Economic Systems xxx (xxxx) xxx

Contents lists available at ScienceDirect

Economic Systems

journal homepage: www.elsevier.com/locate/ecosys

Determinants of macroeconomic resilience in the euro area: An empirical assessment of national policy levers

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ARTICLE INFO

JEL classification:
E32
L50
J21

Keywords:
Macroeconomic resilience
Common shocks
Economic structures
Structural reforms

ABSTRACT

This paper evaluates which structural characteristics matter for macroeconomic resilience, in particular regarding the capacity to absorb and recover from common shocks across euro area Member States over the period from 1998 to 2018. Applying a panel regression analysis and Bayesian model averaging, the paper aims to identify a set of factors as diverse and specific as possible in order to guide future policy actions. These country-specific factors relate to the macroeconomic conditions, the functioning of product, labour and financial markets, institutional quality and to deeply entrenched structural factors. The empirical analysis suggests that the factors conditioning the shock absorption across euro area Member States largely differ from those facilitating recovery in the face of a common shock. More specifically, labour market features play an important role in shock absorption with higher levels of labour market rigidity dampening the shock absorption capacity most. The recovery capacity is affected by a broader set of factors, especially those that hinder the reallocation of labour as well as of the production of goods and services. While high public debt seems to hinder shock absorption capacity, high private debt weakens the recovery capacity. Some factors such as high economic openness have a negative impact on the absorption capacity in case of a common shock as it also affects trading partners, while having a positive impact on the recovery capacity. The results also suggest that degrees of macroeconomic resilience differ across the euro area and well-calibrated reforms are needed to address the nexus of country-specific challenges.

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1. Introduction

The Global Financial Crisis and the euro area debt crisis revealed a strong disparity in euro area Member States' capacity to withstand shocks. Consequently, the European Stability Mechanism (ESM) was established as an intergovernmental organization to provide financial assistance to euro area countries in difficulty, and substantial reforms of the euro area architecture took place,

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https://doi.org/10.1016/j.ecosys.2023.101093
Received 23 November 2020; Received in revised form 21 July 2022; Accepted 5 September 2022
Available online xxxx
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Please cite this article as: M. Jollès, E. Meyermans and B. Vašíček, Determinants of macroeconomic resilience in the euro area: An empirical assessment of national policy levers, Economic Systems, https://doi.org/10.1016/j.ecosys.2023.101093

notably the inception of the Banking Union[1] with the Single Supervisory Mechanism (SSM) and the Single Resolution Mechanism (SRM) based on a common regulatory framework. While the architecture of the Economic and Monetary Union (EMU) is still incomplete,[2] the institutional reforms have strengthened the resilience of the euro area as a whole (Lane, 2021). However, a further strengthening of resilience is still needed at the Member State level to deal with idiosyncratic shocks and the asymmetric transmission of common shocks,given that fiscal authority is retained by Member States and cross-border risk sharing is limited (Furceri and Zdzienicka, 2015) despite post-2010 improvements driven mainly by official loans (Cimadomo et al., 2020).

At the onset of the Economic and Monetary Union, the loss of nominal exchange rate flexibility[3] as an adjustment channel was a major concern (Obstfeld, 1997). This loss, alongside the Stability and Growth Pact putting constraints on fiscal policy, forced national policymakers to rely more extensively on other sources of adjustment, such as labour and product markets. However, the Global Financial Crisis showed that both the duration (e.g. Cros and Alcidi, 2015) and cost (e.g. Gibson et al., 2014) of the adjustment process differed notably across euro area Member States. This then begs the question why some countries showed a stronger capacity to temper cyclical downturns than others or, in other words, why they showed stronger resilience than others. This is an important question because persistent downward deviations from potential may also adversely affect potential growth via hysteresis effects.

This paper evaluates which structural characteristics matter for the macroeconomic resilience of the euro area Member States,[4] focussing on the drivers of resilience at the national level and not on the aforementioned EMU-wide institutional reforms.

1.1. Macroeconomic resilience

The concept of resilience has been used in different fields. For example, in environment science and ecology it mostly refers to the ability of ecosystems to deal with natural disasters such as earthquakes, hurricanes, floods or droughts (Holling, 1973). In economics, resilience has been commonly studied from a regional perspective (e.g. Martin and Sunley, 2015). In such a context, the adverse shock can be represented for example by the closure of a major regional employer or the reallocation of a whole industry, and the system's resilience can be evaluated in terms of the impact on employment and income levels. At the macroeconomic level resilience has been less studied.

Macroeconomic resilience is a broad concept.[5] This paper puts forward a widely used definition, which allows for empirical analysis by focussing on the dynamics of output in the face of a common shock (e.g. Briguglio et al., 2009).[6] One country is more resilient than another if it is able to absorb the same shock with a lower output loss on impact; and as part of the shock is not absorbed, there comes a second phase of resilience, which consists of the ability to recover quickly.

Graph 1 illustrates the variety in cyclical behaviour among euro area Member States in terms of the amplitude and persistence of the output gap.[7] 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 hit hardest by the crisis. To the extent that this was triggered by a common shock with the same intensity, this pattern may reflect differences in macroeconomic resilience.

Empirical evidence on the determinants of macroeconomic resilience is still rather scarce and mostly aimed at narrow sets of broad structural characteristics such as the functioning of the labour and product market (Brůha and Kucharčuková, 2017; Duval and Vogel, 2008; Sondermann, 2018; World Bank, 2019). However, in order to guide structural reforms, it seems necessary to identify more detailed structural features that contribute to the ability of countries to weather the impact of adverse shocks. Similarly, in order to prioritize between different structural reforms, it is necessary to evaluate the impact of a wide range of structural characteristics and institutions.

1.2. Research strategy

This paper empirically investigates at the national level the factors that may have contributed to the apparent differences in macroeconomic resilience across the euro area. The *significance* and *relative importance* of these factors is evaluated by comparing *the impact of* and *recovery from* common shocks across the euro area Member States (for which sufficient data are available). The sample

[1] The banking union, by ensuring that EU banks are stronger and better regulated, has helped correct the strong interaction between the fiscal and financial sectors at the Member State level (e.g. Goodhart, 2014) that was revealed during the Global Financial Crisis (Caruso and Ricco, 2019).

[2] Notably, the European deposit insurance scheme (EDIS) has not been implemented yet and not enough progress has been made in dealing with home bias of sovereign exposures, whereby the banking sector prefers to hold domestic sovereign debt. For instance, Alcidi and Thirion (2016) assess the evolution of the shock-absorption capacity of the EMU in relation to policy levers such as risk sharing via capital markets or labour mobility before and after the EMU reforms. Bénassy-Quéré et al. (2018) lay out a detailed proposal how to pursue the reforms of the EMU architecture by reconciling risk sharing with market discipline.

[3] Which encompasses a devaluation in the case of external deficits, and a revaluation in the case of an external surplus.

[4] For which data are available.

[5] Attempts to narrow it down were only made recently, mainly at the level of international organisations. See, for instance, Alessi et al., 2018; Canton et al., 2016; ECB, 2016; Giudice et al., 2018; G20, 2017; IMF, 2016; World Bank, 2019.

[6] The common measure of macroeconomic output is GDP. However, it is important to note that adverse shocks may also affect non-market production and, most importantly, have significant distributional effects as well.

[7] Other measures could be used. For instance, Caldera Sánchez et al. (2016) identify economic resilience as a lower occurrence of severe recession. Elbourne et al. (2008) use the level of expected discounted utility as a measure of resilience.

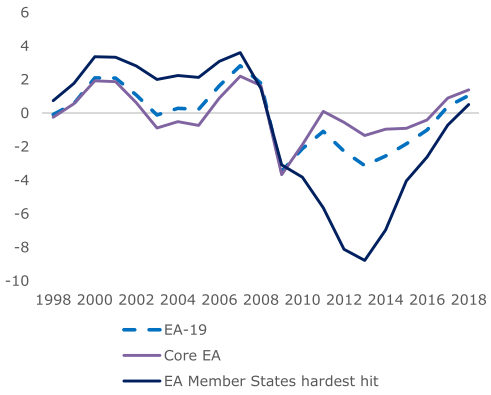


Fig. Graph 1. Output gap dynamics across the euro area, 1998–2018. *Notes*: Core EA includes DE, AT, NL and FR. EA Member States hardest hit includes IE, ES, EL, CY and PT. GDP-weighted average are used. The output gap measures the gap between actual GDP and potential GDP as percentage of potential GDP and is measured in this section as AMECO variable AVGDGP.
Source: Authors' estimates based on AMECO data.

covers the period from 1998 to 2018 and also includes a selected group of non-euro area EU Member States with a view to increase sample variability, which may lead to more precise point estimates.[8]

Strengthening overall macroeconomic resilience entails acting on three elements: *i*) reducing the economies' *vulnerability to shocks* (i.e. the probability to be hit by a shock); *ii*) increasing their *shock absorption capacity* (i.e. the short-term response of an economy to a shock); and *iii*) increasing their ability to reallocate resources and *recover from the shocks* (i.e. medium-term bouncing back to the original growth path).[9] The factors affecting the first element have already been examined elsewhere (e.g. Röhn, et al., 2015, Hermanssen and Röhn, 2015) by identifying the short-term vulnerabilities and imbalances that affect the likelihood of an economy to be hit by a shock. It is important to note that contrary to shocks, which are exogenous and unexpected, imbalances can be policy-driven and commonly build up over time until they become unsustainable. This paper focuses on the latter two elements – shock absorption and recovery. Namely, it aims at *identifying factors that determine the capacity to weather the impact of shocks* both in the short and medium term.

The empirical analysis of the determinants of macroeconomic resilience faces two major challenges. First, we observe only the outcome (e.g. decline of output) and it is empirically difficult to disentangle the relative importance of *shock size* from the strength of *shock transmission* (which is determined by structural characteristics and available policy space). Second, to withstand *asymmetric shocks* that the centralized monetary policy is not suited for, euro area economies need to be particularly resilient. However, in order to determine which factors make countries more resilient, we need to analyse their differentiated response to shocks of the same size. To address both issues, the consecutive empirical analysis aims at examining the response to common euro-area wide shocks (i.e. *symmetric shocks*). However, it is reasonable to assume that the results also hold in the case of asymmetric shocks. While some countries are more likely to be hit by country-specific shocks, the shock absorbing capacity should be independent of the source of the shock. Therefore, this paper does not analyse the determinants of *vulnerability* to asymmetric shocks but rather what determines the *resilience* of a country after it is hit by a shock, irrespective of its origin.

1.3. Outline

This paper is structured as follows. Section 2 identifies the factors that may potentially affect an economy's capacity for shock absorption and recovery. It thereby focuses on specific factors that can be shaped by structural reforms such as regulations affecting the functioning of labour, product and financial markets. Section 3 briefly describes the analytical framework. First, it explains how the common shock has been estimated. Next, it describes how a panel regression model and Bayesian Model Averaging (BMA) have been used to estimate the impact of various factors affecting an economy's capacity to absorb and recover from common shocks. Section 4 shows estimates of the impact of statistically significant factors on euro area Member States' capacity to absorb and recover from shocks. The last section draws some policy conclusions.

It is a limitation of the following econometric analysis that the reduced form regression analysis and Bayesian model averaging do not allow to identify in detail all the specific channels through which the various structural factors affect resilience. However, the analysis provides evidence of the statistical significance of these structural factors' impact on resilience, which could guide future research aimed at clarifying the underpinning transmission channels. As such, referring to the available literature, the following narrative also formulates some hypotheses about specific transmission channels.

[8] The euro area countries included are Austria, Belgium, Finland, Germany, Ireland, France, Italy, Luxembourg, the Netherlands, Portugal and Spain. The non-euro area countries included are Czechia, Denmark, Hungary, Poland and Sweden. The sample size is set by data availability.

[9] See, for example, IMF (2016) and Giudice et al. (2018) for 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.

2. Factors affecting the capacity for shock absorption and recovery

Previous research tested the significance of a number of broad factors (e.g. product market, labour market, taxation) that are most relevant for macroeconomic 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 (Canova et al., 2012). 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 (Sondermann, 2018). The analysis, examining possible trade-offs between growth and macroeconomic 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 (Caldera Sánchez et al., 2016). Finally, some authors report that low protection of temporary contracts, political stability, regulatory quality and pre-crisis fiscal space were found to be most relevant for a swift recovery, whereas unemployment benefits and employment protection legislation do not seem to increase macroeconomic resilience (Brůha and Kucharčuková, 2017).

This paper considers a much wider range of factors potentially affecting macroeconomic resilience than previous studies and at the same time provides an assessment of factors at a more disaggregated level in order to guide targeted structural reforms. We classify the factors affecting macroeconomic resilience into four broad categories: i) *macroeconomic conditions,* which includes variables such as interest rate or debt ratios, ii) specific *characteristics of labour, product and financial markets*, *iii*) *institutional characteristics* such as the level of corruption, and *iv*) *deep structural factors* such as the economy's openness to international trade. While all these variables may affect the resilience of the economy in case of adverse shocks, they are of very different nature. The macroeconomic conditions are often also affected by previous policy choices and the available policy space is often constrained if such tools (e.g. public debt issuance) were excessively relied on in the past. Therefore, they must be complemented by policies increasing economy resilience in the medium and long term. While characteristics of labour, product and financial markets can be affected by structural reforms, as is commonly understood, deep structural and institutional factors are influenced by policy only in longer time horizons.

It should be noted that while there are many potential factors affecting macroeconomic resilience, they do not necessarily point in the same direction. In some cases, the same factor can have a positive impact on absorption and a negative one on recovery, or may be relevant only for shock absorption or recovery. Table A1 in the Appendix briefly describes the indicators that are used to measure these factors and the section below aims to provide more economic intuition about these factors of macroeconomic resilience.[10] The overall choice of factors is crucial. In our case we relied on factors identified in previous research and tried to further extend this set. Still, even our wide-range analysis is constrained by data availability both in terms of cross-country and time coverage.

2.1. Macroeconomic conditions

Above all, macroeconomic conditions affect the economy's absorption capacity, i.e. the short-term response to shocks. First of all, a high *public debt* may weaken the absorption capacity as (i) it limits the fiscal space for discretionary interventions and the working of automatic fiscal stabilisers (Ostry et al., 2010), (ii) it amplifies banking risks as public debt is often held by domestic banks thereby lowering credit to the private sector (e.g. Broner et al., 2014), (iii) it strengthens the expectation of higher income taxes in the future (e.g. Berben and Brosens, 2007).[11] (iv) The composition of public debt may also affect the scope for fiscal policies, for instance with governments with a higher share of debt that has to be rolled over within the year having less room to manoeuvre (e.g. Kose et al., 2022).

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 smooth consumption over time, but it may also be so high that it pushes the private sector into procyclical deleveraging, i.e. a so-called balance sheet recession (e.g. Koo, 2014).

Third, if monetary policy is not constrained by the zero lower bound*, interest rate* cuts can improve the absorption capacity. However, monetary transmission can be hampered if financial markets are fragmented and the domestic banking sector is weak. Moreover, fragmented financial markets may also hinder cross-border risk sharing, thereby weakening Member States' capacity to absorb and recover from (idiosyncratic) shocks. Such cross-border risk sharing can take many forms including cross-border income flows arising from assets held abroad, which are independent from the domestic economic situation, as well as cross-border private and public credit flows (e.g. Asdrubali et al., 1996, Nikolov and Pasimeni, 2022).

Finally, exchange rate depreciation in case of adverse shocks 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, the *real effective exchange rate* may respond to domestic conditions such as nominal unit labour costs – which often show a strong rigidity. Its impact on macroeconomic resilience will then also depend on the economy's structural features, such as the size of its tradable and non-tradable sectors. Nevertheless, the elimination of excessive intra-euro area exchange rate volatility following the irreversible fixing of the nominal exchange rate in turn created more opportunities to export and expanded the scope for cross-border portfolio diversification (Backé et al., 2004; Forster et al., 2011).

[10] The specific variables used in the regressions appear in *italics*.

[11] Nevertheless, the empirical literature on Ricardian equivalence is still inclusive, for instance Ricciutti (2003) shows that when the empirical analysis is based on optimising models, it is usually accepted, but when Ricardian equivalence is tested in a life-cycle framework the hypothesis is usually rejected.

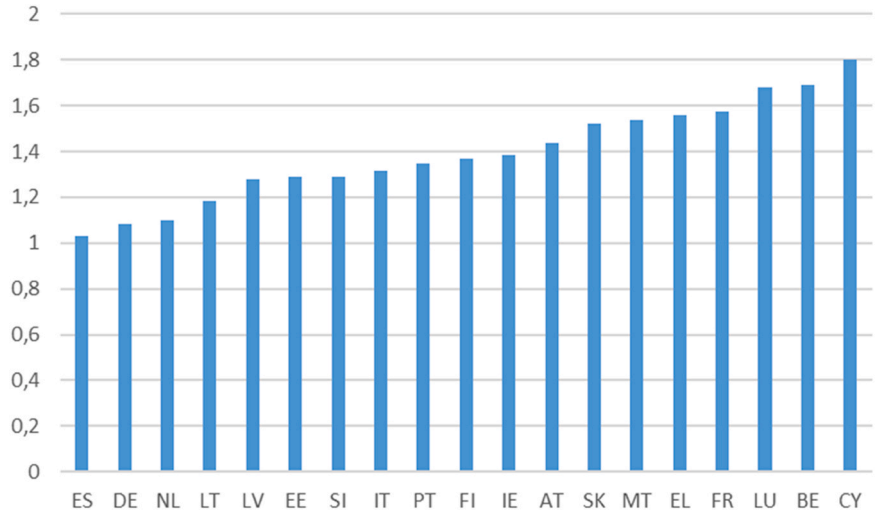


Fig. Graph 2. Overall product market regulation indicator, 2018, *Note*: Index scale 0–6 from least to most restrictive.
Source: OECD.

2.2. Working of markets

The structural characteristics of product, labour and financial markets determine their flexibility and well-functioning, which is crucial especially when the economy is hit by an adverse shock.

2.2.1. Product markets

Competitive product markets are important drivers of macroeconomic 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. The overall flexibility of product markets is usually tracked by the OECD *Product market regulation* indicator. Despite the notable differences across Member States in terms of overall product market regulation (Graph 2), product market integration is an area where structural reforms have progressed more rapidly (Alesina et al., 2010). They have been boosted both by single market policies and the common currency. Both have fostered more competition and innovation in product markets, while the latter has also brought more (price) transparency, which in turn has a direct impact on a country's capacity to absorb and recover from shocks. Differences in macroeconomic resilience across countries may therefore partly reflect differences in product market integration. A disaggregation of the OECD product market regulation indicator can shed some light on which product market areas, specifically, differentiate euro area countries from each other.

Several factors affect the degree of competition in product markets,[12] including i) *barriers to entrepreneurship* such as administrative burdens on start-ups, complexity of regulatory procedures or regulatory protection of incumbents, ii) *barriers to trade and investment* such as differential treatment of foreign suppliers and barriers to FDI, as well as iii) *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 recovery as it helps reallocate resources (Andrews and Saia, 2017). State control, especially price controls and strict regulation of network industries and professional services, may limit an economy's recovery capacity in particular. 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 (e.g. OECD, 2006). On the other hand, however, more stringent product market regulation slows down the recovery as it hinders the reallocation of resources, for instance by limiting the entry of new firms (Duval and Vogel, 2008; Canova et al., 2012). Graph 2 shows that there are notable differences across Member States in terms of overall product market regulation.

In the EU and euro area context, 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 recovery (Jolles and Meyermans, 2018). Product markets also affect resilience indirectly because well-functioning product markets allow for a better transmission of monetary and fiscal policy impulses (Pelkmans et al., 2008).

[12] Following the classification of the OECD Product Market Regulation Indicator (Koske et al., 2015).

2.2.2. Labour markets

The economic literature suggests a two-way interaction between the functioning of labour markets and macroeconomic resilience. Well-functioning labour markets are a necessary (but not sufficient) condition to reallocate labour towards new activities during the recovery. On the other hand, a slow recovery and associated persistent unemployment spells may scare the employability of labour, thereby hindering labour reallocation during recovery, delaying the recovery further.[13] The *well-functioning of labour markets* on policies aimed at labour markets and diverse structural and institutional features of labour markets can be detailed as follows.

Employment policies have a direct impact on the well-functioning of labour markets and macro-economic adjustment.[14] However, their impact on absorption and recovery does not necessarily point in the same direction. For example, *out-of-work income support* could help stabilise aggregate demand if the shock induces 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 (e.g. Meyermans and Nikolov, 2017). However, too generous or protracted out-of–work income support may increase workers' reservation wage, which in turn may hinder labour reallocation.[15] For instance, Bassanini and Duval (2006) report a positive effect of unemployment benefits on the persistence of unemployment. But Brůha and Kucharčuková (2017) do not find evidence that generous unemployment benefits make a difference. In addition, the effective use of such schemes during a downturn may also be conditional on the available fiscal space, as for instance enough funds may not be available in case of unsustainable debt levels (e.g. Hijzen et al., 2018).

Active labour market policies (ALMP) such as training of workers as well as guidance and counselling provided by public employment services (PESs) may also impact macroeconomic resilience especially during the recovery as they facilitate labour reallocation However, meta-studies (both micro- and macroeconomic) find a limited impact of ALMP on employment (Card et al., 2018). Two recurrent explanations come from the fact that the impact of such policies depends very much on the nature of the programmes, and that the effect is visible in the medium to long term but much less in the short term (Eichhorst and Konle-Seidl, 2016). Graph 3 shows that there are notable differences across Member States in terms of expenditure on public employment services and training.

Employment protection legislation (EPL)[16] is another broad area with an impact on the working of labour markets. Strict EPL may temper the firing of labour in the face of an 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. EPL is probably the most popular factor tested across empirical studies on resilience. Duval and Vogel (2008) show that strict labour and product market regulation may initially dampen the impact of a common shock but make it more long-lasting. Biroli et al. (2010) 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 and Wulfsberg (2005). At a more granular level, Brůha and Kucharčuková (2017) report that low protection of contracts positively impacts macroeconomic resilience. On the other hand, a less restrictive EPL could increase job turnover 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.[17]

Wage setting is another important feature of the labour market. When wages (and prices) are rigid, most of the adjustment falls on quantities, including output and employment – especially in the case of persistent shocks. The wage setting can be characterized by variables such as *wage bargaining level* and *wage bargaining coordination*. However, the relation between wage flexibility and macroeconomic resilience can be complex because (downward) wage flexibility (internal devaluation) also dampens demand. However, the drop in demand can in turn contribute to the speed of recovery. *Trade union density* affects wage flexibility via collective bargaining. At the same time, highly centralised as well as highly decentralised regimes strengthen the alignment of wages and productivity, while a high degree of coordination of bargaining can moderate wage increases. For instance, Speckesser et al. (2015) report that a higher degree of coordination and centralisation tempers nominal unit labour cost growth but has no significant impact on real unit labour cost. At the same time, bargaining could increase rigidities in the adjustment to localised developments in case of excessive centralisation or being unable to smooth wage adjustment over time and sectors in case of excessive decentralisation.

2.2.3. Financial markets

Well-functioning financial markets help economic agents to smooth their consumption and investment in the face of shocks by channelling savings and borrowing across regions and over time, provided intertemporal budget constraints are respected. However, several factors may limit this capacity, whereby it is important to distinguish between the financial system's long-term characteristics and vulnerabilities. For example, Caldera Sánchez et al. (2016) report a trade-off between efficiency and crisis risk with regards to

[13] For instance, Yagan (2019), focusing on local labour markets across the US, estimates that exposure to a 1% point larger local unemployment shock in 2007–2009 reduced 2015 working-age employment rates by over 0.3%. Di Sanzo and Perez-Alonso (2010) report evidence that suggests that the dynamic of the unemployment rate is characterized by nonlinear behaviour with frequent shifts from a low to a high unemployment equilibrium in a selected group of euro area countries. Especially the young are at risk of scarring effects in the wake of persistent unemployment spells, see for instance Cockx and Picchio (2012),

[14] Among others, Blanchard and Wolfers (2000) provide empirical evidence on the interactions between shocks and labour market institutions, albeit in their analysis the unemployment rate is the dependent variable.

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

[16] 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 collective dismissals; and 3. Regulation of temporary forms of employment.

[17] Hence the need to explore the empirical significance of other drivers such as income support for the unemployed and access to credit markets (e.g. Koeniger and Prat, 2007).

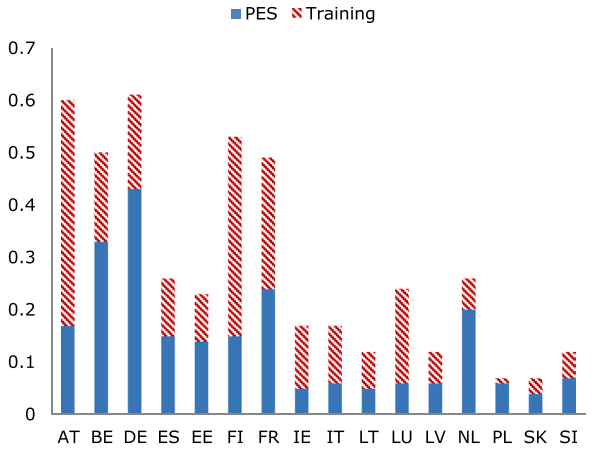


Fig. Graph 3. Expenditure on Public Employment Services (PES) and training, 2018 (% of GDP). *Note:* Data for EL missing. Source: OECD.

financial market policies. 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 (e.g. Kanngiesser et al., 2017). Regarding 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 (e.g. Ahrend and Goujard, 2012a). Last not least, international financial integration, such as international bank lending, tends to amplify contagion shocks and increase crisis risk.[18] Therefore, 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).

Given the relevance of bank credit for financing the euro area economy, resilience depends mostly on the functioning of the banking sector. While the availability of comparable cross-country indicators has significantly improved over time, their availability for the period before the global financial crisis is fairly limited. Therefore, we make use of two indicators related to the banking sector. We use the *share of non-performing loans* (on all loans) as the main indicator of banking sector vulnerability. A high stock of non-performing loans may hinder the absorption of shocks as it limits the banking sector in providing new loans. At the same time, a severe shock may adversely affect borrowers' ability to repay their debts. In turn, this increase in non-performing loans weakens banks' lending capacity and thus also the economy's capacity to absorb shocks.[19] Graph 4 shows strong differences in terms of non-performing loans (as a percentage of total gross loans) across Member States as well as over time in some Member States.[20] From the standpoint of long-term characteristics, *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.[21] However, beyond a threshold level of financial development, the financial sector may ignite a reallocation of highly skilled labour from the real to the financial sector and give rise to excessive increases in mortgage credit, which are both less conducive to macroeconomic resilience (e.g. Popov, 2017).

2.3. Institutional quality

Several empirical studies report that institutional quality may have an important impact on both macroeconomic stability and potential growth (e.g. Acemoglu et al. (2005)). However, determining causality in this context is not always clear-cut. For example, Glaeser et al. (2005) report findings for reverse causality, suggesting that growth and human capital accumulation lead to institutional improvement and not the other way around. The OECD (2013) 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. This paper tests the significance of three aggregated indicators of institutional quality, namely *governance, control of corruption* and *rule of law.*[22]

[18] See, for instance, the identification of structural policies that increase or decrease financial crisis risks in Ahrend and Goujard (2012b).

[19] In the consecutive 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 the lagged output gap and other lagged financial variables such as public debt and household debt.

[20] ECB data on non-performing loans only start as of 2007.

[21] In the consecutive 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).

[22] These indicators are retrieved from the World Bank Governance Indicators, which cover six dimensions of governance.

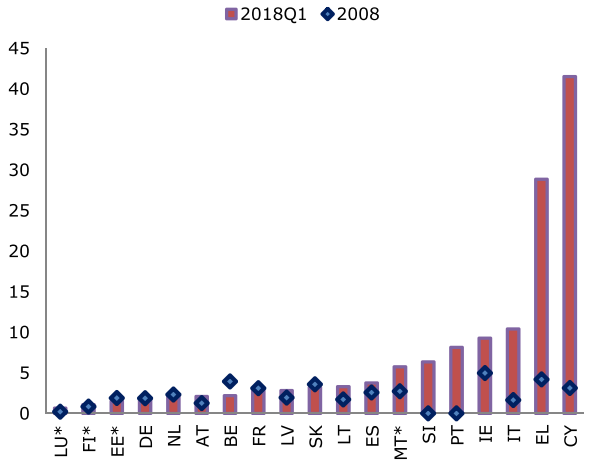


Fig. Graph 4. Gross non-performing debt instrument (as % of total gross debt instruments). *Notes*: Ratio of non-performing debt instruments (payments of interest and principal past due by 90 days or more) to total gross debt (total value of loan portfolio). Debt instruments include both loans and other 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).

Another important dimension of institutional quality which is relevant for macroeconomic resilience is the quality of monetary and fiscal policy.[23] While monetary policy in the euro area has been entrusted to a common institution, the ECB, and its quality does not vary across euro area countries, fiscal policy remains the responsibility of national governments. The quality of the latter can be measured by means of the *design and strength of fiscal rules*.[24]

2.4. Deep structural factors

Deep structural factors represent characteristics of the economy that have developed over a long time and cannot be altered in the short term. *Diversification of economic activity*[25] *and exports* 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 (e.g. Martin, 2012). 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. *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 to stimulate domestic demand expansion in a more open economy as it spills out through the import channel (e.g. Spilimbergo et al., 2008).

Graph 5 shows a positive correlation between trade openness and the degree of specialization, suggesting that Member States with strong market openness have a strong specialisation in their exports, i.e. a less diversified export portfolio (as measured by the Hirschman Herfindahl Index). More specifically, research suggests that inter-industry trade (as opposed to intra-industry) specialisation may make economies more vulnerable to country-specific shocks (e.g. Krugman, 1981). While inter-industry trade specialisation increases the likelihood of asymmetric shocks, the impact of specialisation on shock-absorption is not straightforward and may depend on the nature of the shock. A specialized region or country may gain market shares in the case of a general common shock, while an asymmetric shock specifically hitting the area of specialisation can be very detrimental for those exports and thus for the region as a whole. Concerning the recovery, inter-industry trade may actually foster the reallocation of resources across regions and activities according to their specialisation.

[23] Lane (2021) proposes institutional reforms to foster resilience that encompass i) macroprudential policy that plays a significant role in preventing imbalances and safeguarding financial stability, ii) a resilient banking system with a combination of increasing capital-asset ratios and new laws governing the resolution of failing banks, complemented by a more intrusive approach to banking supervision, iii) safeguarding the sustainability of national fiscal positions and introducing a "central fiscal capacity" to foster area-wide fiscal risk sharing and reflect the area-wide macroeconomic situation.

[24] See the DG ECFIN's fiscal rules database at https://ec.europa.eu/info/business-economy-euro/indicators-statistics/economic-databases/fiscal-governance-eu-member-states/numerical-fiscal-rules-eu-member-countries_en#numerical-indicators-capturing-the-design-strength-of-fiscal-rules

[25] Several indicators have been proposed to measure diversification (see Wundt, 1992). Here, an indicator based on sectoral employment shares is used.

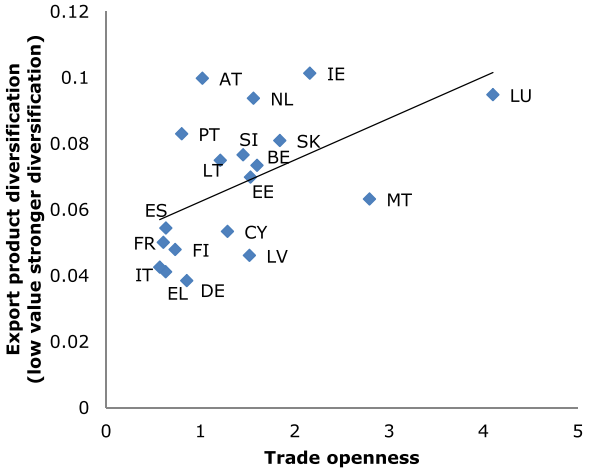


Fig. Graph 5. Trade openness and export diversification (2015), *Notes:* Trade openness = (exports + imports)/ GDP in current prices. Export diversification as measured by the Hirschman Herfindahl Index, which is equal to the sum of squared shares of each product in total exports. A country with a perfectly diversified export portfolio will have an index close to zero, whereas a country which exports only one good will have a value of 1 (least diversified).
Source: Authors' estimates based on AMECO and WB.

With stronger *income inequality*[26] (measured by the Gini coefficient of disposable income) 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 (e.g. Stockhammer, 2015) compared to income earners at the lower end.[27] At the same time, however, the adverse impact may be aggravated if lower income groups do not have savings or access to credit to absorb a negative shock. This can negatively affect the fall in aggregate demand. 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.

3. Empirical framework

The analysis of macroeconomic resilience uses aggregated output as the most encompassing measure of economic activity, and specifically the output gap as a deviation of current output from the potential that is comparable across countries.[28] The key assumption is that output is persistent but also affected by random shocks, and that structural characteristics and macroeconomic policies affect the shock absorption and recovery capacity.

An output gap autoregressive econometric equation is estimated in a panel setting, whereby each country's *absorption capacity* (measured by the response coefficient to the common shock) and *the speed of recovery* (measured by the response coefficient of the lagged output gap) depend on country-specific structural characteristics (see subsection 3.2 for more details on the specification). In reality, each economy is subject to both *idiosyncratic* and *common shocks*. Moreover, the shocks can be of a different nature, such as a productivity shock, confidence shock or change in preferences, and thus be temporary or permanent. Importantly, shocks are not directly observable and have to be estimated. In our empirical framework, the resilience of Member States is tested in case of general common shocks. Namely, an economy is more resilient than another if it performs better after being hit by a common shock. Given that the purpose of the analysis is to identify structural characteristics that make countries weather adverse developments better, it is necessary to draw on the *cross-country experience*. This can be most easily done in the case of *general common shocks*, i.e. shocks of the same size without identifying the exact nature of the shock. It goes beyond the scope of our analysis to distinguish between the effects of different types of common shocks, as well as between the impact of common and idiosyncratic shocks.[29] Subsection 3.1 clarifies the steps to estimate such general common shocks hitting the Member States.

[26] Chen et al. (2018) 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

[27] For instance, using data for 15 European countries from the Household Finance and Consumption Survey, Carroll et al. (2014) report that the spending of unemployed individuals and households with 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.

[28] One could also evaluate resilience from a labour market perspective, like in Hijzen et al. (2018). However, as the focus of this paper is on the well-functioning of the euro area as a whole, it is more appropriate to broaden the analysis and study output fluctuations. The latter are affected in a very direct way by a broader set of country-specific factors such as the working of labour, product and financial markets.

[29] The fact that we specifically aim at determinants of responses to common shocks does not call into question that some countries are more likely to be hit by idiosyncratic shocks (i.e. they are more vulnerable). There can also be a close link between determinants of vulnerability to shocks and determinants of responses to shocks. For example, if a country has a highly leveraged banking sector, it is arguably more likely to be hit by financial shocks. At the same time, high leverage is also a precondition for a higher stock of non-performing loans, which may delay a recovery even after a common adverse shock.

3.1. Estimation of common shocks

The first step in our analysis of resilience[30] is the identification of adverse episodes that were common to all countries in the sample (common shocks) in order to link cross-country divergence to their resilience rather than to the different size of the shocks hitting them. However, shocks cannot be observed and must be estimated.

Graph 6 shows estimates of common shocks based on VAR for the aggregated euro area with three quarterly variables: i) interest rate (specifically the shadow rate by Wu-Xia, originally monthly data were transformed to quarterly), ii) inflation rate (year-on-year, originally monthly data were transformed to quarterly) and output gap (the annual AMECO output gap was interpolated to quarterly frequency using the Danton method with capacity utilization as an additional variable). The residuals of the output gap equation were transformed to quarterly frequency and used as a measure of common shocks. It is notable that around the euro start-up period and before the global financial crisis, common shocks were mostly positive. In contrast, since the global financial crisis and very notably around the euro area sovereign debt crisis, negative common shocks became predominant.

3.2. Specification of output gap dynamics in a panel

The econometric analysis starts from the assumption that the output gap (Y) is affected by a common shock ($SHOCK\_C$) and policy decisions (Q). In addition, the impact of the shock is conditioned by structural factors such as product market regulation and openness to international trade. At the same time, rigidities in macroeconomic adjustment slow down the recovery, and in turn these are also conditioned by structural factors. In order to avoid missing variable biases, the econometric analysis also controls for macroeconomic conditions, namely the short-term interest rate and the real effective exchange rate as well as debt levels (as a percentage of GDP). More formally speaking, the output response function reads as.

$Y_{i,t} = \beta SHOCK\_C_t + \sum_{l=1}^{k} \beta_l Z_{i,l,t} SHOCK\_C_t$ impact of common shock + structural factors.
conditioning its absorption.
$+ \alpha Y_{i,t-1} + \sum_{j=1}^{k} \alpha_j Z_{i,j,t} Y_{i,t-1}$ recovery from past output gaps + structural factors.
conditioning recovery.
$+ \sum_{m=1}^{n} \gamma_{i,m} (Q_{i,m,t} - \bar{Q}_{i,m}) + u_{i,t}$ 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 the output gap such as interest rates; $\bar{Q}$ the equilibrium value of the macro-economic variable; and with i the country index, t the time index, k the number of structural factors and m the 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, with a lower value indicating a faster recovery.

Several issues have to be taken into account when estimating the above equation. *First*, problems of multicollinearity[31] are partly addressed by estimating variants of the baseline model. *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). Problems of simultaneity have been addressed by taking 3-year moving averages of the interaction variables, except for the instrumentalised variables that include the short-term interest rate, public debt, private debt and the real effective exchange rate. *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. These problems have been addressed by applying an appropriate generalised least squares estimator.[32] *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, the output gap is zero in the long term by construction, which still holds even in our relatively short sample of 18 years). Note that the absence of country fixed effects also implies that we do not have a standard dynamic panel model where the joint presence of fixed effects and

[30] Unlike Blanchard and Wolfers (2000), who also test the impact of the institutional dimension in shock propagation (aiming at the labour market), a two–step approach is followed. This is because the "resilience regression" equation is fairly complex (see Section 3.2) due to the large number of regressors. In a potential nested regression all time dummies would have to be interacted with the Z factors, which is not feasible due to the lack of degrees of freedom.

[31] The explanatory variables may be correlated with each other both across countries (e.g. a flexible labour market is reflected in numerous labour market indicators) and across time (structural characteristics are often changed as part of a reform package).

[32] However, as in this exercise the number of time periods is low compared to the 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 the consistency of the estimates.

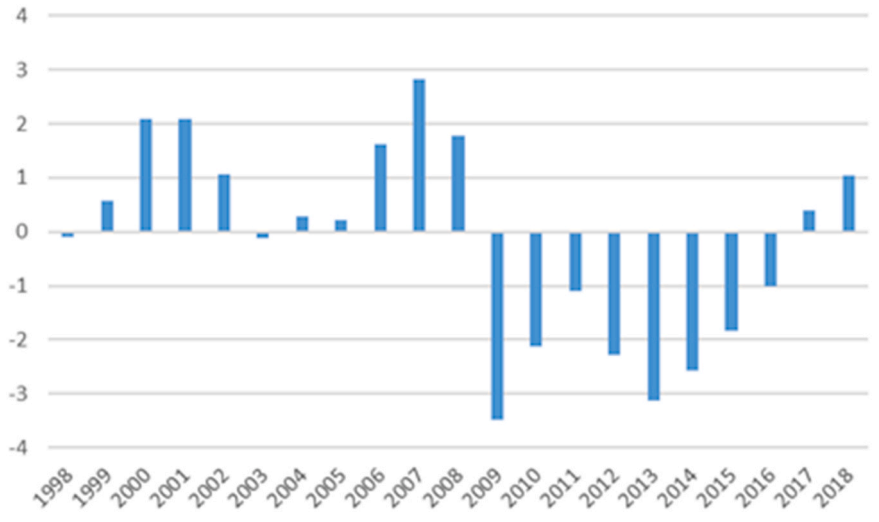


Fig. Graph 6. Estimation of common shocks.
Source: Authors' estimates.

lagged dependent variables requires the use of generalized method of moments type estimators such as Arellano-Bond.[33] Finally, a low significance level for a point estimate of 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 the variation of indicators).

3.3. Variable selection by Bayesian model averaging

One prominent issue related to the estimation of the aforementioned equation is model uncertainty. Namely, macroeconomic resilience in terms of output is a very broad concept, which is affected by many factors. *First*, putting all the potential explanatory 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. Moreover, it is impossible to design sequential testing to deal effectively with the multicollineary between diverse relevant variables as well.

Bayesian model averaging (BMA) is able to deal with the aforementioned challenges of standard (panel) regression. BMA takes into account model uncertainty by considering the model combinations and weighting them according to their model fit.[34] 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). BMA gives each model γ a weight that captures the model's fit (similar to an adjusted R2) and reports weighted averages of the models' regression parameters and standard deviations, using posterior model probabilities from Bayes' theorem:

$$p(M_\gamma|Y_{i,ti,t}Z_{i,l,t}) \propto p(Y_{i,t}|M_\gamma, Z_{i,l,t})p(M_\gamma)$$

where $p(M^\gamma|Y_{i,ti,t}Z_{i,l,t})$ is the posterior model probability, $\propto$ a sign of proportionality, $p(y|M^\gamma,Z_{i,l,t})$ the marginal likelihood of the model and $p(M^\gamma)$ the prior probability of the model. The posterior model distribution of any statistic is then obtained from θ model weighting as follows:

$$p(\theta \mid M^\gamma, Y_{i,t_{i,t}}Z_{i,l,t}) = \sum_{\gamma=1}^{2^K} p(\theta \mid M^\gamma, Y_{i,t_{i,t}}Z_{i,l,t}) \frac{p(M^\gamma \mid Y_{i,t_{i,t}}Z_{i,l,t})p(M^\gamma)}{\sum_{j=1}^{2^K} p(y \mid M_j, Z_{i,l,t})p(M_j)}.$$

[33] The use of such estimators would be unfeasible in our case as lagged dependent variables appear in numerous interactions with structural factors. 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 (e.g. Aitken and West, 1991). However, 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 wide range of factors, are on average also 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.

[34] 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).

To express the lack of prior knowledge about the parameters and models, uniform priors are used. For the vector of coefficients β Zellner's g prior is used as Eicher et al. (2011) have shown that the application of the uniform model prior and the unit information prior to the parameters in the model performs well for forecasting. Moreover, a posterior inclusion probability (PIP) is reported for each variable to show the probability with which the variable is included in the true model:

$$PIP = p(\beta^{\gamma} \neq 0 \mid y) = \sum_{\beta^{\gamma} \neq 0} p(M^{\gamma} \mid y)$$

The large number of potential variables entering into our BMA renders the enumeration of all potential combinations of variables not only time consuming but even infeasible (Feldkircher and Zeugner, 2009). Therefore, we use the Markov Chain Monte Carlo (MCMC) sampler developed by Madigan and York (1995) to obtain results for the most important part of the posterior model distribution. The quality of the MCMC approximation of the actual posterior distribution is linked to the number of draws the sampler is set to go through during the estimation process (iterations). However, the MCMC sampler might start sampling from models that do not yield the best results and only after some time converge to models with high posterior model probabilities. Hence, we discard the initial iterations of the sampler (burn-ins).

4. Empirical results

The empirical analysis is based on an unbalanced dataset that covers around 40 explanatory variables as potential determinants of resilience for the period from 1998 until 2018. These variables interact with the common shock variable (to identify determinants of shock absorption capacity) as well as the lagged dependent variable, i.e. the lagged output gap (to identify determinants of recovery capacity), so that in principle more than 80 explanatory variables can be included in the regression equation underpinning the empirical analysis (see Table A1 in the Appendix[35]). This then poses a problem of degrees of freedom. To deal with this, the following strategy was implemented. *First*, several panel regressions were performed using prior beliefs rooted in economic theory to select the relevant factors affecting shock absorption and recovery. However, this approach has its limitations as some indicators 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 service sectors. *Second*, 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 (see subsection 3.3). This method allows testing even a 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 detailed features thereof) and provides a ranking of the relative importance of such variables. At the same time, as it relies purely on statistical criteria, the results may be difficult to interpret from an economic point of view. Therefore, it seems preferable to rely on complementarities of both approaches.

Following the specification discussed in subsection 3.2., the next two subsections examine the statistical significance of the factors discussed above for a country's capacity to absorb a shock (subsection 4.1) and to recover from a shock (subsection 4.2). While the results are presented separately for each phase of macroeconomic resilience, they come from a joint panel regression and the BMA estimation where both interaction terms with shock (shock absorption capacity) and lagged output gap (recovery capacity) are included. The last two subsections discuss the size of the impact of the significant factors on the absorption (subsection 4.3) and recovery capacity (subsection 4.4) respectively.

The transmission mechanisms via which these factors affect the absorption and recovery capacity have been discussed in general terms in Section 2. While the reduced form panel regression and BMA estimation do not allow us to identify the details of the underlying transmission mechanisms, they provide point estimates that can be assessed on their significance and consistency (such as a positive or negative sign) with the narrative developed in Section 2. As such, the subsequent econometric result may provide guidance for the direction of more detailed research.

4.1. Determinants of the shock absorption capacity: statistical significance

4.1.1. Panel regression

Table 1 presents the panel regression results for the absorption capacity. In this case, we look at interaction terms with the shock, i.e. a negative (positive) coefficient means that this specific factor amplifies the shock less (more) persistently and facilitates (hinders) the shock absorption after an adverse shock. The reference panel regression (labelled V1 in Table 1) is specified in terms of aggregate factors. Subsequently, several variants have been estimated. Namely, the indicators of product markets (V2-V5), labour markets (V6) and public governance (V7) are further disaggregated.[36]

[35] The detailed description in the Appendix is essential since the indicators are not normalised in a way to be comparable with each other.

[36] 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 variable biases when interpreting the estimation results of each of the variants. However, it is to be noted that key variables from groups that cannot be further disaggregated (e.g. I. Macroeconomic conditions) are always included.

Table 1
Panel regression – absorption capacity.

	V1 Base model	V2 PMR disaggregated	V3 Entrepreneus hip barriers disaggregated	V4 Trade and investment barriers disaggregated	V5 State control barriers disaggregated	V6 Labour market policies disaggregated	V7 Governance disaggregated
I. Macroeconomic factors							
% Change REER	0.49	1.06	0.84	0.33	0.28	0.17	0.30
Short-term interest rate	-0.50 ***	-0.50 ***	-0.46 ***	-0.52 ***	-0.50 ***	-0.58 ***	-0.51 ***
Public debt (% of GDP)	-0.27 ***	-0.34 ***	-0.38 ***	-0.14 *	-0.41 ***	-0.44 **	-0.32 ***
Private debt (% of GDP)	-0.18 **	-0.20 **	-0.19 **	-0.19 **	-0.35 ***	-0.31 ***	-0.10
II. Working of markets							
A. Product markets							
Product Market Regulation (PMR) - aggrega	-0.29 ***					-0.41 ***	-0.25 **
i) Barriers to entrepreneurship		-0.11		-0.02	-0.35 ***		
- Administrative burdens on startups			0.03				
- Complexity of regulatory procedures			-0.03				
- Regulatory protection of incumbents			0.06				
ii) Barriers to trade and investment		-0.22 *	-0.25 *		-0.35 **		
- Differential treatment of foreign suppliers				-0.32 ***			
-Barriers to FDI and other barriers				-0.40 ***			
iii) State control		-0.13 *	-0.25 **	-0.02			
- price control					0.15 ***		
- network industries					-0.07 **		
B. LABOUR MARKETS							
Labour market rigidity	1.36 ***	1.71 ***	1.67 ***	1.82 ***	2.36 ***		1.18 ***
i) Employment policies - aggregate							
- public emplyment services (PES)						-0.25 ***	
- employee training						-0.20 ***	
- start-up incentives for unemployed						-3.71 ***	
- out-of-work support						0.17 ***	
ii) Employment protection legislation (EPL)						0.13 **	
iii) Wage setting							
- Level of wage coordination (higher value for more coorddination at higher level)						-0.01	
- Level of wage bargaining (higher value for higher level of bargaining)						-0.01	
- Trade union density						0.01 ***	
C. FINANCIAL MARKETS							
i) non-performing loans	-0.02 *	-0.01	-0.02	-0.01	-0.01	-0.02	-0.02 *
ii) bank competition (Lerner - high value fo	0.51 ***	0.41 **	0.45 **	0.50 ***	0.67 ***	1.21 ***	0.58 ***
III. Institutional quality							
A. Fiscal policy quality							
i) Design strength of fiscal rules (higher valu	-0.11 ***	-0.11 ***	-0.11 ***	-0.10 ***	-0.19 ***	-0.14 ***	-0.11 ***
B. Overall public governance	0.24 **	0.29 **	0.27 **	0.42 ***	0.60 ***	0.17	0
i) Rule of law (higher level for stronger rule)							-0.05
ii) Control of corruption							-0.25 *
iii) Government effectiveness							0.53 ***
IV. Deep structural factors							
Trade openness	0.34 ***	0.35 ***	0.31 ***	0.30 ***	0.52 ***	0.14	0.28 ***
Export diversification (Hirschman Herfinda	-1.41	-0.89	-1.30	0.74	-0.92	-7.37 ***	-2.08 *
Employmnt diversification	0.19	0.72	0.36	-2.04	6.93 ***	-2.70	-1.96
Inequality (Gini coefficient, 0 to 100, with O	0.01	0.01	0.02 *	-0.00	0.02 *	0.05 ***	0.02 *
Other							
Shock (stand-alone)	0.34	0.42	0.40	0.40	-0.27	0.56	0.33
Diagnostic statistics							
Adjusted R-squared	0.811158	0.814972	0.817769	0.820972	0.828614	0.846697	0.818400
Adjusted R-squared	277	277	277	277	277	264	277
Durbin-Watson	28	32	36	34	34	42	32

Variant V1 suggests that a diverse range of factors significantly affects the shock absorption capacity, albeit not always showing the sign expected in Section 2. In terms of macroeconomic conditions, the *short-term interest rate*[37] is significant and has the expected negative sign, i.e. monetary tightening slows down the real economic activity. The *public and private debt* variables are also significant. The negative point estimate for public debt is not in line with the hypothesis formulated in subsection 2.1, but may indicate that countries with higher debt have a stronger inclination to absorb falls in private demand via fiscal expansion. A similar result is found for private debt. Variant V1 also paints a general picture of market rigidities, suggesting that a rigid labour market hindered absorption. At the same time, the results also suggest that more stringent *product market regulation* improves the shock-absorbing capacity (in line with Duval and Vogel, 2008). A lack of *competition in the banking sector*[38] weakens the absorption capacity in a significant way, while the point estimate of the *non-performing loans ratio* is rather unstable across different variants.[39] Institutional quality also has the expected impact on shock absorption capacity; a better *design of fiscal policy rules* improved Member States' capacity to absorb shocks, whereas better *overall public governance* is rather counter intuitively suggested to worsen it. From the deep structural characteristics of the economy that are more difficult to tackle by structural reform only trade openness shows as significant. The positive sign of the point estimate of *trade openness* interacting with the common shock suggests that stronger openness amplifies the impact of the common shock, as a common shock adversely affects not only the domestic market but also export markets.[40]

Variant V2 provides a disaggregation of the product market regulation indicator into their three main sub-components, whereas variants V3-V5 further disaggregate each of these three subcomponents. The results suggest that *barriers to trade and investment* such as a different treatment of foreign suppliers seem to facilitate the absorption of common shocks. The impact of *state control* depends on its type, namely *regulation of network industries* improves shock absorption capacity, while *price control* worsens it. Variant V6 shows that the impacts of the various labour market features on the absorption capacity differ notably, suggesting that *active labour market policies* including *public employment services, employee training,* and *start-up incentives* strengthened the absorption capacity, but *out of work support and employment protection legislation (EPL)* weakened it. While *wage setting* seems to have no significant impact on the absorption capacity, a high *density of trade unions* hinders it. Variant V7 shows results for different aspects of institutional quality. The results suggest that better *control of corruption* improves the absorption capacity but also that good *governance* quite counter intuitively worsens it, which may potentially be driven by multicollinearity between several variables of public governance.

4.1.2. BMA estimation

Table 2 below shows the results of the variable selection by means of Bayesian model averaging (BMA), which aims to overcome the problems of lack of degrees of freedom and multicollinearity of previous panel regressions.[41] 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 entire list of 80 potential ones.[42] The BMA selection is jointly performed for absorption and recovery phases (results for recovery capacity appear in Table 4). There are no fixed regressors, thus even variables that are included in all the variants in Table 1 are subject to a statistical selection process.[43]

A bird's eye view of the BMA results suggests that for shock absorption capacity, we can find about a dozen potentially relevant variables (with PIP higher than 0.1) out of 40 potential determinants. The post mean is the coefficient averaged over all models, including those where the variable was not included (the coefficient is zero in this case). Therefore, the estimate can differ from those of the standard panel regression above, which are conditional on regressors included in each variant.

The BMA-selected variables belong to all broad categories defined above. However, labour market characteristics (group II.B) seem to be the most represented category. The *lack of labour market flexibility* emerges as the most robust determinant of shock absorption capacity (the higher the labour market rigidity, the less shock absorption capacity), which is accompanied with *public employment services* (increasing the shock absorption capacity as it helps the unemployed find a new job)*, wage bargaining* (a higher level of bargaining increasing the shock absorption capacity as centralized bargaining makes the wages more rigid and less likely to fall after a negative shock, thereby supporting aggregate demand), *trade union density* (decreasing the shock absorption capacity), and

[37] The short-term interest rate, together with the exchange rate, enters the regression as a stand-alone variable, i.e. they are assumed to affect output constantly.

[38] As measured by the Lerner indicator, which is equal to the difference between output prices and marginal costs (relative to prices) (World Bank).

[39] 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.

[40] Estimating how trade openness would affect the absorption of a country-specific shock would be beyond the scope of this section.

[41] The estimation was performed with the BMS package described in Zeugner and Feldkircher (2015). As the BMA routine requires a balanced sample, the country/year observation where some variables were missing was dropped.

[42] The variables are all those included in the panel regression with the exception of the aggregates of Product Market Regulation and Employment policies that are by construction collinear with their subcomponents.

[43] Table 2 shows only those variables whose PIP was higher than 0.1. The post mean (SD) is the mean (standard deviation) of the estimated coefficients averaged over all models (this includes models where the variables were not included; the coefficient is zero in this case). For easier exposition, the variables are accompanied by the number/letter of the broad category they belong to.

Table 2
Bayesian model averaging results – absorption capacity.

Shock absorption	PIP	Post-mean	PostSD
II.B Labour market rigidity	0.59	0.01	0.01
I. Public debt	0.37	0.01	0.00
II.B Public employment services (PES)	0.31	-0.57	0.93
IV. Employment diversification	0.31	0.99	2.77
II.B Wage bargaining	0.22	-0.04	0.09
II.B Trade union density	0.21	0.01	0.01
Shock (stand-alone)	0.21	-0.26	2.45
II.B Out-of-work support	0.16	0.05	0.12
IV. Export diversification	0.16	0.01	0.01
III. Control of corruption	0.14	0.06	0.16

Notes: 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.

even employment diversification (suggesting that in the case of a common shock all sectors are affected and diversification does not matter) (group IV). Other variables selected from this group are *export diversification* (increases the shock absorption capacity)[44] and *Gini coefficient of disposable income* (higher income inequality, i.e. a higher Gini coefficient, reduces the shock absorption capacity). Macroeconomic conditions (group I) are represented by *public debt*, which reduces the shock absorption capacity. *Control of corruption* is the only significant institutional quality indicator (group III), but with a counter-intuitive sign. There is no variable representing product market characteristics (group II.A).

4.2. Determinants of the recovery capacity: statistical significance

4.2.1. Panel regression

Table 3 presents the panel regression results for the recovery capacity. In this case, we look at the interactions of the factors with a lagged output gap, i.e. a negative (positive) coefficient means that this specific factor makes the output gap less (more) persistent and speeds up (slows down) the recovery after an adverse shock. The reference variant V1 suggests that the determinants of the recovery capacity largely differ from those of shock absorption. Notably, while the impact of *public debt* is insignificant, high *private debt* levels hinder the recovery capacity. Regarding the markets, rigid product markets (more stringent *product market regulation)* tempered the impact of a shock but slowed down the recovery. The former may be due to lower business failure, but this may then also lead to a rise in zombie firms hindering the recovery. The recovery capacity is in turn supported by institutional quality, namely a better *design of fiscal rules* and quality of *overall public governance* improve the recovery capacity by making the output gap less persistent. The negative sign of the point estimate of *trade openness* implies that a higher openness to trade speeds up recovery, while the evidence presented in Table 1 suggested it hindered shock absorption. This then suggests that in case of a common shock, the more open economies are more affected on impact as their trading partners are also affected, but recover faster in the medium term as they can export more strongly to export markets that are also recovering. Finally, *higher income inequality* seems to slow down the recovery.

A disaggregation of the product market regulation indicator (variant V2) points to an opposing impact of *barriers to entrepreneurship*, which slow down recovery, while *barriers to trade and investment* seem to improve the recovery capacity. A further disaggregation of barriers to entrepreneurship (variant V3) shows that the recovery capacity is hindered by *administrative burdens on startups* and *regulatory protection of incumbents.* The unexpected positive role of *barriers to trade and investment* on recovery capacity (variant V4) seems to be mostly driven by *barriers to FDI*. The impact of *state control* depends on its type (variant V5), namely *regulation of network industries* improves the recovery capacity, while *price control* worsens it. Variant V6 shows that the impact of the various labour market features on the recovery capacity differ notably, suggesting that *public employment services* and *out of work support* strengthen the recovery capacity, while *employee training* and *start-up incentives for unemployed* weakened it – a somewhat puzzling result. While *employment protection legislation (EPL)* and *density of trade unions* seem to have no significant impact on the recovery capacity, a high *level of wage coordination*, i.e. low wage flexibility, worsens it. Variant V7 shows results for different aspects of institutional quality. The positive impact of design on *fiscal rules* on recovery capacity is also confirmed in this specification. Within the domain of public governance, the result suggests that *rule of law* improves the recovery capacity but also quite counter intuitively that *control of corruption* worsens it, which may potentially be driven by multicollinearity between several variables of public governance.

4.2.2. BMA estimation

Table 4 below shows the results of the variable selection by means of Bayesian model averaging (BMA). For recovery capacity, we again find about a dozen potentially relevant variables (with PIP higher than 0.1) out of 40 potential determinants. The selected variables belong to all broad categories. The labour market characteristics (group II.B) again turn out to be the most represented category. While *out-of-work support* and *employment protection legislation* worsen the recovery capacity, *employee training* and *public*

[44] Higher values of the Hirschman-Herfindal index mean lower export diversification.

Table 3
Panel regression – recovery capacity.

	V1 Base model	V2 PMR disaggregated	V3 Entrepreneus hip barriers disaggregated	V4 Trade and investment barriers disaggregated	V5 State control barriers disaggregated	V6 Labour market policies disaggregated	V7 Governance disaggregated
I. Macroeconomic factors							
Public debt (% of GDP)	-0.10	-0.00	-0.14	0.07	-0.20 **	-0.17	-0.09
Private debt (% of GDP)	0.18 ***	0.21 ***	0.18 ***	0.12 **	0.19 ***	0.31 ***	0.08
II. Working of markets							
A. Product markets							
(Index scale of 0-6 from least to most restrictive)							
Product Market Regulation (PMR) - aggrega	0.17 **					0.12	0.12
i) Barriers to entrepreneurship		0.19 ***		0.19 ***	0.11 *		
- Administrative burdens on startups			0.11 **				
- Complexity of regulatory procedures			-0.00				
- Regulatory protection of incumbents			0.15 **				
ii) Barriers to trade and investment		-0.26 **	-0.29 ***		-0.15		
- Differential treatment of foreign suppliers				-0.10			
-Barriers to FDI and other barriers				-0.33 ***			
iii) State control		0.09 *	0.07	0.12 *			
- price control					0.12 ***		
- network industries					-0.09 ***		
B. LABOUR MARKETS							
Labour market rigidity	0.32	0.20	0.26	0.42 **	0.65 ***		0.44 *
i) Employment policies - aggregate							
- public emplyment services (PES)						-0.11 **	
- employee training						0.08 ***	
- start-up incentives for unemployed						2.50 ***	
- out-of-work support						-0.04 ***	
ii) Employment protection legislation (EPL)						-0.07	
iii) Wage setting							
- Level of wage coordination (higher value for more coorddination at higher level)						0.08 **	
- Level of wage bargaining (higher value for higher level of bargaining)						-0.06	
- Trade union density						-0.00 *	
C. FINANCIAL MARKETS							
i) non-performing loans	0.01	0.01	0.01 *	0.01 *	0.01	0.01	0.01
ii) bank competition (Lerner - high value fo	-0.24	-0.09	0.25	-0.15	-0.32 **	-0.36 *	-0.08
III. Institutional quality							
A. Fiscal policy quality							
i) Design strength of fiscal rules (higher valu	-0.08 ***	-0.08 ***	-0.08 ***	-0.08 ***	-0.08 ***	-0.06 ***	-0.08 ***
B. Overall public governance	-0.17 *	-0.20 *	-0.12	0.03	-0.14	-0.16	0
i) Rule of law (higher level for stronger rule)							-0.59 ***
ii) Control of corruption							0.38 ***
iii) Government effectiveness							-0.02
IV. Deep structural factors							
Trade openness	-0.31 ***	-0.35 ***	-0.35 ***	-0.30 ***	-0.27 ***	-0.42 ***	-0.21 ***
Export diversification (Hirschman Herfindal	3.18 ***	3.45 ***	2.94 **	4.34 ***	4.39 ***	5.90 ***	4.06 ***
Employmnt diversification	4.50 **	3.41	3.82	2.51	5.49 **	8.69 ***	6.48 ***
Inequality (Gini coefficient, 0 to 100, with O	0.02 **	0.01	0.01	0.00	0.00	0.03 ***	0.02 ***
Other							
Lagged output gap (stand-alone)	-0.65	-0.53	-0.59	-0.75 *	-0.35	-1.11 **	-0.77 *

employment services reinforce it. The product market characteristics (group II.A) play a role for the recovery capacity too (unlike for the shock absorption capacity), namely *administrative burden on start-ups* and overall *state control* hinders it, while *state control of network industries* reinforces it. Among macroeconomic conditions (group I.), *private debt* is found to weigh on the recovery capacity. Institutional quality is represented by *fiscal rules* (that seem to decrease recovery capacity) and *rule of law* supporting the recovery capacity.

Table 4
Bayesian model averaging results – recovery capacity.

Recovery	PIP	Post-mean	PostSD
II.B Out-of-work support	0.74	0.19	0.13
II.A Administrative burden on startups	0.36	0.08	0.12
III. Fiscal rules	0.24	0.04	0.09
II.B Employee training	0.24	-0.24	0.47
IV. Trade openness	0.24	-0.04	0.09
I. Private debt	0.19	0.01	0.00
II.B Employment protection	0.17	0.03	0.07
II.A State control – network industries	0.17	-0.02	0.06
III. Rule of law	0.15	-0.07	0.23
II.B Public employment services	0.13	-0.16	0.48
II.A State control	0.11	0.03	0.09

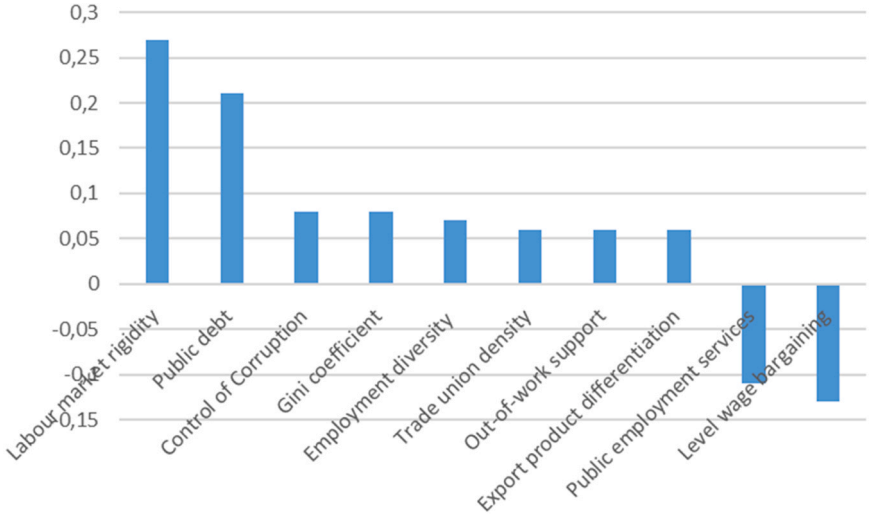
Notes: PIP is post-inclusion probability, indicating that the variable belongs to the true model. Post-mean (SD) is the average estimated coefficient (standard deviation) across the models.

4.3. An integrated view on macroeconomic resilience: overall impact of significant factors

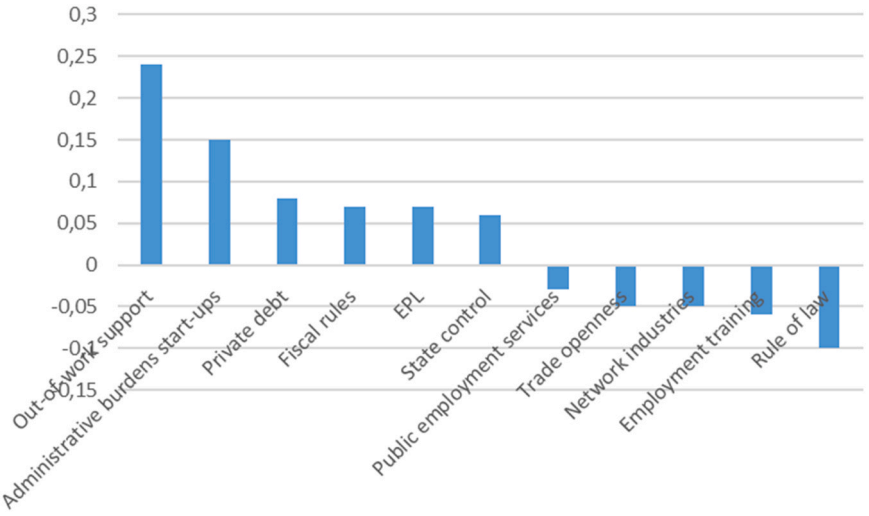
The previous subsection assessed the statistical significance of the various factors affecting macroeconomic resilience applying panel regressions as well as BMA. While many results are consistent across these two methods, there are some notable differences. For example, for some factors, such as public debt or labour market policies, the two methods provided point estimates with a different sign, or some variables that turned significant in the panel regression did not make it among the most relevant factors selected by the BMA. This may be the result of the choice of specifications used in the standard panel regression analysis, which was driven by theoretical considerations of the specific structure of the interactions as well as of multicollinearity and simultaneity, i.e. the estimates are conditional on each specific variant. On the contrary, the BMA provides a ranking of variables that belong to a "true model" taking into account overall model uncertainty, i.e. considering specifications that were never considered in the standard panel framework.

For example, some of the regressors, such as the macroeconomic factors that were included in all the panel variants, are subject to a statistical selection process, and may not be among the most relevant factors (e.g. the short-term interest rate). Interestingly, the post means from the BMA, which are the coefficients averaged over all models, including those where the variable was not included (the coefficient is zero in this case), seems to be more in line with the prior theoretical consideration outlined in Section 2. Therefore, this subsection provides an estimate of the overall impact of the most significant factors on resilience by multiplying the post means of the most robust indicators pre-selected by BMA (Tables 2 and 4) with its sample mean (2008–2018). The relative contribution of each variable to shock absorption capacity appears in Graph 7, and to recovery capacity in Graph 8. The transmission mechanisms via which these factors affect the absorption and recovery capacity have been discussed in Section 2.

Graph 7 provides estimates of the size of the significant factors affecting a country's absorption capacity. First, labour market rigidity seems to have a strong adverse impact on a euro area country's capacity to absorb a common shock. But the evidence also indicates that active labour market policies such as job search assistance programmes (Card et al., 2010) that better connect



Graph 7. Factors affecting absorption capacity. *Notes:* Estimates based on BMA results in Table 2, i.e. variables with PIP ≥ 0.1 are evaluated for the period 2008–20184. The scale on the Y-axis measures the ppt. change in the output gap.



Graph 8. Factors affecting the recovery capacity, *Notes:* Estimates based on the BMA results in Table 4, i.e. variables with PIP ≥ 0.1 are evaluated for the period 2008–20184. The scale on the Y-axis measures the ppt. change in the output gap.

jobseekers with employers and a higher level of wage bargaining strengthened this capacity (Hijzen et al., 2018). By contrast, passive labour market policies such as the provision of out-of-work support weakened the absorption capacity, but very moderately. Second, high public debt also weakens the absorption capacity, which should not be surprising as a high public debt level limits the room for counter-cyclical public measures and automatic stabilisers in the case of a temporary shock. Third, higher income inequality reduces a country's absorption capacity, in line with the literature reporting that the marginal propensity to spend available income is much higher for low income deciles than for high income deciles (e.g. Cynamon and Fazzari, 2016). Fourth, diversification of export goods and services and control of corruption seems to weaken the absorption capacity of common shocks.[45] While this result is not consistent with prior theoretical considerations, its quantitative relevance is fairly limited. Finally, the absorption capacity is not affected by the working of product markets.

Graph 8 suggests that out-of-work support (including unemployment benefits) is the main factor having an adverse impact on the recovery capacity, as high support may reduce the incentives of the unemployed to accept a job. Likewise, the recovery capacity seems to be weakened by employment protection legislation because it hinders the reallocation of labour.[46] At the same time, employment training and public employment services support the recovery capacity because they facilitate the reallocation of labour.

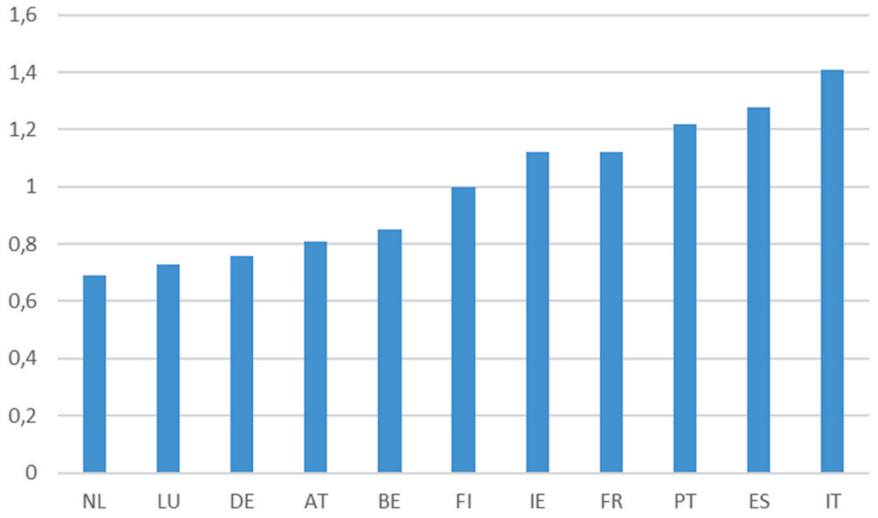
At the level of product markets (that were found to play a very limited role for shock absorption capacity), the results suggest that higher levels of administrative burdens on start-ups and state control weaken the recovery capacity. Better regulated network industries in turn strengthen the recovery capacity, probably because they provide collective services (including gas and electricity) that are essential inputs in the production process. These findings are consistent with the literature on institutional quality showing that characteristics such as red tape or administrative and bureaucratic quality constitute a differentiating factor among euro area countries' recoveries (Papaioannou, 2015).

Among macroeconomic factors, high private debt as a percentage of GDP weakens the recovery capacity. High private debt may weaken the recovery capacity as a higher debt service associated with higher debt reduces the capacity to invest and consume, slowing down the recovery (e.g. Claessens et al. (2012)). In turn, lower investment and consumption may put downward pressure on prices, leading to a rise in the real debt burden that may further lower investment and consumption (debt deflation) with adverse macroeconomic feedback loops to the rest of the economy in its wake (e.g. Ernst et al., 2017).

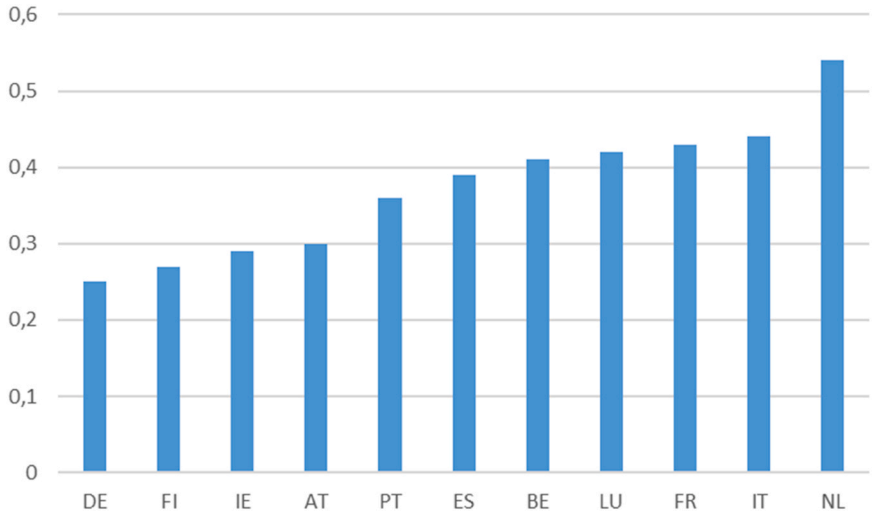
At the institutional level, the results suggest that higher levels of rule of law strengthen the recovery capacity as they reduce uncertainty for instance, but stricter fiscal rules may hinder the recovery capacity. Finally, higher trade openness improves the capacity to recover from a common shock.

[45] The literature is ambiguous on trade specialization. Caselli et al. (2020) argue that if specialization occurs in intrinsically volatile sectors, or in sectors that are subject to shocks that correlate with a country's aggregate shocks, trade specialization may temper resilience. However, stronger trade openness may also induce stronger specialization, which in turn may increase vulnerability and volatility (see, for instance, Di Giovanni and Levchenko, 2009).

[46] At the macro level, Duval and Vogel (2008) provide evidence that strict EPL may dampen the impact of the shock, but it contributes positively and significantly to the persistence of shocks. At the micro level, focusing on the smallest firms, Millán et al. (2013) report that strict employment protection legislation (EPL) is negatively related to both hiring and firing decisions of these firms.



Graph 9. Shock absorption capacity in the case of a common shock. *Notes:* Estimates based on Table 2, evaluated for the period 2008–2018. The scale on the Y-axis measures the ppt. change in the output gap.



Graph 10. Recovery capacity in case of a common shock. *Notes:* Estimates based on Table 4, evaluated for the period 2008–2018. The scale on the Y-axis measures total recovery speed.

4.4. Relative performance of euro-area Member States

Graph 9 shows Member States' overall capacity to absorb a common shock, combining the impact of all individual factors in a country making use of the BMA post means.[47] Member States recording a high value for this parameter will experience a stronger output loss when hit by a common shock than Member States recording a low value. The chart suggests that Italy, Spain and Portugal show the lowest shock absorption capacity and thus the strongest impact of a common shock, which seems to be a reflection of more rigid labour markets and higher public debt ratios. On the opposite side, the Netherlands and Luxembourg shows a strong absorption capacity, which seems to reflect its lower public debt, less labour market rigidities and more effective active labour market policies.

Graph 10 shows Member States' overall capacity to recover from a common shock. Germany shows the strongest capacity to recover from a common shock, partly reflecting its lower product market regulation and more effective active labour market policies. The Netherlands demonstrates the weakest recovery capacity, which seems to be related to the previous finding where the

[47] Note that other studies usually take an unweighted average of normalised scores for various relevant factors to assess resilience at the national level (see, for instance, Alessi et al., 2018). This paper allocates very specific weights to each of the individual factors based on the point estimates of the regression analysis described above. This should be less arbitrary, improving the overall accuracy of ranking Member States' performances.

country achieves the highest level of shock absorption and thus there is less to recover from. Although the Dutch labour market performs well among advanced economies, factors such as a relatively higher private debt ratio may also explain its lower recovery capacity.

5. Conclusions

The macroeconomic resilience of Member States' economic structures is crucial for the well-functioning of the EMU. Indeed, if Member States of the euro area displayed similarly strong performances in terms of absorption and recovery from common shocks, common policy tools such as the common monetary policy would become more effective. Stronger economic resilience at the national level would not only provide stronger stability in terms of income and employment, but 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.

This paper investigated the empirical significance of a wide range of factors that may affect the euro area economies' capacity to absorb and recover from a common shock. To our knowledge, it is the first attempt to assess the impact of individual factors on macroeconomic resilience at a highly disaggregated level, while at the same time taking into account a very wide set of potential resilience drivers.

As a caveat it should be remembered that the analysis provides empirical results within the limits set by data availability and the use of a reduced-form panel regression and BMA estimation. 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 particularly 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.

The empirical analysis highlighted that macroeconomic resilience is affected by a diverse set of factors whereby macroeconomic conditions including public and debt levels interact with features of labour and product markets and other institutional features of the countries. While the shock absorption capacity seems to be driven by different factors than the recovery capacity, the labour market characteristics play a very significant role in both. In addition, specific factors may have a different impact on the absorption capacity than on the recovery capacity. For example, 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 simultaneous recovery of trading partners. Such ambiguities call for a well-balanced design of policy reforms. The results also confirmed that there are notable differences among the euro area Member States in terms of both absorption and recovery capacity.

Appendix

Appendix Table A1.

Table A1
Dataset.

Factor		Source
Output gap	*Gap between actual and potential gross domestic product*	AMECO
Common shock	*Stochastic disturbance arising outside the economic system*	Authors' estimate
I. Macroeconomic factors		
% Change REER	*Real effective exchange rates, based on unit labour costs relative to the rest of 37 countries*	AMECO
Short-term interest rate	*Nominal short-term interest rate*	AMECO
Public debt (% of GDP)	*General government consolidated gross debt :- Excessive deficit procedure (based on ESA 2010*	AMECO
Private debt (% of GDP)		
II. Working of markets		
A. Product markets		
Product Market Regulation (PMR) - aggregate	*Aggregate of items below. Index scale 0-6 from least to most restrictive.*	
i) Barriers to entrepreneurship	*The OECD prioduct market regulation indicators have been published for most OECD countries*	OECD
- Administrative burdens on startups	*every 5 years between 1998 and 2013. Published with new methodology in 2018. Missing*	
- Complexity of regulatory procedures	*years between 1998 and 2013 have been interpolated; missing data as of 2014 are*	
- Regulatory protection of incumbents	*extrapolated based on information available in 2018 vintage.*	
ii) Barriers to trade and investment		
- Differential treatment of foreign suppliers		
-Barriers to FDI and other barriers		
iii) State control		
- price control		
- network industries		
B. LABOUR MARKETS		
Labour market rigidity		
i) Employment policies - aggregate	*Aggregate of items below*	
- public emplyment services (PES)	*PES and administration - Public expenditure per unemployed*	OECD
- employee training	*Training - Public expenditure per unemployed*	OECD
- start-up incentives for unemployed	*Start-up incentives - Public expenditure per unemployed*	OECD
- out-of-work support	*Out-of-work income maintenance and support - Public expenditure per unemployed*	OECD
ii) Employment protection legislation (EPL)	*Employment protection. Index scale of 0-6 from least to most restrictive.*	OECD
iii) Wage setting		
- Level of wage coordination	*The predominant level of wage bargaining. Ranging from 1 = predominantly local or company level to 5 = predominantly central or cross-industry level*	ICTWSS
- Level of wage bargaining	*Coordination of wage-setting. Ranging from 1 = fragmented to individual firms or plants to 5 = maximium coordination*	ICTWSS
- Trade union density	*Proportion of employees who are member of a trade union (among all employees)*	ICTWSS
C. FINANCIAL MARKETS		
i) non-performing loans	*Ratio of defaulting loans to otal value of loan portfolio).*	World Bank/European Commission
ii) bank competition	*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.*	World Bank
III. Institutional quality		
A. Fiscal policy quality		
i) Design strength of fiscal rules	*Indicator covering all types of numerical fiscal rules (budget balance, debt, expenditure, and revenue rules) at all levels of government (higher value for better design).*	European Commission
B. Overall public governance		
i) Rule of law (higher level for stronger rule)	*Reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence (-2.5 (weak) to 2.5 (strong) governance performance)*	World Bank Worldwide Governance indicators
ii) 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. (-2.5 (weak) to 2.5 (strong))*	World Bank Worldwide Governance
iii) 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 provided are estimate of governance (from -2.5 (weak) to 2.5 (strong))*	World Bank Worldwide Governance indicators
IV. Deep structural factors		
Trade openness	*(exports+imports/GDP in current prices*	Authors
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).* *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
Employmnt diversification	*Sum of squared deviation of sectoral employment share from 1 divided by number of sectors*	authors
Inequality (Gini coefficient,)	*Gini coefficient of equivalised disposable income. Scale form 0 to 100, with 0 perfect equality c*	Eurostat

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