II. Special topics on the euro-area economy

II.3. Sectoral resilience to shocks

Introduction

Economic policy has two general goals: growth and stability. Growth aims to maximise living standards (income net of social and environmental costs) and stability aims to minimise fluctuations (booms and busts) in income, employment and prices in the short and medium term. The two goals are not independent since long-term growth is likely to be higher in a stable environment.

Resilience to shocks – i.e. the capacity of the economy to weather shocks with limited output losses - is crucial for macroeconomic stability. At firm level, resilience means the ability of enterprises to avoid bankruptcy or significant losses during economic downturns, thanks to prompt adjustment of their production technology, product characteristics, trade linkages, employment regimes, etc. At sectoral level, resilience means low responsiveness of sectoral output to shocks. It is supported by low entry and exit barriers that facilitate a more efficient reallocation of resources. The flexibility of firms and openness of sectors translates into low co-movements between sectoral output changes and aggregate common shocks. The current crisis shows that in a monetary union, the inability of countries to smoothly adjust to asymmetric shocks or to common shocks with asymmetric effects can be very costly.

The latest recession has demonstrated how important the policies supporting resilience are and, in particular, has brought to the forefront of public discussion the role that structural reforms can play. Adjustment channels other than the exchange rate are particularly important for euro-area countries, which, without national monetary and thus exchange rate policy, need to rely on the smooth and proper functioning of other adjustment mechanisms. Regulations that facilitate adjustment in firms have an important role to play in this respect. Understanding the reasons behind euro-area countries’ different resilience to shocks is a first step in identifying how to improve it, and taking into account countries’ sectoral composition and the various sectors’ different adjustment capacity to shocks could shed some light on the matter. This section examines the adjustment capacity, or resilience, of industrial sectors in the euro area to common shocks and describes the role that institutional factors and, in particular, product market regulations, play in this adjustment process. (49)

Methodology

The starting point of the analysis is the identification of sector-level business cycles in the EU countries that are then confronted with common euro-area GDP shocks. The focus is on ‘classical’ cycles, i.e. fluctuations of output levels (rather than variations in ‘output gaps’). Resilience is defined as a low impact of common shocks on sectoral output cycles, and it is measured as the conditional correlation between sectoral output changes (over sectoral business cycle phases) and common disturbances (see Box 1 for more details). Common disturbances are defined as euro-area shocks that are derived from a small euro-area VAR model. Regression analysis is used to estimate resilience and how it is affected by product market regulations (measured by the OECD product market regulation composite indicator, PMR) and other structural variables such as the level of financial development (measured by the equity market capitalisation to GDP ratio), trade openness and participation in EMU. The industry sector is the focus of the econometric work and the analysis is carried out for 21 industry sub-sectors (2-digit NACE). The analysis of quarterly data is undertaken for the period 1980-2008, and separately for the period 2008-2010Q2.

In theory, countries’ product market regulation could be expected to have a negative effect on resilience as stricter regulations reduce the ability to adapt to shocks; however, strict regulations could also be working as a form of protectionism insulating inefficient sectors from shocks. Likewise, the level of financial development and trade openness could have a positive, but also a negative, effect on resilience. Highly integrated economies, from a financial and a trade point of view, could be more exposed to external shocks and therefore show less resilience. On the other hand, a high level of financial development and trade openness may positively affect resilience because the indicators could also capture easy access to financial markets (resulting e.g. in consumption smoothing and smaller fluctuations of investment), and the fact that more open economies tend to be more efficient, competitive and can recover quicker thanks to foreign demand.

Box II.3.1: An econometric framework to estimate industrial sectors’ resilience to common shocks

This box presents the methodology developed in Canova et al. (2011) to estimate industrial sectors’ resilience to common shocks.

To measure sectoral business cycle amplitudes, sectoral turning points, i.e. peaks and troughs, are identified applying the Bry-Boschan method. (1) Alternatively, where that procedure does not identify turning points, the simple two-consecutive-change rule is used: a recession (expansion) starts if there are at least two-consecutive quarter declines (increases) in output. Subsequently, a measure of sectoral output change (cycles) capturing both intensity and persistence (taking into account differences in the length of adjustment) (2) is constructed for each sector \(i\), country \(j\), and business cycle phase \(k\), based on the following formula:

\[
\tilde{Y}_{ijk} = \frac{\alpha(Y_{\text{peak}} - Y_{\text{trough}})}{\frac{1}{2}(Y_{\text{peak}} + Y_{\text{trough}})n}
\]

where \(Y\) is quarterly output, \(\alpha = 1\) for upturns and \(-1\) for downturns and \(n\) denotes the number of quarters from trough to peak.

A structural VAR is employed to construct the main explanatory variable: the common euro-area shocks (\(S\) in the formula below). Common output shocks are defined as the change in output that cannot be predicted using information contained in current and past values of interest rates, broad money supply, prices, and past values of output itself. (2) The reason why only common disturbances are considered, is to better isolate differences in the adjustment capacity of sectors. This would not be possible if, for example, sector-specific idiosyncratic disturbances were employed.

Then, series of GDP shocks associated with each sectoral business cycle \(k\) and country are constructed. For this, the common GDP shocks (structural residuals, \(e\) in the equation below) have been normalised and their changes cumulated across quarters \((t)\) for each sector \(i\), country \(j\), and earlier identified sectoral business cycle phase \(k\). The cumulative sum of shocks can be also seen as a difference between the residuals at the end and at the beginning of the business cycle phase \(k\):

\[
S_{ijk} = \sum_{t=\text{start of } k}^{\text{end of } k} A e_t = e_{\text{end of } k} - e_{\text{start of } k}
\]

Standard econometric techniques are then used to estimate the responsiveness of sectoral output changes (\(\tilde{Y}_{ijk}\)) to (normalised) shocks (\(S_{ijk}\)) and to relate sectoral resilience to product market regulation and other important sectoral and national characteristics, such as openness or financial development.

\[
\tilde{Y}_{ijk} = \beta_0 + \beta_1 S_{ijk} + \beta_2 D_{ijk} S_{ijk} + \beta_3 Z_{ijk} S_{ijk} + \beta_4 PMR S_{ijk} + \epsilon_{ijk}
\]

where \(\beta_0\) is a vector of sector-specific effects; \(D\) is a matrix of dummy variables, controlling for certain sector, country or phase cycle characteristics. For example, it includes EMU membership and a dummy allowing for asymmetric responses to shocks for upturns and downturns. \(Z\) is a vector of country characteristics that are expected to affect the transmission mechanism of shocks, such as financial development indicators, trade openness and debt. (3) Finally, PMR is countries’ product market regulation, which is expected to affect resilience to shocks and is the main focus of interest of the analysis. (4)

---

(1) Emulating the analytical process of the NBER and, to some extent, CEPR business cycle dating committees.
(2) As an alternative, the authors also apply the Blanchard and Quah (1989) identification method which imposes long-term restrictions to distinguish between permanent and transitory shocks. The negative link between product market regulations and resilience is detected for permanent shocks, Blanchard, O. and D. Quah (1989), “The dynamic effects of aggregate demand and supply disturbances”, American Economic Review, Vol. 79, No. 4, pp. 655-673.
(3) Financial development (market capitalization to GDP ratio), debt-to-GDP ratio and trade openness are averages over the period 1995-2008.
in the economies not suffering from the recession (e.g. emerging countries).

Main results

The regression results show that product market regulations negatively impact the resilience of industrial sectors. (50) This finding is in line with the effects generally predicted in the literature. Ahn (2002) argued that all components of firms’ efficiency (allocative, productive, and dynamic) are likely to be adversely affected if product markets are highly regulated. The liberalisation of product markets usually improves allocative efficiency (quicker reallocation of resources to more productive firms and sectors) by facilitating entry and exit and increasing the contestability of markets (Melitz, 2003). In addition, product market reforms aimed at increasing competition can lead to an increase in price and wage flexibility that also facilitates reallocation of resources (see for example Rotemberg and Woodford, 2001; Bulhol et al., 2006). Product market reforms are also said to increase productive efficiency through the impact on incentives for workers and managers to increase productivity (Nickell et al., 1997; Griffith and Harrison, 2004). (51)

The regression results also indicate that trade openness is not significantly correlated with resilience, contrary to the level of financial development, which has a negative and significant impact. As mentioned before this could be related to the fact that countries with more developed financial systems are more open and, hence, more exposed to external financial shocks (e.g. through portfolio and investment flows, and through the activities of multinational companies). The fact that a high level of financial development may facilitate the transmission of common shocks should, however, be put in perspective and weighed against the well-documented positive effect of financial deepening on growth. Finally, regression results also show that industrial sectoral output responds more to euro-area GDP shocks in countries that belong to EMU, independently of size. (52) Although this result seems obvious, it does not have to be. When the accounting bias is controlled for, the EMU dummy remains significant, most likely showing that euro-area countries are more sensitive also to shocks originating outside the euro area.

Main results for countries

Countries’ sensitivity to shocks induced by product market regulations (PMR), financial development and EMU membership is depicted in Graph II.3.1. It is evident that product market regulations play an important role in determining the resilience of countries. The countries that display a lower correlation with the euro-area shocks (e.g. Norway, Denmark, Hungary, the UK) are the ones for which the average levels of PMR over the sample are relatively low, meaning that regulatory constraints are light. In contrast, others that are at the bottom of the ranking (e.g. Spain, Greece and France) had on average relatively high PMR levels over the sample. These countries, with the exception of Greece, have nevertheless progressed significantly in lowering their levels of regulation, and this moves them up in the resilience scale if we consider only the most recent PMR levels.

The level of financial development also emerges as playing a role in determining resilience. Countries with more developed financial markets such as the UK and the Netherlands, which are relatively well positioned in terms of product market regulations, move down the resilience scale (i.e. the marginal effect of the shock, independently of sectoral composition, increases) due, presumably, to their greater exposure to shocks through financial market linkages. This finding is consistent with related business cycle literature, which tends to find that financial integration increases business cycle synchronisation across countries. (53)

(50) The results reported refer to the period 1980-2008 unless otherwise indicated.


(52) To control for a possible accounting bias, due to the fact that large sectors in euro-area countries could be more correlated with euro-area output shocks simply because they contribute more to euro-area GDP, the analysis also controls for the size of sector and country in total euro-area production. The effect is, however, non-significant, indicating that such an accounting bias is not of much importance in the analysis.

(53) Kose, M. A., E. S. Prasad and M. E. Terrones (2004), ‘Volatility and Co-movement in an Integrated World Economy: An Exploration.’ In Macroeconomic Policies in...
membership also seems to increase susceptibility to common shocks, although, on the other hand, it presumably reduces the occurrence of country-specific shocks (a hypothesis not tested here, though). Therefore the offsetting role of vigorous reforms is even more important for countries in the euro area and for those with a high degree of financial development, as these two latter determinants increase vulnerability to common shocks.

Graph II.3.1: Sensitivity to euro-area shocks — Contribution of key country-specific characteristics (1980-2008)

Each component’s contribution is the product of the estimated coefficient times the country-specific data variable (for PMR, financial development and EMU: βPMRPMRj + βFDFDj + βEMUEMUj). The actual period for some countries is shorter due to data availability. See also Box 2.1.

Source: Commission services, based on Canova et al. (2011).

The ranking in Graph II.3.1 does not control for sectoral composition effects. When sectoral differences in sensitivity to shocks are accounted for, countries’ resilience is altered. (54) For some countries the effects of sectoral composition are substantial and lead to significant movements in the ranking: Germany moves down due to the relatively large weight of less resilient industries (such as manufacturing of motor vehicles). Conversely, in countries such as Greece and Italy, sectoral composition has a positive effect on resilience due to the predominance of relatively more resilient mature industries in these countries, particularly producing basic goods such as ‘food and beverages’ and ‘wearing apparel’. The sector-specific resilience is further described in the subsequent section. In general, however, the effect of country characteristics (such as PMR) dominates and sectoral composition effects do not radically change the ranking of countries.

Main results for sectors

Turning to the sectoral dimension, the number of cyclical fluctuations varies significantly across industry sectors. This heterogeneity could be attributed to asymmetric shocks (e.g. change in tastes), common shocks with idiosyncratic impact across sectors and countries (e.g. oil price shocks, the impact of which depends on the energy intensity of production) or policies at national or EU-wide level that are sector-specific (e.g. specific national industrial policies).

Graph II.3.2: Estimated resilience of industry subsectors to euro-area shocks (1980-2008)(1)

(1) Differences in sectoral resilience identified from significant sectoral dummy variables. The average resilience for the EU is calculated using EU sector weights; sectors for which dummy variables were not significant have resilience equal to the baseline sector (chemicals and pharmaceuticals). The three largest subsectors are marked with the dark red bars.

Source: Commission services, based on Canova et al. (2011).

Concerning sectoral resilience to shocks, the commonly perceived sensitivity of the car industry to shocks is confirmed by the analysis (Graph II.3.2). This relatively low resilience is present also in another major euro-area manufacturing industry: the production of chemicals and pharmaceuticals. At the other extreme, and somehow surprisingly, mining, as well as wearing apparel, textile and leather production, which are often perceived as declining industries, appear to perform relatively well in the ranking of resilience. Clustering industrial sectors into intermediate goods, investment and consumption goods confirms that consumer goods sectors are more resilient, while those producing investment goods are less so due to more elastic demand.

The focus of the analysis in this section is on industrial sectors. To get a sense of how industry compares with other economic sectors (services, construction, etc.), the analysis was extended to a
broader level of sectoral aggregation (see Table II.3.1, which provides the number of total upturns and downturns for these broad sectors, across all countries). The results show ‘industry’ displaying the lowest resilience, i.e. the highest correlation with euro-area common shocks, followed by ‘wholesale and retail trade’ and ‘construction’. Typically non-tradable activities such as construction and non-financial services are highly domestic-oriented and have traditionally been sheltered from international competition and therefore less exposed to euro-area common shocks.

<table>
<thead>
<tr>
<th>Table II.3.1: Number of identified upturns and downturns across broad sectors (1980-2009)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture, hunting, forestry and fishing</td>
</tr>
<tr>
<td>Total industry (excluding construction)</td>
</tr>
<tr>
<td>Construction</td>
</tr>
<tr>
<td>Wholesale and retail trade, repair of motor vehicles,</td>
</tr>
<tr>
<td>motorcycles and personal and household goods;</td>
</tr>
<tr>
<td>hotels and restaurants; transport, storage and communication</td>
</tr>
<tr>
<td>Financial intermediation; real estate, renting and</td>
</tr>
<tr>
<td>business activities</td>
</tr>
</tbody>
</table>

Source: Commission services, based on Canova et al. (2011)

The 2008-2009 downturn

Data used in the analysis cover the period until 2010Q2 and thus take only partly into account the effects of the ongoing crisis on sectors and countries across the EU. Still, it is interesting to see to what extent, with the information available at the moment of the analysis, the crisis shared some common characteristics with previous episodes. (55)

Graph II.3.3 summarises the quarterly sectoral output changes during the 2008-09 downturn. During the recent crisis period, no industrial subsector faced positive growth, but there were significant differences in the magnitude of the retrenchment.

![Graph II.3.3: Output decline during the 2008-09 downturn by industry subsectors, EU (in%)](image)

Source: Commission services, based on Canova et al. (2011)

The regression results confirm the robustness of results concerning product market regulation and the level of financial development (higher financial development associated with lower resilience). This is especially plausible for this period since the global downturn originated from a negative shock in financial markets. Contrary to the previous cyclical phases, the trade openness interaction is strongly significant and lowers resilience. Also for this particular cycle phase, the results indicate that a higher ratio of sovereign debt to GDP is associated with lower resilience to shocks. This may be explained by the fact that countries with higher debt levels were constrained in their use of fiscal policy to stabilise sectors’ output. High debt levels may also have deterred adjustment by increasing uncertainty about the actions that the government might take to meet its debt obligations, e.g. raise taxes. Countries with high debt to GDP ratios, such as Greece, Italy and Belgium, are found to exhibit higher correlations to common shocks, although — as before — the role played by product market reforms in offsetting this correlation is important. The contribution played by openness and the level of financial development is also large in the case of some countries that had relatively low debt levels at the beginning of the crisis (e.g. Ireland, but also the UK, and Switzerland) but are highly integrated in the global production chains or financial networks.

Conclusions

The principal lesson to be drawn from this analysis is that the EU countries differ in their degree of resilience to common shocks primarily

(55) A main caveat to be borne in mind, however, is that the methodology applied to identify turning points for this recent period is different and thus comparisons should be made carefully. It is not possible to identify the trough that marks the end of the current cycle when using the methodology that was applied to the period 1980-2008. Instead, common turning points across countries are derived from the structural GDP shocks obtained in the VAR analysis. This rule identifies the peak in 2008Q1, and the trough is 2009Q1. This is almost identical to the peaks and troughs identified ‘officially’ by the CEPR for Europe. This method ignores idiosyncrasies in the timing of the recession, but avoids a selection bias that would result from the exclusion of sectors in countries for which the end of the downturn could not be identified.
as a result of country-specific characteristics, among which product market regulation stands out as a major factor. Within the euro area in particular, the unequal ability of countries to adjust to shocks raises policy concerns as channels of adjustment other than the monetary and exchange rate channels need to work as smoothly as possible.

The analysis also indicates that international integration — of goods and services as well as capital — may amplify the transmission of shocks. Since further advancement in integration seems inevitable in view of technological development and the irrefutable overall benefits of integration, it should go hand-in-hand with flexible functioning of product markets to reinforce the adjustment capacity. Thus vigorous reforms in product markets are particularly important for countries in the euro area and for those that are highly integrated.

Turning to the sectoral findings, the results corroborate the fragility of some sectors (e.g. car manufacturing) as well as the higher resilience of consumer goods compared with investment goods. Given cross-country differences in the sectoral composition of output, this differentiated sectoral resilience to common shocks has an effect on the countries’ estimated resilience. However, the findings show that country-specific structural characteristics such as the level of product market regulations have a stronger impact on resilience than sectoral composition effects.

The latest deep recession is a strong common shock that can also provide insights into which factors determine the differing resilience of countries and sectors. In particular, analysis of the years 2008-09 confirms that flexible and well-functioning product markets facilitate a country’s adjustment capacity. However, the particular circumstances that triggered this recession, namely a banking crisis and ensuing financial turmoil, make it unique and drawing generalised conclusions becomes more difficult.

Future studies in this area could explore the possibilities of extending the detailed resilience analysis to other sectors, such as services. For that, though, data at sectoral level is required, in particular covering characteristics such as sector-specific product market regulations as well as sectoral effects of labour market policies.