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The role of national settings in the economic resilience of regions—Evidence from recessionary shocks in Europe from 1990 to 2014

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Abstract

This paper focuses on the particular role of the national setting for the economic resilience of regions during the resistance and recovery phase. Our empirical set-up introduces a spatial hierarchy of 249 NUTS-2 regions nested in 22 European countries while it includes numerous recessionary shocks from 1990 to 2014. Our results suggest that the impact of the national setting is strongest during the resistance phase when the national level accounts for up to 44.9% of the variance in regional GDP development. During recovery, however, the national share decreases but still amounts to no less than 22.0%. Apart from the direct effects that originate from, for example, regulatory density and fiscal policy measures, the national impact takes the form of cross-level moderation effects. These indirect effects indicate that the regional patterns of resilience are additionally shaped by the inter-linkages of country-specific institutional factors and regional determinants. Taking all this into account, regional economic resilience is anything but just a matter of regional capacities.

Christian Hundt and Linus Holtermann are contributed equally to this work.

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1 | INTRODUCTION

The “Great Recession” of 2008/2009 undoubtedly inspired the academic debate on regional economic resilience. Since the world economy was hit by the hardest economic crisis in decades, the number of theoretical and empirical contributions to this topic has been increased considerably. Nevertheless, most of these studies either treat regional economic resilience as an exclusively regional phenomenon or they neglect the phase-related character of the resilience process (see Section 2 for a comprehensive literature overview). Both restrictions are problematic. First, the relative bias towards the regional level clouds the fact that regional economies are not isolated from their environment but nested within a country-specific institutional setting and thus exposed to its influence. Second, the suppression of the multiphase character of resilience, as, for instance, the distinction into a resistance and a recovery phase, leads to ignoring potentially diverging mechanisms across sequent phases and hence to imprecise, if not false conclusions. In addition to this, most of the existing studies are restricted to the recession of 2008/2009 which limits the transferability of their findings to other contexts and prevents them from deducing more generalisable insights on the shock-resilience nexus, respectively.

In this study, we make use of an integrated econometric approach that scrutinises resilience from both a spatial and a temporal perspective to overcome the aforementioned limitations. For this purpose, we take three measures. First, we get past the regional bias by introducing a more nuanced spatial hierarchy that not only includes 249 NUTS-2 regions but also incorporates the national setting of 22 European countries as an additional autonomous level. Second, we disaggregate the resilience process into a resistance and a recovery phase to reveal phase-specific cross-level mechanisms that would remain indistinguishable otherwise. Third, in order to identify mechanisms that are valid beyond the scope of the 2008/2009 recession, we cover an extended time span from 1990 to 2014 including numerous recessionary shocks in a total of 22 countries. In accordance with the research gaps identified above, our investigation pursues three interrelated objectives. The first is to quantify the overall importance of the national setting for the economic resilience of regions. The second is to examine whether the impact of the national setting is either constant over time or shows phase-specific features. Eventually, the third objective is to test to what extent regional determinants are moderated by country-level factors and whether this relationship is characterised by phase-related patterns.

The remainder of this paper is structured as follows: The theoretical and empirical state-of-the-art is presented in Section 2. Section 3 builds up the framework. Here, we first delineate the shock events (Section 3.1), before we operationalise the phase-related patterns of resilience (Section 3.2) and the spatial hierarchy of resilience determinants (Section 3.3). The structure of the corresponding econometric model is set out in Section 4. In Section 5, we present the patterns and mechanisms of resilience determinants in European regions as derived from our baseline models and verified by a comprehensive series of robustness checks. In the closing Section 6, we critically discuss the central findings and their contribution to theory development, address the limitations of our approach, and highlight important areas of future research.

2 | THE MISSING PIECES IN CURRENT RESILIENCE RESEARCH

2.1 | Conceptual state-of-the-art

The focus of research on the regional economic resilience is on two main questions (Martin, 2012; Martin & Sunley, 2015; Martin et al., 2016; Simmie & Martin, 2010): (1) How do regional economic

systems react to external shocks in a short, middle, and long-term perspective? (2) Why do regional economies differ in terms of their capacities to resist, to recover, and to adapt? Question (1) puts emphasis on the temporal dimension of resilience. In this study, we adopt a short-term perspective that is captured by the engineering concept and can be best modelled by means of the resistance and recovery phase (Martin, 2012). The reference state of engineering resilience is a region-specific equilibrium growth path. From this viewpoint, resilience can be defined by the region's ability to bounce back from a shock-induced downturn and to return to its pre-shock growth path, respectively. The faster and the more comprehensive the return, the more resilient is the regional economy (Simmie & Martin, 2010).¹

Question (2), instead, refers to the possible determinants of resilience. These determinants need to be structured according to useful criteria. From a geographical perspective, this involves localisation and spatial hierarchies. Again, it is Martin and Sunley (2015) who provide the hitherto most comprehensive list of potential resilience determinants. These factors are sorted into five main categories: *industrial and business structure*, *labour market conditions*, *agency and decision-making*, *financial arrangements*, and *governance arrangements*. Although they are mainly divided up by content-related criteria, an underlying hierarchical structure becomes evident to some extent. In this regard, the category *agency and decision-making* primarily addresses determinants that are tied to players at the micro level, while determinants with a predominantly local/regional reference are assigned to the categories *industrial and business structure* and *labour market conditions*. The two remaining categories, though, do not have a distinct spatial reference. Both *financial arrangements* and *governance arrangements* include determinants from the local as well as from the national or, in the case of the latter category, even the international level. The existence of a hierarchical system of resilience determinants, however, is not put into question.

Adding another feature to their conceptual framework, Martin and Sunley (2015) suggest that the impact of resilience-related economic attributes is—at least partly—phase-specific. For this reason, the authors distinguish between *inherent/inherited* factors on the one hand and *adaptable* factors on the other. While inherent/inherited factors are expected to be relevant in particular during the resistance phase, adaptable factors are assumed to primarily shape the recoverability of a region. It should be noted, however, that both groups are anything but strictly dissimilar. For the most part, they refer to common parameters including *sectoral structure*, *exports*, *productivity*, *technology*, *policy regime*, and *external relations*. From this, one can conclude that resistance and recovery are not necessarily affected by per se different factors, but by a set of widely similar determinants whose impact is likely to vary from phase to phase.

The combination of the aforementioned key considerations from Martin and colleagues provide us with the conceptual state-of-the-art. Therefore, regional resilience can be considered (a) a *multi-phase process* that is influenced by (b) *hierarchically structured*, and (c) *phase-related* determinants. It results from this conclusion that research in this field, though nominally directed at the regional level, cannot afford to disregard the phase-specific impact of the surrounding national setting and its cross-level interactions with regional determinants.

2.2 | Gaps in empirical research

The key considerations of Martin and colleagues provide a clear agenda for empirical research. Hence, in a next step and in line with the three conceptual dimensions as identified above, we concisely assess whether and to what extent previous empirical investigations have addressed (a) the phase-specific operationalisation of resilience, (b) the spatial hierarchy, and (c) the phase-related structure of the

underlying determinants.² A tabular overview of our literature review is given in online Appendix A1. The findings are mixed. While the phases (a) and the phase-related determinants (c) of resilience are becoming increasingly integrated into empirical research, the national setting (b) remains largely ignored.

More specifically, we find that 7 out of 31 studies concurrently investigated both phases (a) and phase-related determinants (c). Such investigations include, to begin with, Martin (2012) and Martin et al. (2016), who examine the resistance and recoverability of UK regions covering three, respectively four recessionary shocks within a time span from 1971 to 2014. As for the determinants, the authors focus on regional industries and make use of either descriptive measures (Martin, 2012) or shift share analysis (Martin et al., 2016) to assess the mutual relation between the sector structures and resilience capacities over time. Further country-specific studies that explicitly distinguish between resistance and recovery are conducted by Pudelko et al. (2018) and by Di Caro (2014). While Pudelko et al. (2018) concentrate on the Great Recession and its impact on Western German regions, Di Caro (2014) focusses on Italian regions and takes into account three major shocks from the early 1980s onwards. Both studies put special emphasis on the regional sector structure and make use of regression-based techniques to assess its resilience-related impact.

The resilience of EU regions, in turn, is investigated by Davies (2011) and by Fratesi and Perucca (2018). Focusing on the Great Recession, both studies divide resilience into a resistance and recovery phase and apply linear regressions to analyse the phase-related patterns of potential determinants: policy measures in the case of Davies (2011), assets of territorial capital in the case of Fratesi and Perucca (2018). A seventh study that addresses the resistance-recovery nexus as well as the respective impact of determinants is carried out by Balland et al. (2015). Covering a time span from 1975 to 2002 and using various regression methods, the authors examine *technological* resilience through the example of US cities. Consequently, resilience is measured by patents, not on the base of GDP (Fratesi & Perucca, 2018; Pudelko et al., 2018) or via (un-) employment (Davies, 2011; Di Caro, 2014, 2018; Martin, 2012; Martin et al., 2016).

What all seven studies have in common, though, is that they are restricted to the regional level alone and thus do not capture the hierarchical structure (b) of determinants. In other words, the national setting is disregarded. This limitation, however, is at least partly redressed by works of Crescenzi et al. (2016) and Giannakis and Bruggeman (2017). Crescenzi et al. (2016) take into account both the regional and national determinants as they examine the resilience of EU regions during the Great Recession. Whilst choosing one-level regression procedures, though, the authors forego the possibility of modelling cross-level interactions. Giannakis and Bruggeman (2017) investigate the impact of the 2008/2009-crisis on EU regions, too, but apply, alternatively, hierarchically structured regression techniques to explicitly model spatial hierarchies. Yet, they do not include national determinants and consequently, in this regard similar to Crescenzi et al. (2016), do not explore interactions across different spatial levels. Besides, neither Crescenzi et al. (2016) nor Giannakis and Bruggeman (2017) account for the process character of resilience and distinguish between a resistance and a recovery phase, respectively.

The empirical state-of-the-art can thus be summarised as follows: On the one hand, at least 7 out of 31 studies have modelled successive phases of resilience (a) while accounting for the phase-specificity of the corresponding determinants (c) at the same time. On the other hand, only little attention is paid to the fact that regional economies are embedded in a specific national setting (b). In fact, so far only two studies have addressed this matter at all and have either investigated regional and national determinants (Crescenzi et al., 2016) or modelled spatial hierarchies (Giannakis & Bruggeman, 2017). None of these two studies, however, have tested cross-level interactions. It hence remains unknown to what extent the impact of regional determinants is influenced by the national setting. What is more, no empirical

study up to date has incorporated different phases as well as phase-related and hierarchically structured determinants into one holistic estimation procedure, let alone testing resilience mechanisms beyond the Great Recession. In view of these research gaps, we intend to scrutinise the phase-specific impact of the national setting on the economic resilience of regions whilst paying particular attention to cross-level moderation effects. Also, our analysis is not restricted to only one shock in one country. Instead, it incorporates numerous recessionary shocks from 1990 to 2014 in a total of 22 European countries.

3 | CONCEPTUAL FRAMEWORK

3.1 | Identification of exogenous shocks

We adopt a macroeconomic concept that defines shocks as structural disturbances in the macroeconomic environment. These disturbances are sudden events that adversely affect the economic environment over a limited period of time. The shocks should fulfil the following three characteristics (see among others: Blanchard & Watson, 1986; Ramey, 2016): (1) the shocks are “exogenous forces” that are “economically meaningful”; (2) the shocks are uncorrelated with each other; (3) the shocks are unanticipated.

Following Martin et al. (2016) and Fingleton et al. (2012), we employ *national recessions* as shock events to the respective sub-national regions. We define a national recession as a year with negative output growth, whereby output is measured by inflation-adjusted GDP per capita. Those contractions of the output-cycle are (in general) unpredictable for economic agents and are “meaningful” in the sense that they reflect disruptions in the macroeconomic system as a whole and not only exert economic pressure on isolated regions. By looking at national downturns, we can exclude region-specific crises that may arise from structural growth weaknesses, “slow burns” or endogenous output drops on regional level. Even though it is unlikely for the growth performance of a single region to cause a national recession, it is arguable that our identification strategy might not be fully exogenous since national growth performance is the weighted average of regional growth rates. Hence, we introduce *banking crises* as a second shock indicator to validate the exogeneity of the recession indicator.³ In our sample, most of the national recessions are direct consequences of banking crises (see online Appendix A2 for an overview of national recession dates and bank crises dates). As, in turn, the determination of banking crises dates is independent of the output growth of regions or countries, our identification procedure is likely to meet the assumption of exogeneity.

Furthermore, our case study meets the assumption of uncorrelated shocks as both national recessions and banking crises occur at irregular intervals and are characterised by prolonged periods of economic growth between shock events. Possible exceptions are the national downturns in 2008/2009 and 2011/2012 during the aftermath of the global economic crisis. We adopt the reasoning of Reinhart and Rogoff (2014) and consider these successive recessions as a “double dip” (for a detailed explanation, see Section 3.2).

In the next step, we test the assumption of the unpredictability of shocks. For this purpose, we compare 1-year ahead growth forecasts obtained from the IMF World Economic Outlook database with historically observed national growth rates. More precisely, we regress the forecast error (the difference between actual observed growth rate and midyear forecast in the previous year) on the recession or banking crisis dummy indicator. Table 1 shows the estimation results. The regression results corroborate the assumption that national recessions, as well as banking crises, are unanticipated events. The negative and statistically significant coefficients indicate that the actual outturn of growth in recession or banking crisis years is well below the expected growth rate.

TABLE 1 IMF forecast errors for output growth

Shock types	National recessions	Bank crises
Next year forecast error	−.0349*** (.0023)	−.0364*** (.0043)

Notes: Regressions include country dummies to control for the forecast error that is "typical" for each country. The recession (banking crisis) indicator is one in years of national recessions (banking crises) and zero otherwise. ***, **, * denote significance at the 1%, 5%, 10% level, respectively.

3.2 | Delimitation of resilience phases

We define a shock-induced regional crisis as an interval that starts with contraction in regional GDP per capita and ends when GDP per capita returns to its pre-event level, or, alternatively, to its counterfactual trend-level. We specialise in recessionary shock episodes where regional growth decelerates to a negative rate because of a shock-induced disturbance in the macroeconomic environment (see Figure 1a). This procedure enables us to exclude slowdowns of growth dynamics due to long-run growth volatility and growth decelerations that are postulated by regional growth theory, for example, those that are generated by convergence to a steady state in neoclassical growth models (Hausmann et al., 2006). Fixing the starting date and the turning point for each region to the dates of the system-wide national recession, bears the risk of ignoring that the same shock might affect some areas earlier or later (Sensier et al., 2016). Thus, we treat each region as an economic system which responds individually to the national shock-event. In order to separate the immediate post-shock periods from longer periods of "stable" growth prior to the next recession, we further split all regional growth trajectories into three mutually exclusive phases: resistance, recovery, and expansion (see Figure 1a). While resistance and recovery are at the core of our analysis, the expansion phase—defined as all years that are not classified as either resistance or recovery—is only of secondary interest in this study.

The identification of the resistance phases is linked to all regional recessions that occur during the times of national recessions (alternatively: banking crises) or within a window of 1 year around these national shock-events.⁴ The resistance phase starts with the first year of decline in regional GDP per capita and ends when the regional low point is reached (from peak-to-trough). By definition, the average growth rate in this resilience component is negative, but there might be periods of temporally rebound within the phase.

Recovery is defined as the period from the regional low point to the end of crises (trough-to-end), whereby the end date of crisis can be determined in two ways (see Figure 1b). First, the recovery phase ends when the GDP value that immediately preceded the decline is attained again (dashed line). Second, the recovery phase ends when the GDP reaches the presumed level that would have been achieved in the absence of the shock (dotted line). Situations in which the GDP experienced a renewed downturn before reaching the threshold that specifies the end of crisis are regarded as "double dips" (Reinhart & Rogoff, 2014). Under these circumstances, we consider the event as one crisis. Or, put in other words, a crisis cannot start if the region is already in crisis.

Applying the pre-crisis level as reference state in our baseline model is consistent with the concept of "engineered resilience" as the "bounce back" to a pre-shock state is adequately captured in this approach. Moreover, the method has the advantage of being a transparent and readily available measure, which is why it exhibits a wide prevalence in economic studies and is regularly used by the International Monetary Fund (Claessens et al., 2009; Fatás & Mihov, 2013; Hausmann et al., 2006; Mauro & Becker, 2006; Reinhart & Rogoff, 2014; Sensier et al., 2016 among others). Nevertheless, there is an ongoing debate about the advantages and limitations of this method to determine the completion of a crisis. Some authors are concerned that the reference point of pre-event GDP produces a (too) conservative

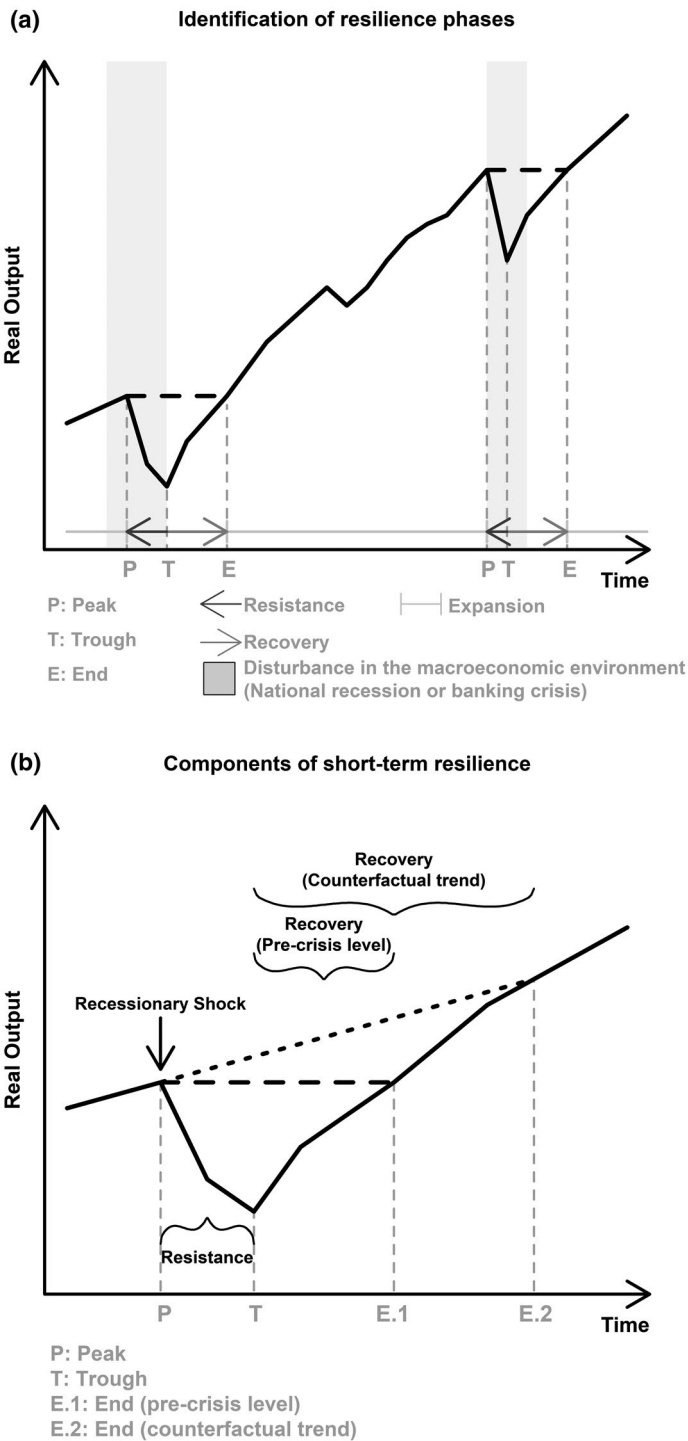


FIGURE 1 Phases of short-term resilience

measure of the length of recovery and the costs of crisis because this method abstracts from trend-growth during the event (e.g., Fatás & Mihov, 2013; Martin et al., 2016; Mauro & Becker, 2006). For this reason, we additionally estimate a counterfactual scenario in which we first measure the average

region-specific growth trend up to 6 years prior to the crisis and then project it into the post-shock period (as symbolised thru the dotted line in Figure 1b). In order to exclude hysteretic effects of shocks on long-run growth trajectories, we restrict the maximum length of the “counterfactual” recovery (indicated by the distance from T to E.2) to be twice as long as the “pre-crisis” recovery (from T to E.1).⁵

In the tradition of a multiphase business cycle as proposed by Burns and Mitchell (1946), we adopt a three-phased framework where expansions are followed by phases of resistance, which are followed by recoveries. The partitioning of the growth path into three discrete regimes can be found in many macroeconomic studies (e.g., Calvo et al., 2006; Cerra et al., 2013; Fatás & Mihov, 2013; Hausmann et al., 2006). As stated by Fatás and Mihov (2013), the three-phase description of the business cycle is close to the spirit of Friedman’s “plucking model” which bears high affinity to the notion of “engineered resilience” (Martin, 2012). The “plucking model” postulates that the output springs back to the long-run trend during recovery phases. Mean-reversion of output implies that the impact of the recessionary shock is transitory and that growth rates during recoveries are on average higher than growth rates in all years of positive growth (Friedman, 1993; Kim & Nelson, 1999). Following these theoretical considerations, it is reasonable to suggest that the underlying growth dynamic is different between recovery years and expansion years. Hence, we consider it useful to isolate the recovery from the expansion phase because otherwise the true impact of recovery-related determinants might be concealed as potentially opposing effects between the phases might smooth each other out due to temporal aggregation. A similar problem arises if we analysed the determinants of overall (short-term) resilience whilst omitting the distinction between resistance and recovery. In our opinion, these procedures could lead to incorrect conclusions as important phase-specific attributes might be masked out. In fact, the question must be asked why opposing directions of crisis-related short-term economic development (downturn during resistance versus upturn thru recovery) should not be accompanied by opposing directions of influences from the underlying economic determinants. Consequently, we assess the impact of short-term resilience determinants separately according to the resistance and to the recovery phase.

3.3 | The hierarchical structure of resilience determinants

In our empirical investigation, we assume that resilience processes in regions (lower level) are not independent of each other but nested in a larger environmental setting (upper level). We scrutinise whether that assumption is appropriate in our sample and whether regional determinants of resilience are coupled to the institutional setting on the upper level. The lower regional level comprises 249 NUTS-2 regions, while the upper national level includes 22 European countries. The units of observations are regions. The hierarchical relationship between regional determinants and external, viz. national condition factors manifests itself through direct and indirect impacts. The latter tells us to what extent regional determinants are moderated by factors from the upper national level. Such cross-level moderations are of particular relevance in our empirical framework since this type of interaction constitutes a direct interplay between determinants from distinct levels within the hierarchical system. For example, factors from the regional and national level can be mutually reinforcing and therefore—in addition to the direct effects—enhance regional resilience by stabilising or increasing growth rates during the times of crisis. Furthermore, the regional determinants are shaped by the context level over time. Regarding this, the similarity of determinants is generally higher in regions within the same country compared to regions from different countries (“intra-class correlation”).

As set out by Martin and Sunley (2015), resilience determinants can be categorised either as inherent or adaptable. Overall, adaptable determinants include government support measures or crisis-driven, hence abrupt adaptations of economic policies. As such, they often lack sufficient data

sources, especially in terms of international comparability, and are often endogenous with respect to crisis due to reverse causality. Therefore, we confine the case study to inherent determinants of resilience. The vast majority of inherent determinants are time sluggish. If at all, they gradually change over longer periods and, correspondingly, cannot be adjusted by policy makers in a short amount of time. Thus, these factors can be regarded as pre-shock or pre-recovery conditions that might shape the economic performance of a region during the corresponding resilience phase (see Section 3.2). Due to our panel set-up with time trends, we are able to account for unobserved heterogeneity between regions and thus control for regional and national differences in time-sluggish (unobserved) factors between regions and for gradual changes in inherent regional and national determinants that are not directly tested in our model (see Section 4).⁶

To evaluate the impact of the institutional environment on regional economic performance during distinct resilience phases and to test for potential moderation effects of the upper hierarchical level, we focus on national determinants for which we are able to obtain statistically comparable data across the sample period ranging from 1990 to 2014. We model the institutional setting by means of the regulatory regime and the extent of macroeconomic stability. With regard to the regulatory density, we make use of two OECD-indices, namely labour market regulation (LMR) and product market regulation (PMR).⁷ In general, we expect a phase-specific impact of the regulatory regime: while a high degree of regulation is, on the one hand, likely to facilitate imperfect competition and thus to stabilise output in the resistance phase, it could, on the other hand, impede the rise of more productive firms when the economy starts to recover. The macroeconomic stability is approximately measured by three variables: government deficit-to-GDP ratio, government debt-to-GDP ratio, and Eurozone membership. Fiscal deficit, the first variable, can be considered as a proxy for anticyclical policies in the sense of Keynes that are implemented to overcome shortfalls of demand and thereby stabilise the macroeconomic environment (Cerra et al., 2013).⁸ In contrast, a high debt-to-GDP ratio is likely to limit the scope of action for active governmental interventions. The same holds for the uniform monetary policy in the Euro currency area that may reduce the output growth in some countries during crises (Fingleton et al., 2015).

At the regional level, we focus on the “industrial portfolio” of a region which is widely considered as a key factor in shaping resilience capacities (e.g., Conroy, 1974; Dissart, 2003; Martin et al., 2016). To capture the economic structure of regions, we include the respective shares of industry, financial, and business services (FBS), and non-market sector in our models. Due to varying “cyclical sensitivities” of sectors, not only the direct impacts on resilience might be different between resistance and recovery but also the moderation effects of the sector-related impacts by institutional factors at country level that are external to a single region might reveal phase-specific patterns. A stricter regulatory regime is assumed to be more harmful in regions that exhibit an above-average share of “cyclical sensitive” sectors, such as manufacturing and production activities. The reason behind this is that a strict regulation is likely to hamper the adjustment processes especially in those sectors that are greatly exposed to cyclical fluctuations and thus depend most on flexibility. Moreover, a high public debt level is likely to impede the growth rate of the non-market sector during macroeconomic downturns as well as during subsequent recoveries as national and regional governments come under pressure to implement cuts in public expenditures.

4 | THE EMPIRICAL MODEL

We utilise a hierarchical linear model that allows taking complex spatial dependencies into account, in our case: regions nested within countries. Disregarding the embeddedness of lower level units

can lead to biased estimates because spatial heterogeneity and “intraclass correlation” are not appropriately captured (Antweiler, 2001; Montmarquette & Mahseredjian, 1989).⁹ One important consequence is that the application of ordinary least squares (OLS) regression models would be error-prone. In our case, the OLS assumption of independent observations is violated. In fact, the error terms are positively correlated as regions in the same country are influenced by the same institutional setting. Hence, if the standard errors were computed under the assumption of an independent and identically distributed error term, they would tend to be downward biased and the risk of Type I errors would increase (Moulton, 1986, 1990).

The following model serves as our baseline model throughout the analysis:

$$y_{ijt} = X_{ijt-1}\beta_r + Z_{jt-1}\lambda_r + X_{ijt-1} \times Z_{jt-1}\gamma_r + \theta_i t + \varepsilon_{ijt} \quad (1)$$

where the dependent variable y_{ijt} denotes our indicator of resilience outcome proxied by growth of real GDP per capita of region i in country j at year t . X_{ijt-1} represents explanatory (exogenous) variables at the regional level including an intercept and economic structure variables. Z_{jt-1} relates to a set of variables at the national level containing country-specific indicators of the regulatory regime and macroeconomic stability. $X_{ijt-1} \times Z_{jt-1}$ denotes cross-level-interactions between region-specific indicators and national externalities. Note that all variables in X_{ijt-1} and Z_{jt-1} are lagged by 1 year to avoid reverse causality with output growth. This assumption implies that regions require time to internalise national externalities and that the economic structure exerts delayed impacts on growth. Since the inherent determinants possess only small year-to-year variations, this assumption is not likely to affect our estimation results.¹⁰ $\theta_i t$ denote region-specific time trends, while β_r , λ_r , and γ_r represent parameters of interest to be estimated. The subscript r indicates that the parameters are regime-specific and hence vary between the three business cycle phases outlined in Section 2.2.¹¹ The hierarchical structure is introduced via the remainder term ε_{ijt} which follows an error component structure:

$$\varepsilon_{ijt} = \alpha_{j,r} + \mu_{ij,r} + v_{ijt,r} \quad (2)$$

$$\alpha_{j,r} \sim N(0, \sigma_{\alpha_r}^2) \quad (3)$$

$$\mu_{ij,r} \sim N(0, \sigma_{\mu_r}^2) \quad (4)$$

$$v_{ijt,r} \sim N(0, \sigma_{v_r}^2) \quad (5)$$

where α_j denotes an unobservable country-specific time-invariant effect which is assumed to be normally distributed. μ_{ij} stands for the nested effect of region i within the j th country, which is normally distributed, while v_{ijt} symbolises the remainder disturbance which follows a normal distribution. The assumption that the nested error components are independent of each other and among themselves is a standard assumption in the literature (Baltagi et al., 2014). We allow for phase-specific unobservable effects on the hierarchical levels to account for potential changes in unobserved heterogeneity. Failing to account for temporal variation in unobserved heterogeneity leads—in case it exists—to omitted variable biases and hence results in invalid inferences in panel data analysis (Park, 2012). This justifies, apart from the region-specific time trends, the interaction of all regression parameters (both observed and unobserved factors) with each of the three model phases. The hierarchical linear model is estimated according to the maximum likelihood procedure as described by Antweiler (2001).

The objective of the statistical model is to isolate the effects of the selected inherent resilience determinant from effects that are related to (unobservable) confounding factors. In this regard, the panel data set-up offers two main advantages. First, we observe a longer time range and can assess the impacts of determinants from several shock-events of the same “nature” (see Section 2.1). This enables the model to absorb all cross-sectional differences in each resilience phase, preventing these average differences from influencing our estimates. Any time-constant region- or country-specific characteristics are accounted for via level-specific effects as expressed in formula (3) and (4). These parts of the error component are catch-all terms for any sources of spatial (unobserved) heterogeneity at regional and national level. This is particularly important as our study focuses on inherent determinants of resilience that are likely to be correlated with confounding time-sluggish factors as, for example, agglomeration economies or varying endowment of (human) capital. Furthermore, gradual changes in region-specific growth rates that may be driven by slowly altering factors, such as demographic shifts, integration in the global economy, evolving institutions or slow adjustments in economic policies as well as long-run conditional convergence, are accounted for by region-specific time trends (Barro & Sala-i-Martin, 2004). Second, the panel model utilises annual data and thereby captures temporal variations in the tested determinants of interest. In contrast to cross-section models that regress static pre-shock values of determinants on resilience indicators, our model recognises that resilience determinants are exposed to potential shock-induced changes and adjustments (besides yearly fluctuations).

To provide evidence for a hierarchical system of resilience determinants we ascertain whether the national institutional setting proves to be relevant in addition to the regional level, and thus may be regarded as an autonomous dimension in explaining variations in resilience across regions. The Intraclass Correlation Coefficient (ICC) indicates the proportion of overall variance in regional growth that can be attributed to a specific hierarchical level in the model. By this measure of variance decomposition, we calculate the relative importance of each nested level. In addition, we have a primary interest in the detection of cross-level interaction effects between the regional and national level in case that the impact of a regional determinant is further moderated by contextual factors at the national level. The coefficient of γ_r indicates whether a statistically significant relationship between determinants across levels arises in different phases of resilience. Finally, we empirically test the (null) hypothesis that the model parameters are equal across the resistance and recovery phase. Its purpose is to detect potentially heterogeneous phase-specific effects of resilience determinants. If the null hypothesis is rejected for a parameter, we can infer that the impact of the corresponding determinant on regional growth varies between the two components of short-term resilience.

5 | THE ROLE OF THE NATIONAL LEVEL FOR THE ECONOMIC RESILIENCE OF REGIONS

The procedure of our empirical analysis consists of three consecutive steps. First, we employ an intercept-only model by means of which we calculate the ICC and assess the phase-specific importance of each level, respectively (see Table 2). Second, we add variables from both the regional and national level, before we test for cross-level interaction effects. We also test the sensitivity of estimation results by moving the endpoint of recovery from “return to pre-crisis level” to “return to counterfactual level” and further replace national recessions by banking crises as exogenous shock events (see Table 3). It should be noted that our baseline model estimates the “average” or “pooled” impact of resilience determinants over the entire sample for shocks that exhibit a similar “nature.” However, as requested by Martin et al. (2016), we bear in mind that the impact of resilience determinants might vary across

TABLE 2 Variance components of the hierarchical system

	(1)			(2)		
	Shock: National recessions			Shock: Banking crises		
	Resistance	Recovery	Expansion	Resistance	Recovery	Expansion
Intercept	-.0327*** (.0052)	.0352*** (.0033)	.0355*** (.0050)	-.0325*** (.0050)	.0349*** (.0039)	.0365*** (.0057)
Variance component: country (σ_α)	.0235	.0130	.0222	.0220	.0162	.0250
Variance component: region (σ_μ)	.0129	.0044	.0047	.0031	.0056	.0034
Variance component: residual (σ_ν)	.0224	.0241	.0278	.0256	.0249	.0274
ICC: country	.4491	.2200	.3822	.4200	.2885	.4512
Adjusted overall R^2	.4228			.4341		

Notes: Variance components of hierarchical levels are expressed as square root of the variance to present the unexplained dispersion on each level in units of the dependent variable. ICC: country indicates the share of country-level variance in overall variance. The models are based on data from 249 NUTS-2 regions nested in 22 countries over 24 years (5,976 observations). ***, **, * denote significance at the 1%, 5%, 10% level, respectively.

different settings. For this reason, we re-run our baseline model for spatial and temporal subsamples (see Table 4).

5.1 | National differences in regional resilience

The first focus of our empirical examination is on the phase-specific impact of the national setting. Table 2 shows the results of the intercept-only model, which are used to establish the share in variance of the two spatial levels under investigation. As stated through the ICC values in the penultimate line, 44.9% of the variance in regional GDP development during resistance phases of national recessions can be attributed to the national level, while the same level still accounts for 22.0% of growth variance in the subsequent recoveries. Similar results are received in the case of banking crises. Apparently, the relative importance of the overall institutional frame at national level tends to be higher in periods of output downturn, which fits in well with the observation that the within-country similarity of regions is comparatively higher in the resistance phase. At the same time, the influence of the national factors mitigates when the growth path switches to positive rates, indicating that regional determinants play a key role once the macroeconomic pressure diminishes. All in all, the test results strongly support the relevance of a national contextual level as well as the existence of (at least) two temporal growth regimes.¹²

In Figure 2, we plot the country effects separately for each growth phase to visualise the magnitude and patterns of the national differences. During the resistance phase, national deviations from the sample mean range from -4.62 percentage points (Lithuania) to 2.51 percentage points (Norway) in GDP growth in the case that national recessions are defined as shock-events (see Figure 2a).¹³ The average deviation between country effects is 2.35 percentage points which is equivalent to 0.87 standard deviations in phase-specific regional growth. The huge disparities in country effects indicate that regions in different countries react differently to recessionary shocks. Furthermore, Figure 2 provides evidence that there are

TABLE 3 (Continued)

	Shock: National recessions						Recovery to counterfactual level						Shock: Banking crises					
	(1)			(2)			(3)			(4)			(5)			(5)		
	Resistance	Recovery	Difference	Resistance	Recovery	Difference	Resistance	Recovery	Difference	Resistance	Recovery	Difference	Resistance	Recovery	Difference	Resistance	Recovery	Difference
Industry *																		
Labour Market																		
Regulation																		
FBS * Product																		
Market																		
Regulation																		
FBS * Labour																		
Market																		
Regulation																		
Non Market *																		
Government																		
Debt																		
Variance component: country (σ_a)	.0235	.0130	.0105	.0224	.0155	.0069	.0207	.0160	.0047	.0207	.0165	.0042	.0171	.0168	.0003			
Variance component: region (σ_p)	.0129	.0044	.0085	.0048	.0048	.0000	.0051	.0059	-.0008	.0051	.0052	-.0001	.0039	.0060	-.0021			
Variance component: residual (σ_e)	.0224	.0249	.0025	.0248	.0237	.0011	.0250	.0234	.0016	.0250	.0232	.0018	.0251	.0244	.0007			
ICC: country	.4491	.2200	.2291	.4400	.2900	.1500	.4046	.3063	.0983	.4046	.3241	.0805	.3113	.3089	.0024			
Adjusted Overall	.4228			.4422			.4488			.4805			.4499					
R-Squared																		

Notes: Country effects, region effects, and region-specific time trends included but not reported. For the sake of brevity, results are only reported for the components of short-term resilience (resistance and recovery). All metric predictor variables are grand mean centred. Variance components of hierarchical levels are expressed as square root of the variance to present the unexplained dispersion on each level in units of the dependent variable. ICC: country indicates the share of country-level variance in overall variance. Columns (4) and (5) show robustness checks: (4) end of regional crisis is determined by recovery to counterfactual output level instead of return to pre-crisis level; (5) shocks to the macroeconomic environment are defined by banking crises instead of national recessions. All models are based on data from 249 NUTS-2 regions nested in 22 countries over 24 years (5,976 observations). ***, **, * denote significance at the 1%, 5%, 10% level, respectively.

TABLE 4 Heterogeneity across samples

(1)		(2)											
EU-15 and Norway vs. Eastern Europe													
Resistance		Recovery		Resistance		Recovery							
1991–2004	2005–2014	Difference	1991–2004	2005–2014	Difference	Non-East	East	Difference	Non-East	East	Difference		
Intercept	−.0210*** (.0080)	−.0209 (.0220)	−.0001 (.0204)	.0396*** (.0064)	.0542*** (.0177)	−.0146 (.0160)	−.0238** (.0092)	−.0158 (.0372)	.0400*** (.0072)	.0040 (.0292)	.0360 (.0296)		
Regional sector structure (shares)													
Industry	.0890** (.0411)	−.0725 (.0432)	.1615*** (.0548)	.0513 (.0403)	.1571** (.0712)	−.1058 (.0787)	−.0176 (.0301)	.2069 (.1279)	.0745** (.0325)	.2075 (.1278)	−.1330 (.1338)		
FBS	.0770 (.0498)	−.1205** (.0583)	.1975*** (.0746)	−.0471 (.0492)	−.0461 (.0631)	.0010 (.0775)	−.0668* (.0399)	.0194 (.1840)	−.0481 (.0435)	−.0412 (.1544)	−.0069 (.1659)		
Non market	−.0215 (.0545)	−.3028*** (.0579)	.2812*** (.0733)	−.1360*** (.0494)	−.3153*** (.0683)	.1793** (.0793)	−.1723*** (.0406)	.3000 (.2441)	−.1421*** (.0453)	−.1238 (.2118)	−.0183 (.2188)		
National determinants													
Product market regulation	.0111 (.0125)	.0548*** (.0133)	−.0437** (.0194)	.0180** (.0076)	−.0195 (.0219)	.0374* (.0210)	−.0131* (.0064)	.0255 (.0224)	.0160** (.0066)	.0161 (.0131)	−.0001 (.0143)		
Labour market regulation	.0050 (.0073)	.0038 (.0093)	.0012 (.0111)	.0044 (.0056)	−.0159* (.0094)	.0203*** (.0087)	−.0074 (.0052)	.1493*** (.0775)	.0021 (.0054)	−.0066 (.0283)	.0088 (.0285)		
Euro	.0157* (.0086)	−.0518** (.0237)	.0676** (.0238)	−.0179*** (.0066)	−.0348** (.0153)	.0168 (.0158)	.0207*** (.0052)	−.0116 (.0371)	−.0125** (.0060)	−.0595** (.0242)	.0470* (.0255)		
Government debt	.0514*** (.0178)	.0358*** (.0102)	.0156 (.0216)	.0059 (.0160)	.0309** (.0133)	−.0250 (.0198)	.0448*** (.0075)	.1610 (.1234)	.0455*** (.0096)	−.1218*** (.0454)	−.1672*** (.0454)		
Fiscal deficit	−.0495 (.0655)	.1738*** (.0484)	−.2233*** (.0795)	−.0020 (.0720)	.1048** (.0486)	−.1068 (.0859)	.1553*** (.0309)	.4131 (.5703)	.1176*** (.0419)	.0965 (.1893)	.0211 (.1922)		
Government debt * Fiscal deficit	.0630 (.1990)	−.9404*** (.1009)	1.0034*** (.2223)	.1156 (.2234)	.0564 (.2213)	.0593 (.3178)	−.5566*** (.0758)	1.7383* (1.0633)	−.3662** (.1712)	1.1518** (.4453)	−1.5180*** (.4736)		

(Continues)

TABLE 4 (Continued)

	(2)									
	Europe-wide crisis in 2008/2009 vs. remaining shocks					EU-15 and Norway vs. Eastern Europe				
	Recovery					Resistance				
	1991–2004	2005–2014	Difference	1991–2004	2005–2014	Difference	Non-East	East	Difference	Recovery
<i>Cross-level moderations</i>										
Industry *	.1156***	.0991*	.0156	.0204	–.0760	.0964	.0619**	.1320	–.0701	.1826**
Product market regulation	(.0456)	(.0599)	(.0686)	(.0444)	(.1204)	(.1197)	(.0337)	(.0895)	(.0987)	(.0870)
Industry *	.0422	.0788**	–.0367	.0609*	.0629	–.0020	.0492*	.0037	.0455	.0587**
Labour market regulation	(.0318)	(.0368)	(.0443)	(.0319)	(.0383)	(.0452)	(.0251)	(.1344)	(.1389)	(.1182)
FBS * Product market regulation	–.0261	.4953***	–.5214***	.2096	.0158	.1938	.0016	–.4125	.4141	.0301
	(.0830)	(.1238)	(.1225)	(.2118)	(.0378)	(.2160)	(.0555)	(.3252)	(.3215)	(.3334)
FBS * Labour market regulation	.0760	.0860	–.0100	–.0376	.0292	–.0668	.0021	–.2245	.2266	–.2123
	(.0576)	(.0621)	(.0588)	(.0713)	(.0294)	(.0635)	(.0429)	(.3828)	(.3782)	(.3518)
Non Market * Government debt	–.0380	–.0229	–.0151	–.0041	.0079	–.0120	–.1383***	–.3283	.1900	.8009
	(.1214)	(.0840)	(.1446)	(.1203)	(.1518)	(.1797)	(.0646)	(.6231)	(.5973)	(.5753)
Variance component: country (σ_e)	.0145	.0243	–.0098	.0161	.0172	–.0011	.0241	.0191	.0050	.0270
Variance component: region (σ_μ)	.0049	.0062	–.0013	.0060	.0083	–.0023	.0069	.0050	.0019	.0082
Variance component: residual (σ_ϵ)	.0233	.0254	–.0021	.0221	.0249	–.0028	.0249	.0257	–.0008	.0244
ICC: country	.3709	.4635	–.0926	.3308	.3004	.0304	.4652	.3473	–.1179	.4945
Adjusted overall R^2	.4995						.4872			–.2938

Notes: Estimation results of baseline specification for subsamples of data: (1) sample is divided into two sub-periods, years from 1991 to 2004 and years after 2004 to separate the severe Europe-wide recession starting in 2008/2009 from the remaining shock-events; (2) subsamples for regions that belong to EU-15 countries (including Norway) and regions in Eastern Europe. ***, **, * denote significance at the 1%, 5%, 10% level, respectively.

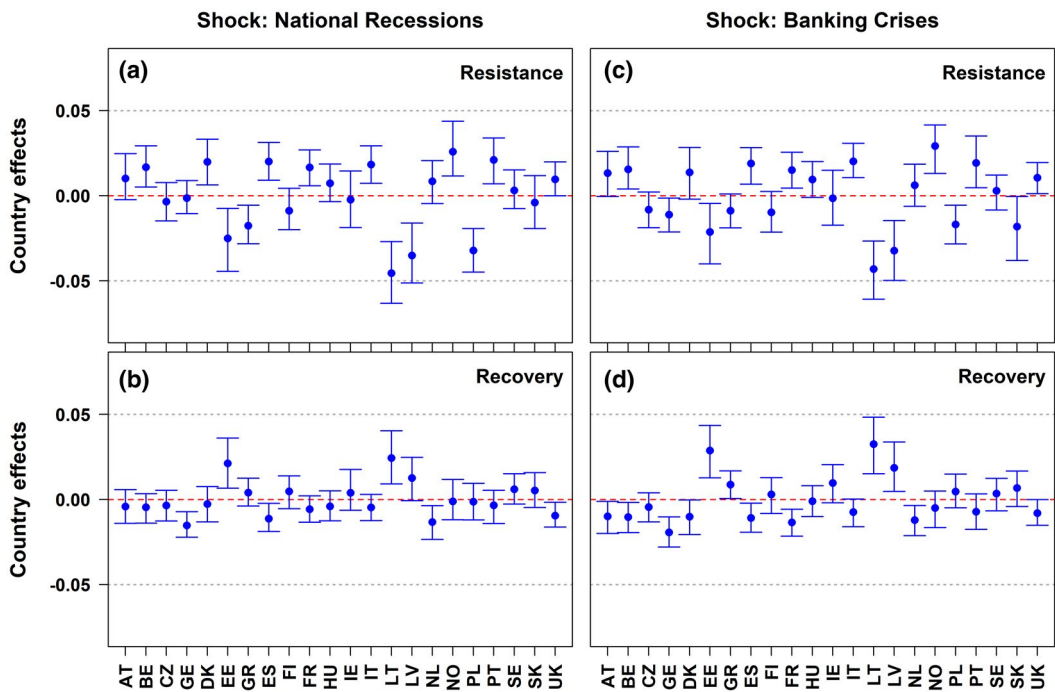


FIGURE 2 Phase-related country effects.

Notes: Figure displays country effects calculated on basis of intercept-only models (Table 2). Blue dots indicate point estimates of country effects centered by the sample mean growth rate in each phase and whiskers mark the corresponding 95% confidence intervals. Country effects represent national deviations from the sample mean growth rate in each phase. Red dashed lines indicate the sample mean growth rates (phase-specific intercept of the intercept-only model). For countries with only one NUTS-2 region (EE, LT, LV), the national level coincides with the regional level. In these cases, we interpret the unit-specific effect as national effect

clusters of negative and positive national effects. All countries in Eastern Europe exhibit below-average national effects, with statistically significant deviations from the sample average in the Baltic States and Poland, whereas regions in EU-15 states and Norway show, on average, a more resilient response towards national recessions. This relation is reversed in the phases of recovery. During recovery-growth, the mean deviation of country effects drops to an equivalent of 0.52 standard deviations (see Figure 2b). In this phase, only six country effects exhibit significant deviation from the sample mean in contrast to 12 significant deviants in the predecessor phase. Hence, the plotting of the country effects confirms a central finding of the intercept-only models, which is that the influence of the national level is comparatively high in the phase of resistance and considerably drops in the period of recovery (see Figure 2).

A distinctive feature of Figure 2 is that upward (downward) deviations of country effects from the sample mean in resistance years are accompanied by downward (upward) deviations in the recovery phase. To further investigate this conjecture, we plot country and region effects of these two sequential growth phases against each other. With regard to the country effects, whose plots are displayed in Figure 3a, the negative resistance-recovery nexus becomes immediately visible. The slope coefficient of the regression line indicates a statistically significant relationship at the 1% level. This result, however, should not be treated without caution given the relatively small number of observations. The corresponding findings for the regional effects, as presented in Figure 3b, are less conclusive. Though the sign of the slope coefficient is also negative, the relation between resistance- and recovery-growth is rather weak and statistically not significant. Apparently, the impact of the overall institutional frame

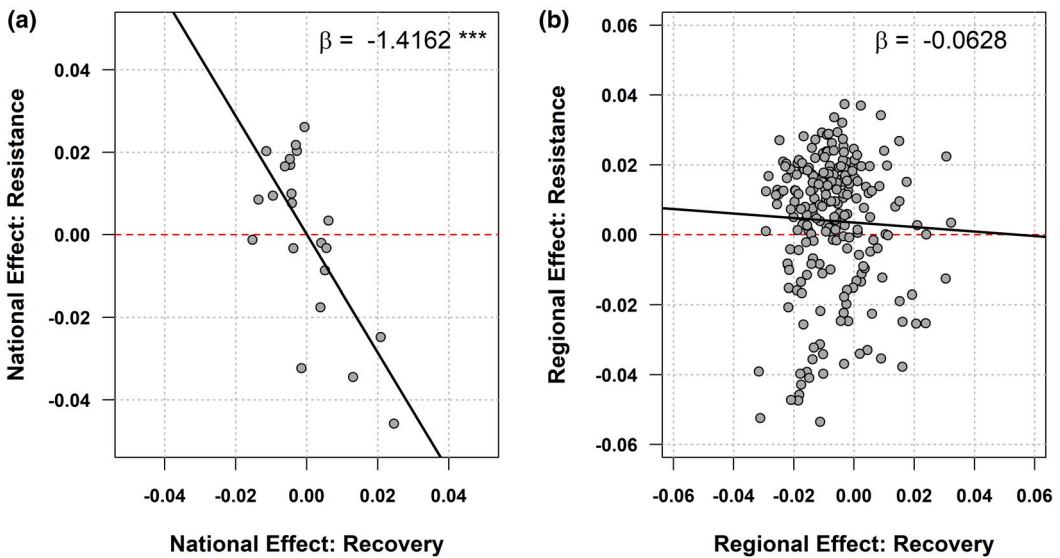


FIGURE 3 Relationship of national and regional effects in short-term resilience phases.

Notes: Scatterplots show the relationship between country effects in sequential resilience phases (a) and between regional effects in sequential resilience phases (b). Black line represents fitted regression line for each scatterplot. denotes the slope of regression line, asterisks indicate statistical significance at the 1% (***), 5% (**), 10% (*) levels. National and regional effects are calculated on basis of estimation results from model (1) in Table 2. For countries with only one NUTS-2 region (EE, LT, LV), the national level coincides with the regional level. In these cases, we interpret the unit-specific effect as national effect

at country level—not necessarily of each national determinant, of course—on regional growth is contrary in the resistance and in the recovery phase. With respect to regional resilience, this finding is a two-edged sword: On the one hand, a given institutional setting helps to stabilise regional economies in periods of shock-induced downturns; on the other hand, the same setting impedes regional recovery during subsequent economic upswings. Inversely, a setting that expedites the recovery process obstructs the capacities to resist. Either way, the results highlight the autonomous role of the national level within the hierarchical system.

5.2 | How determinants vary between phases and interact across levels

As documented by the results of the variance decomposition, a substantial share of regional growth variance is to be found at the national level. Thus, the affiliation to different national contexts can contribute to explain variations in growth performance between regions, which applies not only, but particularly to the resistance phase (see Section 5.1). Hence, in the next step, we investigate the role of the national level in more detail. In particular, we look at the phase-specific impact of selected country-level determinants and examine to what extent the effects of regional determinants are moderated by the national setting. Table 3 shows the estimation results of the hierarchical linear model as introduced in Section 4. We run a number of regressions while adding variables of the regional and national level in a stepwise procedure. Model 3 is equivalent to the full model, including determinants of both hierarchical levels as well as cross-level interactions. In comparison to the intercept-only model, the adjusted overall R^2 increases only slightly across models, indicating that the added time-sluggish

determinants hardly improve the fit of the model. In other words, the impacts of the inherent determinants on growth are, for the most part, already captured in the intercept-only model by means of the region and country effects as intended by our estimation strategy. Furthermore, the coefficients are consistent across models in Table 3, giving us confidence in the reliability of our estimation results.

The results show that the phase-specific impact of the national setting is also reflected in the country-level determinants included in the model. This applies, for example, to a membership in the Eurozone. While it lacks a statistically significant impact on regional resistance, being a member of the Eurozone noticeably impedes a region's capability to recover. This finding is consistent with the existing literature. A possible explanation is that regions in the European monetary union can—at least temporarily—suffer from an unfitting monetary policy as, for instance, the (national) instrument of currency devaluation is no longer available. A thorough discussion of this and further reasons can be found in Fingleton et al. (2015). Another macroeconomic indicator that reveals a phase-specific impact is fiscal policy. Relating thereto, we follow Cerra et al. (2013) and use fiscal deficit as variable to measure the overall fiscal stimulus. According to our results, regions nested in countries with expansionary fiscal incentives (expressed through larger values of fiscal deficit-to-GDP ratio) tend to benefit from an ad hoc growth stabilising effect of government intervention. Yet, the resistance-improving effect diminishes with increasing government debt-to-GDP ratio and eventually turns negative. The decreasing effect and the finding that fiscal measures wear off with high indebtedness of a country is in-line with other studies that examine the relationship for national GDP growth (Cerra et al., 2013; Hubbart, 2012).¹⁴

Not only does the national setting influence the resilience of regions directly, hence independently from the factor endowment at regional level. Furthermore, our results suggest the existence of an additional indirect impact according to which the national setting shapes the mechanisms of action of regional determinants. The background to this is that the impact of a given regional determinant is not necessarily the same across different countries. Instead, the same regional determinant can have different, even opposing effects on resilience, depending on the national setting in which it becomes effective. In our models, such hierarchical interdependencies are captured by cross-level interaction effects whose influence becomes most evident during the resistance phase. In this phase, cross-level interactions are the main driver of the reduction of unexplained variance at national level. As displayed in the bottom section of Table 3, the residual standard deviation at country level decreases by 0.11 percentage points if national and regional determinants are included (from 2.35 to 2.24) but drops by another 0.17 percentage points once a selection of interactions effects is added.

To exemplify the operating principle of cross-level interactions, we visualise the marginal growth effects of “regional industry share” and “regional non-market share” at different values of selected national moderators including “LMR,” “PMR,” and “government debt” (see Figure 4). In all three examples chosen, the impact of the national moderators becomes immediately visible. As can be seen in Figure 4a,b, the resistance-impeding effect of a high regional industry share becomes effective in a statistically meaningful way only in regions that are nested in countries where the regulation of labour respectively product markets is relatively low, whereby lower index values express a more rigid regulatory regime. In contrast, less strictly regulated macro environments do not enhance the resilience effect originating from the industry sector. In geographical terms, the resistance-reducing interplay between industry share and regulation can be traced back to the rigid labour market in Portugal and the relatively high barriers for competition in Portugal, Greece, Hungary, Poland, and the Czech Republic. Besides, it should be noted that statistically relevant interactions involving the regulatory regime are restricted to the cyclically sensitive industry sector, while the financial and business services are not exposed to any national moderator at all (see Table 3).

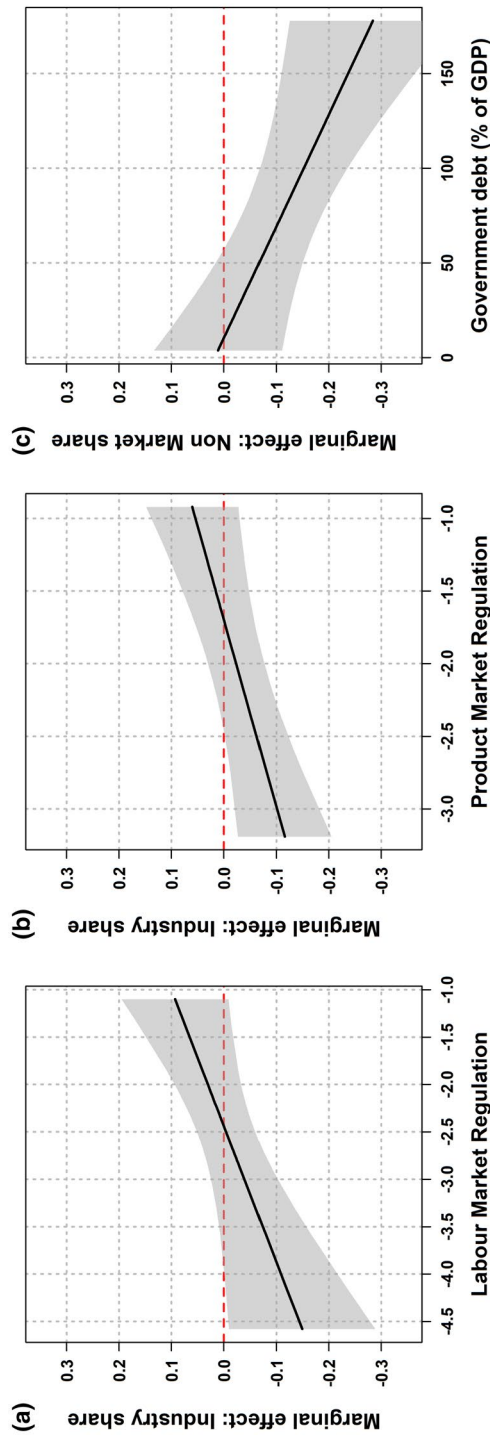


FIGURE 4 Cross-level interactions in resistance phase.

Notes: Black lines show point estimates for marginal effect of regional determinant on GDP per capita growth for different values of national moderator with 95% confidence intervals (grey). Point estimates are calculated on basis of estimation results from model (3) in Table 3 (resistance phase)

A third example of a cross-level interaction is depicted in Figure 4c. Here, an increase in non-market share exhibits a statistically negative impact on output growth during the resistance period if regions are nested within countries that possess a debt-to-GDP ratio above 50%. In our sample, this threshold is crossed by all Western European, but by none of the Eastern European countries which can be explained by the shorter budget history of the latter. The importance of the national setting is highlighted by the fact that the negative growth effect of the non-market sector becomes effective only in combination with higher government debts, while we do not find a destabilising effect otherwise. Consequently, the disregard of interaction effects bears the risk of biased interpretation when comparing resilience capabilities of regions in different countries. When cross-level moderations are erroneously omitted, one would assume that a regional determinant affects resilience homogenously in all regions, while in fact the effect-size of the regional determinant depends on the national institutional setting in which the region is nested.

We conduct a series of robustness checks that employ different operationalisation methods and model specifications, respectively (see Table 3 and online Appendix A5). Model 4, to start with, shows the estimation results in the case that the counterfactual output level determines the end of the recovery period instead of the pre-crisis level (as depicted in Figure 1b). As displayed in Table 3, this procedure provides almost identical results as the baseline model. This may be interpreted as suggesting that short-term recovery and economic growth during stable times (here approximated by the longer recovery period) are driven by similar determinants, while it is the resistance period that is exposed to different, partly even opposing influences. Model 5, in turn, exploits banking crises as exogenous shock-events instead of national recessions (see Section 3.1). Again, the estimation results are largely in-line with our findings from the baseline model. The only discrepancy, however, refers to the indices of labour respectively PMR that—apart from the cross-level interaction between industry share and PMR—lose statistical significance when re-defining the shock event (see Table 3). As it would appear, banking crises, as long as they do not result in national recessions, are only weakly connected with the national regulatory regimes. Moreover, as presented and further explained in online Appendix A5, the results are robust to estimation procedures that allow the time trend to evolve non-linearly, use year dummies to account for any abrupt shocks common to all regions, account for spatial autocorrelation in growth between regions via spatial lag model, and use wider flows of regional determinants by calculating regional-level variables as average of own region and neighbouring regions characteristics.

5.3 | Accounting for potential heterogeneity across subsamples

In the next step, we generate temporal (model 1) and spatial (model 2) subsamples to examine the generalisability of our baseline results (see Table 4 for an overview). Regarding the temporal dimension (model 1), we split the sample into two periods (1991–2004 and 2005–2014). The purpose is to isolate the “Great Recession” that—unlike previous crises—hit the vast majority of European regions in 2008 and onwards. We find that estimation results for the inherent determinants in both subsamples deviate from the baseline results as shown in Table 3. It appears that a large number of coefficients differ between both temporal subgroups at a statistically significant level. For example, we find no relevant impact stemming from a high share of FBS for the 1991–2004 period, while it, however, significantly enhances the shock-sensitivity of regions during years of the “Great Recession.” Also, we observe that the supporting impact of expansionary fiscal incentives becomes effective only during the years 2005–2014 and that, in addition, the positive interplay between industry share and lowly regulated labour markets shifts from the resistance to the recovery phase when moving to the earlier sub-period (1991–2004). On the whole, the differing results reveal some specific characteristics of the

“Great recession” including its origins in the financial sector, the rapid spillover to the real economy, the unparalleled severity of the subsequent downturn, and, as a consequence, the prominent use of anticyclical policy measures.

With respect to the spatial dimension (model 2), we separate regions in the economically more developed EU-15 countries and Norway from regions in Eastern Europe. The division of the sample into space-specific subgroups reveals differences regarding the impacts of resilience determinants. For instance, the recovery-enhancing effect of a high industry share at regional level (model 3 in Table 3) can only be confirmed for the EU-15 group (plus Norway), while the supporting effect of low LMR at national level only applies to the group of Eastern European regions. Likewise, the statistically significant cross-level interactions of the resistance phase turn out to be relevant during both phases in EU-15 regions, while, with the exception that a more competitive-friendly environment reinforces the strengthening effect of the industry sector during recovery, we do not find any significant moderations across levels within the Eastern European group. The sample-specific mechanisms suggest that the effects of resilience determinants might vary depending on the level of economic development.

It is a common feature of all models presented in this section that cross-level interactions prove to be more frequent and more important in the resistance than in the recovery phase. This finding corresponds, after all, with the comparatively low share of country-level variance in overall variance when the regional economy starts to recover (see Section 5.1). Evidently, the impact of the national setting on regional resilience, whether it is direct or indirect, is strongest in the resistance phase. Furthermore, as the spatial and temporal subsamples reveal, the national setting itself is not a constant factor but subject to context-sensitive conditions which allows for the conclusion that universal patterns of resilience mechanisms might not exist.

6 | IMPLICATIONS FOR THEORY, POLICY, AND FUTURE RESEARCH

The aim of this paper was to disclose the phase-specific impact of the national setting on the economic resilience of regions. Grounded in the conceptual framework as developed by Ron Martin and colleagues (Martin, 2012; Martin & Sunley, 2015; Martin et al., 2016; Simmie & Martin, 2010), our empirical set-up integrates two hierarchically structured spatial levels (regions nested in countries) and two subsequent components of short-term regional economic resilience (resistance and recovery). The necessity to distinguish between the different levels and phases is well-documented by means of our empirical results. With respect to the spatial hierarchy, we find, most importantly, an autonomous impact of the national setting in both phases of short-term resilience. Furthermore, the additional presence of cross-level interaction effects indicates that the national context does not affect the resilience of all nested regions equally. Instead, the size and direction of growth effects from contextual factors depend also on regional characteristics, as exemplified here by sectoral composition. From a regional perspective, this means that differences in resilience are not solely caused by unrelated determinants from different levels. In fact, the impacts of regional determinants are distinctively moderated by elements of their surrounding institutional setting. These findings imply that resilience determinants are hierarchically structured and that the regional patterns of resilience are additionally shaped by the interlinkages of country-specific institutional factors and regional determinants. In other words, *regional* economic resilience is anything but just a matter of *regional* capacities. The impact of the institutional setting is strongest during the resistance phase when the national level accounts for up to 44.9% of the variance in regional GDP development. During recovery, however, the national share decreases but still amounts to no less than 22.0% (see Section 5.1). Apparently, regional capacities

gain in importance once the immediate shock effect diminishes, which fits in well with the decreasing significance of cross-level interactions during recovery. Yet, the overall importance of the national setting cannot be questioned.

The observation of varying, if not opposing directions of influences across the sensitivity and recovery phase appears to be a general feature of our models (see Section 5.2) and fits in well with recent findings from Pudelko et al. (2018) (see Section 2.2). At the same time, though, our results seem to be inconsistent with a central statement of Di Caro and Fratesi (2018) according to which those factors that help to explain economic growth in economically stable times are also useful to understand resilience patterns. This statement refers to a synoptic key finding that Di Caro and Fratesi (2018) derive from a special issue of empirical investigations on regional determinants of economic resilience (see online Appendix A1). Due to different methodological designs, however, the implications of these studies cannot be directly compared to the findings in our paper. Still, in the light of our results, the above statement does not seem applicable to resilience patterns per se. On the one hand, we can confirm that determinants of economic growth in stable times also contribute to recovery while, on the other hand, we observe that the resistance of regions is subject to contrary mechanisms, thereby suggesting a modification of Di Caro's and Fratesi's (2018) statement. It appears plausible that this modification is related to the resistance phase because here the influence of the national setting is strongest while the above statement is derived from studies that do not take the national setting into account. With that in mind, it is not unreasonable to assume that ignoring the spatial hierarchy and the temporal two-component structure entails the risk of imprecise, if not false conclusions on the driving mechanisms stabilising and/or destabilising regional economies in times of crises. Such false conclusions may arise from the oppression of phase-specific patterns if, for example, opposing impacts of determinants in the resistance and recovery phase cancel each other out or if certain determinants should be relevant only for one specific phase, but not for overall resilience.

In addition, findings from the comparison of subsamples indicate heterogeneous patterns of influence across different time-periods and spatial subgroups, even for shocks that possess a similar "nature" (see Section 5.3). Overall, there is no straightforward evidence that changes in the impacts of determinants follow a regular pattern. The obvious absence of a general mechanism, however, is in-line with the concerns expressed by Martin et al. (2016) who argue that averaging across cycles, or shock-events in our case, might produce misleading results since resilience capacities could not be viewed as being independent of the respective temporal and spatial context. Instead, it is plausible that the impact of a specific determinant depends, among other things, on the type of the shock, on the shock-specific transmission channels, on the duration and spatial expansion of the economic disturbance, and on spillover effects that are triggered or altered by the shock. While it is notoriously difficult to disentangle the effect channels of resilience determinants, we conjecture, based upon our empirical results, that a hierarchically structured framework offers benefits to assess and understand the role of resilience determinants in the context of *engineered resilience*. Our assessment is supported by the fact that significant effects stemming from regional and national determinants as well as from corresponding cross-level interactions are an essential part of all of our model specifications.

Despite—or even precisely because of—the absence of general mechanisms, our results provide two essential insights that policy makers should adhere to. First, any policy design should be phase-specific and, respectively, combine two different strategies: a short-term strategy aimed at the ad hoc stabilisation following the shock event, and a long-term strategy aimed at the strengthening of competitive capabilities in order to support sustainable growth during recovery as well as in economically stable times (see discussion above). The mutual connectivity of both strategies becomes apparent if we take into consideration that the absence of immediate measures to stabilise the economy might weaken the long-term growth resources of the economy, while a fundamental deficit regarding

competitive capabilities would certainly increase the vulnerability towards the shock. Second, regional policy makers are well advised to pursue integrated approaches that encompass the national context as well as its corresponding moderation effects. The following example illustrates this: Given our results on the effects of the regional sector structure, policy makers might want to strengthen the industrial basis while cutting back on non-market sector activities (see Section 5.2). This approach, however, would have to be accompanied by a low degree of market regulations at national level as an insufficient competition leads to a higher vulnerability of the industry sector which in turn could hamper its further development. Also, in case that the industrial sector requires short-term stabilisation, a solid budget policy would be needed to ensure the effectiveness of anti-cyclical fiscal measures. Our results thus suggest that national policy instruments are indispensable components for the improvement of regional resilience capacities. This especially applies to the resistance phase, where the impact of the national setting and its moderation effects is strongest. Then again, the relatively weaker impact of the national level during the recovery phase should not mislead into assuming that national policy instruments are much less important once regional growth has resumed. Instead, supportive national conditions are required permanently so that they can contribute to improving regional competitiveness which in turn helps to strengthen future resilience capacities.

Any model has its limitations, and we recognise at least two caveats in our own approach. The first refers to the number of regional resilience determinants. Due to limitations in the availability of comparable data across sample period, our study is restricted to a small selection of inherent determinants and does not include any adaptive determinants. As a consequence, the generalisability of our results is somewhat limited. In particular, we cannot rule out that time-varying adaptive factors affect the inter-relationship between inherent determinants and resilience outcome. Future empirical studies are thus encouraged to incorporate a larger number of inherent as well as adaptive determinants. Enlarging the number of determinants would not only allow taking into account potential interactions between inherent and adaptive factors, but also examining the region-specific impact of the national institutional setting on a broader and more complex empirical base. It is, for instance, conceivable that the degree to which the national setting and cross-level interactions shape regional resilience partly depends on the autonomy status of a region. To provide more insights into the moderation effects of regional autonomy, forthcoming studies might utilise newly published data sets on regional governance indicators (e.g., Charron et al., 2014 or Fazekas, 2017) and integrate those data into the multilevel framework. The second caveat refers to the framework itself as the construction of hierarchical levels does not need to be constrained to two levels. For example, federal states can form the meso level in the case of a federalist political system within a country. Furthermore, it appears plausible that determinants at the upper level are interlinked with other institutional environments and that regional determinants might also depend to some extent on national factors that have their origin outside of the own institutional environment. Another level that is worth being integrated into a multilevel system is the micro level as it contains no less than the actual agents of economic resilience, for instance firms and entrepreneurs. All these extensions of our two-level model as portrayed in this case study are useful points of reference for future research.

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ENDNOTES

- ¹ The mid- and long-term perspective on resilience is represented by the concept of adaptive resilience (Carpenter et al., 2005; Davoudi et al., 2012; Hassink, 2010). This approach focuses on the capacities of regions to cope with changes in their macroeconomic, social, and institutional settings. It is noteworthy that these changes do not have

to be sudden phenomena. They can also arise from continuous, incremental processes. Martin and Sunley (2015), however, point to the risk of diluting the resilience concept if sudden shocks are not clearly separated from slow burns whose impact is already subject of many existing theories on structural transformation.

- ² Further categories include the shock(s) under investigation, the resilience indicators used, the temporal and geographical frame of the sample, and the main method(s) applied (see online Appendix A1).
- ³ Banking crises are defined by two types of events (Laeven & Valencia, 2013; Reinhart & Rogoff, 2011): (1) bank runs that lead to the closure, merging, or takeover by public sector of one or more financial institutions; (2) distress in the financial system that leads to closure, merging, or takeover of an important financial institution or group of institutions with simultaneous introduction of large-scale government assistance to the financial sector.
- ⁴ We also experimented with alternative definitions of the crisis windows, expanding, and contracting the length of the crisis by increasing the window size to 2 years or considering only the years of national recession as potential trigger of regional crisis. Our results are not sensitive to the alternative definitions.
- ⁵ Also, this cut-off avoids that the recovery phase remains incomplete in case the regional growth path does not catch up to the counterfactual trend.
- ⁶ Such inherent determinants include, for instance, human capital, innovation capacities, and agglomeration effects at regional level and the quality of government at national level.
- ⁷ Both indices are multiplied with -1 , so that higher values indicate a less rigid labor market and a more competition-friendly environment, respectively. See online Appendix A3 for the summary statistics, data sources, and variable descriptions.
- ⁸ It could be argued that fiscal deficit is more of an adaptive determinant than an inherent factor, but in our analysis, we determine the impact of fiscal deficit on growth as a function of public debt level, which can be regarded as an initial condition in each year.
- ⁹ This approach is employed in many studies to confront the problem of (spatially) nested data, for example, in: analyses of house price variations in districts (Baltagi et al., 2014; Fingleton et al., 2018); examination of the drivers of student's entrepreneurial climate perceptions (Bergmann et al., 2018); economic evaluation of regional health effects (Eibich & Ziebarth, 2014); estimation of spatial demand patterns (Case, 1991); educational studies where pupils are nested within schools or classrooms (Montmarquette & Mahseredjian, 1989).
- ¹⁰ For example, the correlation coefficient between share of industry measured by data in 2004 (2009) and 2005 (2010) is .9942 (.9850).
- ¹¹ Phase-related temporal variation in the model is captured by estimating a standard change point model, where the pre-defined resilience phases (see Section 2.2) serve as structural breaks. More precisely, we created a dummy variable for each discrete regime r (taking a value of one for observations in years belonging to the regime (resilience phase) r and zero for observations in all other years) and interacted each regional and national level covariate with the regime-dummies.
- ¹² To underpin this assertion, we conduct likelihood-ratio tests to compare the goodness of fit of the intercept-only model with alternative model set-ups without macro level or distinct phases of resilience (see Table A4 in the online Appendix).
- ¹³ The right column of Figure 2 displays the phase-specific country effects in case banking crises serve as exogenous shock-events (see Figure 2c,d). The findings are very similar to those of the baseline model. We therefore argue that potential issues of endogeneity are rather weak or absent in our initial model set-up.
- ¹⁴ We like to remind the reader that all explanatory variables are lagged by 1 year. This standard approach mitigates the bias of reserve causation (e.g., Cerra et al., 2013; Christiano et al., 1999). For example, under Keynesian theories, an increase in fiscal deficit would boost growth. Moreover, an increment in growth caused by policy actions would likely generate a fiscal surplus due to increased tax revenues. As pointed out by Cerra et al. (2013), potential endogeneity biases the coefficient towards zero. Thus, in case we do find an effect, it is likely to be at the lower bound of the true policy impact.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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