro area and its six largest Member States. Some data series for Germany prior to 1992 had to be extrapolated on the basis of west-German data [208]. A dummy variable with value 1 from 1992 on and zero before was therefore added to the long-run estimations for Germany and the euro area to cater for any instability in the coefficients introduced by reunification. The estimated coefficients below are however similar whether the dummy is included or not. Other variables like mortgage levels and rates (from the ECB), or high-frequency data such as building permits (Eurostat) are only available for more recent periods and not for all countries. These are introduced in the section on the near-term outlook.

Before estimating the error-correction model (ECM), a simple autoregressive (AR(1)) model is estimated as benchmark for the euro area (first column of Table IV.2). Turning to the ECM, the series that are candidates for the long-run relationship are first tested for unit roots and cointegration. Systematically, residential construction, population and real disposable incomes are integrated of order one. The real interest rate is found to have a unit root in most but not all cases. The variables for which the Johansen test suggests cointegration are included in a first estimation of the long-run relationship. Variables that are not statistically significant are then excluded and cointegration tested again for the remaining ones. The estimated long-run relationships are presented in the upper panel of Table IV.2. In some cases, several variants are possible. Only the relationship with the higher adjusted R^2 is shown and possible other variants are used as robustness check. The panel estimation presented in the fourth column is based on the six largest euro area Member States (unweighted). It uses country fixed effects and White cross-section standard errors. The reunification dummy is not statistically significant on top of the country fixed effects.

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[207] Philiponnet, N. and Turrini, A. (2017), 'Assessing House Price Dynamics in the EU', *Directorate-General Economic and Financial Affairs European Economy Discussion Paper* 048.

[208] Indices for RC and RDIPC built from growth rates for west Germany (1960-1992) and reunified Germany 1992 onwards. There is no consumption deflator for west Germany in AMECO. Therefore, pre-1992 RDIPC was deflated with CPI. POP exists for entire DE since 1960. R is the combination of west DE and reunified DE (East DE wasn't a market economy).

Table IV.2: **Estimation outcomes**

	euro area				Member States					
	AR(1)	short sample	full sample	panel						
	1978-2007	1978-2007	1978-2017	1974-2016	DE	FR	IT	ES	NL	BE
long run										
c				1.4***						
RDIPC		0.97***	0.97***	0.68***	0.31***	0.61***	1.01***	0.98***		1.00***
POP					0.62***	0.42***			0.97***	
r						-0.02***		-0.03***		
dummy 92		0.12***	0.08***		0.18***					
short run										
dRC lag1	0.56***	0.27*	0.40***	0.33***	0.42***	0.03	0.36*	0.30*	0.48***	0.20
dRDIPC				0.32*						
dRDIPC lag 1		-0.48*	-0.60**	-0.47***						
dU		-1.64**	-1.52***	-1.39***		-1.93**		-1.31**		-2.92*
dHPI		0.59***	0.67***	0.36***	0.46	0.38***	0.32*	0.30*	0.43***	1.03***
dPOP				1.23						
l-r res		-0.40	-0.24	-0.14	-0.21	-0.03	-0.15	-0.12	-0.24	-0.28
obs	30	30	39	258	43	43	31	38	43	43
adj. R²	0.14	0.62	0.65	0.50	0.32	0.52	0.51	0.63	0.58	0.56
DW	1.89	1.96	1.82	1.97	1.90	1.69	2.21	2.26	1.80	2.14

(1) Statistical significance at 1% (***), 2%(**) and 5% (*) level (not shown for the error-correction term because of its non-standard distribution).
(2) The euro area panel includes the 6 largest Member States unweighted.
Source: AMECO, own calculations

The short-run relationship links the annual growth rate of residential investment to the rate of change in the long-run determinants, the lagged residual of the long-run relationship and additional explanatory factors. These include house price inflation ([209]), the change of the unemployment rate, and population growth. Results are presented in the lower panel of Table IV.2.

For the majority of countries as well as the euro area, real per capita disposable income is identified as a major driver of housing investment in the longer run, sometimes, but not systematically in conjunction with demographic developments. The real interest rate is picked up as a long-run driver of housing investment only in a few cases.

House price inflation is positively and quite robustly linked to housing investment, in other words, housing investment slows down when house prices decelerate or fall, in line with the findings by Kohlscheen et al (2018).([210]) Income uncertainty proxied by the change in the unemployment rate also affects the residential construction cycle. Improvements in the labour market appear to make households more confident to undertake a major investment and take out a mortgage. Short-term population developments are not generally found to impact the residential construction cycle.

Considering the volatility of residential construction, the fit of the estimated ECMs (adjusted R² at 0.5 or more in most cases) appears reasonable, except for Germany, where it remains close to 0.3.

The autoregressive benchmark and the ECM in the second column are estimated over the period 1978-2007 in order to perform out-of-sample year-ahead forecasts. As the change of the unemployment rate and the change of real house prices enter the model contemporaneously, this forecast is conditional. It uses the unemployment projection from the Commission's Spring European Economic Forecast of the same year and a naïve projection of house price increases at previous year's rate. This forecast is compared to a naïve projection of the growth of residential construction investment and the AR(1) benchmark.

Forecast errors are substantial for any of the techniques. Nonetheless, the ECM has the lowest

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([209]) The level of house prices could also be considered a driver of residential construction in the long run. However, no cointegration relationship is found between the two.
([210]) Op. cit.

Graph IV.2: **Residuals of long-run regression**
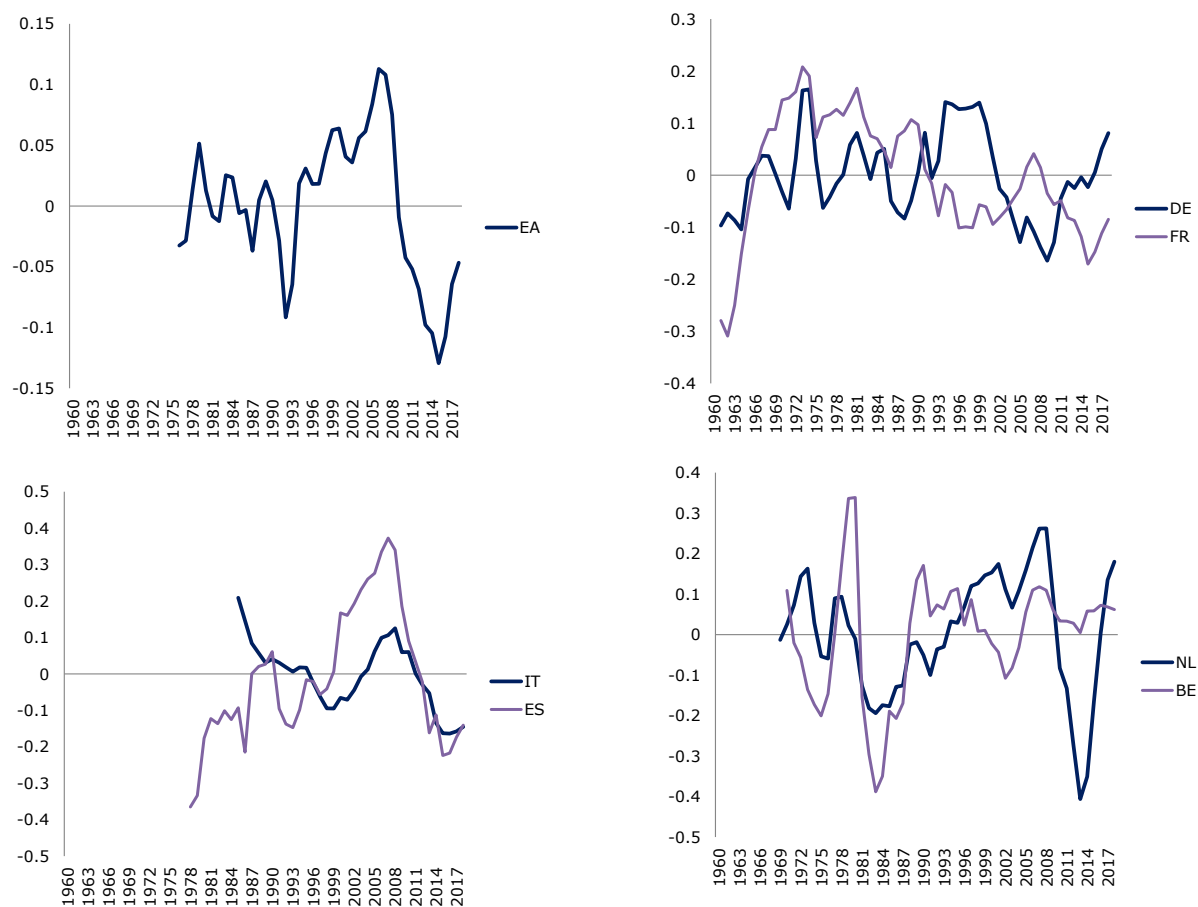
Source: AMECO, own calculations

Root Mean Squared Error at 4.0 against 4.2 for the AR(1) and 4.8 for the naïve forecast.

### IV.4. Model-based prospects for residential construction

In view of the forecast errors, point estimates of residential construction growth should not be over-interpreted. However, the model is useful insofar as it points to the likely structural and cyclical drivers of residential construction developments at a given point in time.

In 2017, residential construction in the euro area expanded at a rate of 4.2%. Graph IV.2 plots the residuals of the long-run regression extended on the basis of data from the spring forecast. For the euro area, it points to a decreasing gap between the current level of residential investment and the level implied by real disposable income, which is its main long-run determinant in the euro area. The residual graph clearly displays housing overinvestment in the decade preceding the crisis

followed by a sharp and protracted drop with a trough in 2015. By 2017, residential construction was well on the recovery path. The remaining difference between the actual level of residential construction investment and the level implied by disposable income points to continued impetus behind residential construction in the euro area in the medium term. In 2017, residential construction gaps, i.e. the level of residential construction investment relative to its long-term drivers identified in section V.3., were most pronounced in Spain and Italy, and to a lesser extent France. In the Netherlands residential construction has already moved back well above the level implied by demographics. For Germany and Belgium, the current level of residential construction investment is also higher than suggested by its long-run drivers.

Graph IV.3 illustrates the contributions of the different drivers of residential construction investment. For the euro area, the falling unemployment rate has contributed positively since

Graph IV.3: **Model-based contributions to residential construction growth**
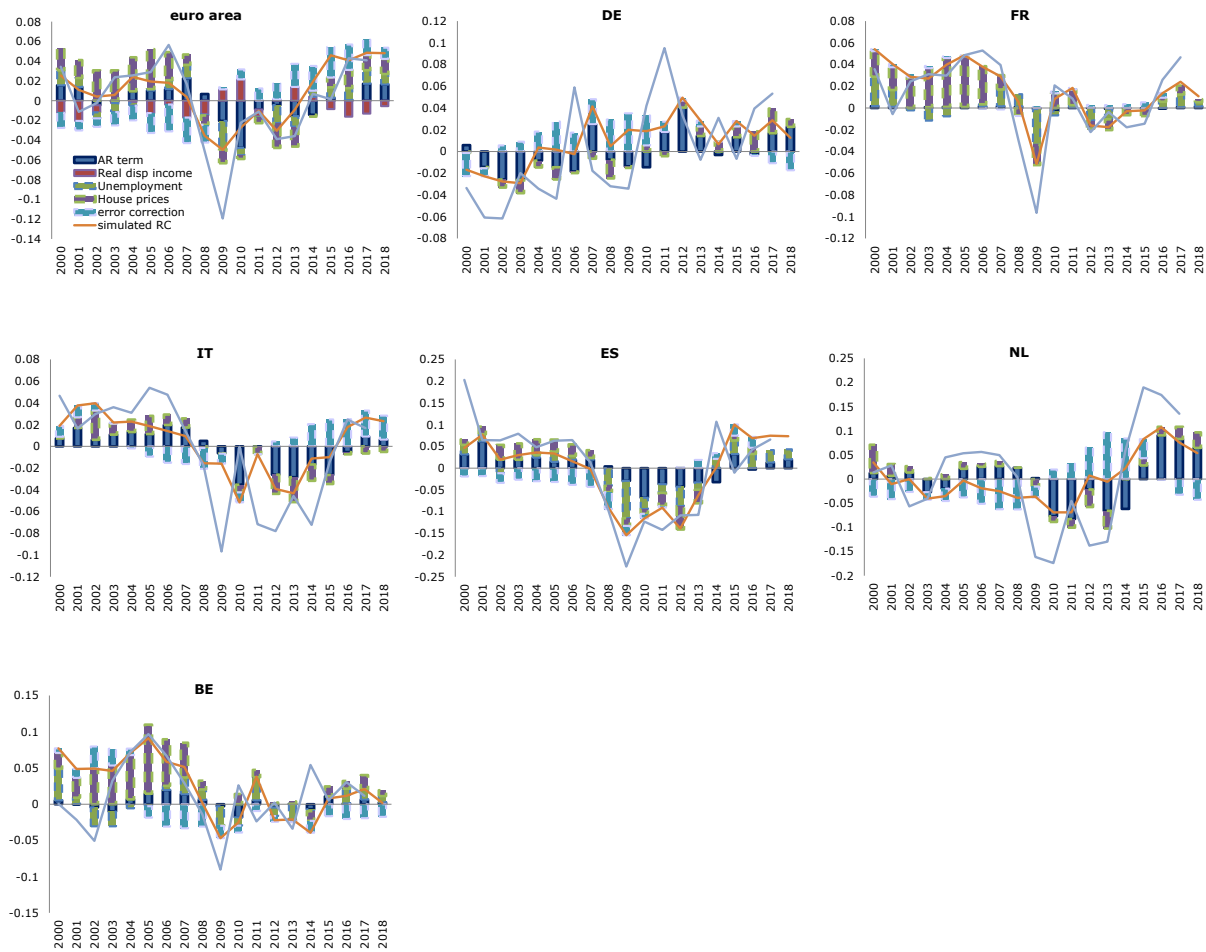
Source: AMECO, own calculations

2014. Since 2015, house price inflation is also contributing positively to residential construction. Moreover, the error-correction model attempts to close the gap with the long-term relation, pushing the projected growth of residential investment higher.

At the level of Member States, falling unemployment is also identified as a positive contributor in recent years for France, Spain and Belgium. House price increases have underpinned recent residential construction in all countries under review except Italy. For Germany, the Netherlands and Belgium, the model suggests a dampening impact of the long-term relationship through the error correction term.

For 2018, the graph shows a conditional model projection. It is based on the change in the unemployment rate from the Commission's Spring 2018 forecast and the assumption that house prices

in 2018 as a whole evolve like in the first quarter, for which data are already available from Eurostat (nominal HPI deflated with the consumption deflator from the spring forecast). For the euro area, the combination of a remaining residential investment gap, falling unemployment and increasing house prices points to continued robust growth of residential construction investment. Also for Italy and Spain, the identified drivers of residential construction points to continued growth. For the other Member States under review, the main medium-term and short-term drivers of residential investment suggest some growth moderation. [211]

It should however be recalled that the forecasting errors of the model are quite substantial, inter alia because residential construction is much more

[211] Note that these model-based projections are not necessarily identical with those that enter the Commission's forecasts.

volatile than most of the explanatory variables. It is therefore useful to cross-checked the drivers of residential construction identifies by the model with other data. [212] These include higher-frequency data many of which could not be included in the model for lack of long time series.

Confidence in the construction sector [213] is high, having picked up sharply since 2014. At 6.4 points in August 2018, construction confidence stands 1½ standard deviations above its long-term average since 1985. Business managers in construction also indicate a backlog of orders slightly above average and a strong flow of incoming orders. Confidence in the construction sector is above its long-term average in all Member States discussed here. In Germany and the Netherlands, as well as in the euro area as a whole, construction confidence reached record highs in recent months.

Building permits lead residential construction growth by about two quarters, due to the time it takes for construction to proceed and be recorded in national accounts. Monthly and even quarterly indices of building permits are however quite volatile. In the first five months of this year, the number of residential building permits in the euro area increased at an average annual rate of 4%, which is slower than in 2017 (7%) and 2016 (17%) pointing to a moderation of residential construction activity. The latest available data point to accelerating delivery of permits in Belgium and Spain and a moderation in Germany, France, Italy and the Netherlands.

Financing conditions are ample. Market participants do not expect the ECB to hike policy interest rates before 2019. The ECB's latest Bank Lending Survey [214] points to easing lending conditions for mortgages in the second quarter of 2018. Banks expected further easing in the third quarter. Mortgage credit (nominal) expanded at annual rates around 3% the first half of 2018. Household debt as a share of GDP has fallen only slightly in the euro area as a whole since the onset of the crisis, but it was reduced substantially in the countries where households had the highest

leverage. As house prices have bottomed out in 2013 and GDP growth has accelerated, acute deleveraging pressures have receded. The Bank Lending Survey reports firming mortgage credit demand in the second quarter of 2018 and expectations of increasing demand also in the third quarter.

Graph IV.4: **Construction confidence and building permits, euro area**
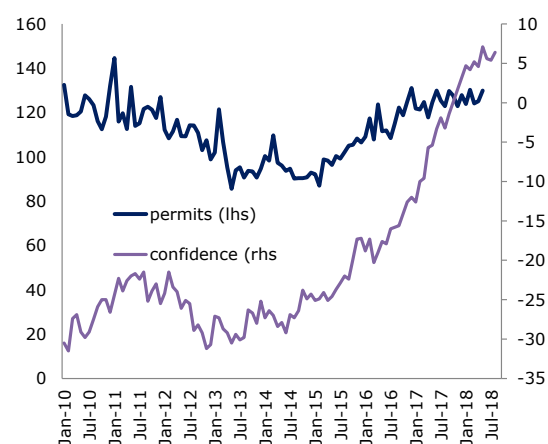
Source: Eurostat

Overall, high-frequency data also point to a continuation of robust growth in residential construction, which is in line with the model-based analysis of growth drivers.

IV.5. Conclusion

Swings in residential construction investment are frequent and large. GDP recessions are systematically associated with contractions of residential investment. The link from drops in housing investment to GDP is however more complex: between 1970 and the early 2000s, when residential construction in a Member State contracted by 5% or more, GDP dropped in about half of the cases and slowed down in most other cases. During the Great Recession, GDP and housing investment dropped in all 12 Member States examined. There is evidence of construction investment leading the business cycle in the US. On this side of the Atlantic that seems to be the case for some Member States, but not for the euro area aggregate. Even though residential construction investment seems contemporaneous to GDP in the euro area, building permits are a leading indicator for both.

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[212] Cf. also ECB Economic Bulletin May 2016, Box 6.
[213] Residential construction represents about half of overall construction activity.
[214] See ECB (2018), 'The euro area bank lending survey. Second quarter of 2018' at https://www.ecb.europa.eu/stats/pdf/ecb.blssurvey2018q2.en.pdf?776aed1b5334351b742031c1d7ef08fb

A standard error-correction framework is used to model drivers of residential construction investment in the long- and short run in line with the literature. Real disposable income and to a lesser extent population growth and the real interest rate can be identified as drivers of residential investment trends. This long-run relationship points to a quickly narrowing investment gap in residential construction.

In the shorter run, the unemployment rate and house prices are additional drivers of residential investment. This general pattern is rather similar across Member States.

The medium-term and short-term drivers of residential construction investment identified in the modelling exercise point to continued growth of residential construction in the euro area. This picture is confirmed when higher-frequency indicators are taken into account. GDP growth in most of the euro area is thus set to benefit from the demand related to residential construction. At the level of the largest Member States, positions in the residential construction cycle differ, and this is reflected in the conditional model projections for residential construction growth this year.

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