# Recessions, recoveries and regional resilience: Evidence on Italy

**Paolo Di Caro***

**Abstract**

The regional resilience framework recently conceptualized offers a unified perspective for analysing regional economic evolution. Transient and permanent effects of employment shocks occurred in Italy in the last four decades are described by adopting a quite flexible econometric approach. Spatial interdependency across regions is introduced trough the structure of the error terms. Selected regional comparisons provide evidence on the geographical unevenness of regional resilience in Italy. Some concluding suggestions introduce possible future areas of research based upon the causes behind regional resilience and the policies which can be adopted.

Keywords: Recessions, recoveries, regional resilience, spatial interdependence.

JEL classification: E32, R11, R15.

* University of York and University of Catania
Heslington, York, YO10 5DD (UK) - Corso Italia, n.55 95129 Catania (Italy)
tel. +39 095 7537738 e-mail: pdc503@york.ac.uk.
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## I. Introduction

Recessionary shocks and recovery periods have been longer studied in many disciplines in order to identify origins, analyse consequences and provide policy recommendations. One important question, however, seems to have not been investigated enough in the economic literature: how are booms and busts geographically distributed within a country? Although some recent contributions have studied the geography of crisis and upturns at sub-national level (Wilkerson, 2009; Groot *et al.*, 2011; Hamilton and Owyang, 2012), most of the research in this area still remains spatially-blind.

On the contrary, the spatial unevenness of economic downturns has been evident and clearly observable within nations over the centuries. And the same has been true for post-recessionary stages. While some places show a strong attitude toward shock-absorption, re-orientation of activities and ability to recover; others are less responsive to slumps and deeply affected, remaining in struggle for years. Differences in regional business cycles and asymmetric growth trajectories among diverse cities are tangible examples.

The regional resilience framework recently conceptualized (Martin, 2012) bridges this gap, providing a place-aware synthesis for the study of shocks at territorial level. It allows considering both the temporary impact of exogenous disturbances on a given equilibrium level ('engineering resilience') and the persistence of out-of-equilibrium regional evolutions *à la* Kaldor-Myrdal ('ecological resilience'). Moreover, it represents a different way of analysing the relations between adverse shocks and economic growth in various areas.

Following the econometric specification adopted by Fingleton *et al.* (2012) for the UK case, this paper aims to study the effects of employment shocks on the 20 Italian regions (NUTS II) and their recovery capability over the past four decades. The availability of different series allows to apply this strategy at both aggregate and sector-specific level. In particular, a seemingly unrelated regression (**SUR**) model will be used in order to test the relevance of (engineering) resilience of Italian regional employment to the recessionary shocks in the sample. It is well-known that the SUR model is able to capture simultaneous spatial interdependencies among different units without specifying the familiar spatial matrix (**W**), overcoming some theoretical issues recently observed (Partridge *et al.*, 2012).

Permanent effects and possible time differentiated shocks spillovers across the Italian regions will be analysed using a vector error-correction model (**VECM**) estimated

including interregional employment interdependencies. Given the nonstationarity **I(1)** of all the regional employment series the VECM specification favours the articulation of shocks effects as temporary and persistent. Orthogonalized impulse response functions (**OIRFs**) obtained by a particular Cholesky decomposition will be reported for measuring the effect of a unit shock to one particular endogenous variable at a specific time.

In the past forty years Italy had experienced three main economic crises before the latest depression (Bassanetti *et al.*, 2010): in the early-1970s on the occasion of the Yom Kippur War; in the early-1980s after the Iranian Revolution; in the early-1990s after the devaluation of the Italian *Lira* in September 1992. The present crisis, originated in the US in the second half of 2007 as a financial slump, is still ongoing and, then, interpretations shall be proposed *cum granu salis*.

The analysis hereafter proposed achieves three main objectives. First, it contributes to the growing literature on regional resilience providing original empirical evidences on Italy. Second, it allows to unveil the region-specific effects of the different recessions and recoveries experienced in Italy in the last four decades. Third, it describes the evolution of Italian regions by comparing transient and permanent employment impacts caused by various shocks.

The remaining of the paper is organized as follows. Section II briefly discusses the regional resilience theoretical framework. Section III describes the data and illustrates some preliminary empirics. The econometric analysis is developed in section IV. Section V summarizes and concludes speculating on some possible explanations for differences in resilience across regions over time.

## II. Regional resilience

Economic resilience has been decomposed in 'engineering' resilience, the ability of a given area to bounce back after a negative shock, and 'ecological' resilience, multiple patterns of growth experienced by a place after a recession (Simmie and Martin, 2010; Martin, 2012). The former presents similarities with the well-known 'plucking' model of Milton Friedman and its extensions (Kim and Nelson, 1999); while the latter can be better understood as a hysteretic evolution of a particular economic context showing long-run not-equilibrating trajectories (Redding *et al.*, 2011).

Engineering resilience captures the sensitivity of a region affected by a specific shock and its capability to regain its stable growth pattern. In this sense, it can be described

as transient resilience. A particular fluctuation is able to impose a reduction in the level of a variable for a certain period, but its structural trend is re-established in the long run (peak-reversion effect). As a consequence, a decline in GDP or employment does not influence an economy in a perpetual way, given that a place such a region or a city is involved in a self-equilibrating continuous process.

More resilient regions are expected to suffer less in terms of magnitude and recover faster than less resilient regions. Hence, differences in cumulative losses occurred during recessions and post-recessionary positive changes result helpful in order to detect engineering resilience. Historical asymmetries in the shock-absorption showed by different places have been traditionally observed at both regional (Owyang *et al.*, 2009; Artis *et al.*, 2011) and urban (Glaeser *et al.*, 2011) level.

The recent adoption of Markov-switching techniques in the regional business cycles literature (Owyang *et al.*, 2005) offers a possible alternative way of assessing engineering resilience: regional differences in the timing of a recessions ('entry' and 'exit') can be conceived as a signal of transient resilience. Hence, regions affected longer than the national average, with anticipated entry and postponed exit, may be candidates to be less resilient than the rest of the nation.

At the other end of the spectrum, the notion of ecological resilience denotes a situation where the adverse effects of crises become permanent not dying out over the periods. This view of resilience is closed to the rooted concept of hysteretic behaviour in Economics, which highlights the persistence of specific disturbances influencing the path of an economy. A given area, then, does not necessarily evolve through self-adjusting dynamics, but it can experience multiple patterns such as non-ideal relay (Göcke, 2002) and memory of recessions (Cross *et al.*, 2010).

As extensively discussed in Martin (2012), a particular shock can shift downward/upward the long-run potential of a system while maintaining a constant rate of variation or, alternatively, it is able to cause both a change in the structural evolution of a system and a negative/positive long-run growth. Weather a depressing case can be associated to a perverse cumulative dynamic, a more optimistic one arises from a process of creative destruction *à la* Schumpeter where the turning point is represented by the adverse shock.

Studying ecological resilience, therefore, represents an alternative way of analysing the impact of crises on the growth paths experienced by different geographical areas. In

this sense, regional resilience can be thought as a complementary step for a better understanding of regional evolutions. Moreover, it contributes to integrate some recent empirical works relating economic and political crises to economic growth in cross-country comparisons (Cerra and Saxena, 2008; Panizza *et al.*, 2009).

Although the regional resilience framework is *in fieri* both in theory and in practice, it provides a unified perspective for investigating the various explanations traditionally proposed in order to justify the geographical unevenness of recessions and recoveries within and across countries. Similar productive contexts, for instance, will probably experience symmetric rises and falls (Clark and Van Wincoop, 2001; Kalemli-Ozcan *et al.*, 2001). Regions may become more synchronized in reacting to shocks *ex post* the institution of a common market (Barrios and Lucio, 2003), depending on the distribution of human capital (De Haan *et al.*, 2008) or according to a particular product fragmentation across territories (Ng, 2010).

The permanent effects of crises observed in given areas have been ascribed to the one-way migration of people and ideas (Martin and Sunley, 1998) and to the permanent relation between employment growth and attractiveness to outside labourers across territories (Burridge and Gordon, 1981). On the contrary, the presence of small and innovative firms can facilitate the recovery phase, benefiting from flexible structures and risk-taking behaviour (Clark *et al.*, 2010), as well as the reallocation of productivity through cleaning effects which is able to re-address a given system towards productive-enhancing activities (Caballero and Hammour, 1994).

Considering simultaneously engineering and ecological resilience means analysing a particular economic context in two alternative scenarios: in-balance and out-of-balance. Although modelling shock-absorption and shock-persistence across regions taking into account spillovers effects is not a trouble-free task, unveiling the spatial distribution of benefits and losses deriving from recessions and recoveries can contribute to the debate concerning regional development. The next pages will deal with this task for the Italian case.

## III. Italian regional evolution: preliminary empirics

The empirical part is based on Italian regional data for employment over the period 1977-2011. Employment series have been preferred to GDP or other economic measures for two main reasons: first, they are more articulated at regional level and need not be deflated; second, they provide interesting insights on the evolution of a regional context (Blanchard and Katz, 1992), though they can be affected by issues related to place-specific frictions in labour markets.

Annual series are available for the whole period, while quarterly data range from 1992(IV) to 2012(I)[1]. More precisely, then, we have two distinct series for the 20 Italian regions (NUTS II): annual data (t=35) and quarterly data (t=78). This difference is mainly due to changes in the methodology of collection adopted by the Italian National Institute of Statistics during these years (ISTAT, 2004). In particular, quarterly data for employment collected *ante* 1992 are not comparable with the series elaborated *post* 1992.

***Insert about here:***
***Figure 1.a,b. – Italy employment level (Millions) and growth rate, 1977-2011.***

Figure 1 illustrates aggregate Italian employment both in level and growth rate for annual data. The sample period contains three main national adverse shocks: the early-1980s, the *Lira* crisis in the early-1990s and the last recession started in 2008.

The first crisis was experienced in the early-1980s and it was part of a prolonged slowdown in the economic activity registered in Italy and in other European countries over all the Seventies. It caused a substantive reduction in output, exports and internal consumption, while employment was less affected (Bassanetti *et al.*, 2010). Perhaps the mild shifting in occupation can be justified with the massive utilisation of generous temporary work subsidies and the increased public labour demand arising from the contextual process of regional administrative decentralization started in the second half of the Seventies.

Comparisons of employment at regional level are difficult to be made over the 1970s, given that the regional series elaborated by ISTAT only starts in 1977. However, using a complementary dataset provided by the research centre CRENOS some

[1] In what follows, the main sources of data are ISTAT (Italian National Institute of Statistic) and CRENOS (Centre for Economic Research North-South). A complementary series ranging from 1970 to 2009 will be used to integrate the discussion on the recessionary events occurred in the Seventies. This additional dataset, elaborated by CRENOS, has been created from Italian regional accounts and other related sources (Paci and Saba, 1998).

interpretations on the geographical distribution of the two main recessions had in the 1970s-1980s can be advanced.

In particular, some regions such as Piedmont, Liguria, Friuli V.G. and Sardinia were more affected than the overall country, showing longer negative dynamics than the national one. By contrast, other regional contexts registered lower decline in the total number of occupied than the national average as in the case of Veneto, Lombardia, Emilia-Romagna, Toscana, Lazio and Campania[2].

The recovery phase registered in the second half of the 1980s was characterized by the emergence of a common positive trend in employment shared by the regions in the Centre-North and being part of the well-known 'Third-Italy'. Other favourable exceptions were Campania and Sardinia. The post-recessionary cumulative growth showed by other regions, mainly most of the Southern areas and the traditional industrial ones, was lower than the Italian aggregate.

***Insert about here:***
***Figure 2. – Italy employment growth rate, 1992(IV)-2012(I).***

Figure 2 above shows the Italian employment growth from 1992(IV) to 2012(I). It is clearly observable why before the latest recession started in 2008 the *Lira* crisis was identified as the Italian 'Great Recession' with relevant employment losses from late 1992 to the beginning of 1995. For the only 1993, for instance, Miniaci and Weber (1999) reported a decline in GDP of around 1.2% and household disposable income falling by 5%.

The announcement of devaluating the Italian *Lira* operated by the government in September 1992 is generally recognized as the starting point of the Italian currency crisis. This prolonged slumps, officially ended after six quarters in 1995(I), caused almost one third of cumulative loss in term of external value and sudden depreciation in the real exchange rate: a fall by 10.25% was registered only over the last quarter of 1992. Moreover, it contributed to temporarily pushing Italy out of the European Monetary System.

Whether the consequences on inflation were less strong than expected, due to some structural reforms launched in late-1980s, interest rates substantially raised creating relevant problems for the equilibrium of the public sector. In addition, the Italian labour market

[2] The qualitative analysis for the 1970s-1980s is deliberately incomplete for two reasons. First, difficulties related to affordable time series for regional employment, given the different techniques adopted by ISTAT. Second, given the limited availability of quarterly data, the focus will be on the two more recent crises.

experienced a substantive fall in employment (more than 4% summing over the six quarters), deepened by the prior reform of temporary layoff schemes introduced in 1991 on the basis of more restrictive criteria.

A diachronic comparison with the recent recession results difficult for two evident reasons. First, even if the official timing range from 2008(II) to 2010(III) it is clear that the last crisis is not completely over. Second, the concomitant presence of 'three crises' (financial, Euro and sovereign debt) characterizing the present recession requires cautious explanations. Limiting the observation to the reduction of aggregate employment registered between late 2008 and the end of 2010, Italy had experienced more than 2% of employment losses.

As discussed in Martin (2012) and Fingleton *et al.* (2012), regional resilience can be better described by using some particular indexes. Table 1 reports the sensitivity of the 20 Italian regions to the two most recent recessionary shocks, calculated as the regional percentage decline in employment relative to the national decline during each adverse event.

***Insert about here:***
***Table 1. – Italian sensitivity index.***

During the *Lira* crisis some regions were more resistant than the national counterpart (sensitivity index lower than 1), while others, mainly in the Centre-South, suffered high cumulative losses in employment with respect to Italy as a whole. This strong polarization was probably caused by both the contemporaneous abolition of the specific additional measures devoted to the Italian *Mezzogiorno* (i.e. extra-ordinary regional programs) and the increased flexibility introduced in public employment, highly diffused in these areas.

A more complex situation seems to appear across the Peninsula when considering the regional differences in sensitivity originated from the current economic slump. Despite these observations shall cautiously be interpreted, it emerges the absence of a clear spatial divide. Disaggregating this index at sector level it can be noted the higher sensitivity of some industries such as building, petrochemicals, mechanical and retailing. These results are confirmed for both recessionary events heretofore discussed.

***Insert about here:***
***Table 2. – Italian recovery index.***

Table 2 contains the recovery index of Italian regions for the period between the two more recent crises (1995(II) – 2008(I)), defined as the post-recession percentage growth in employment in a region relative to the percentage growth in national employment (Martin, 2012). In the aftermath of the *Lira* crisis the relative employment growth followed the rooted North-South divide, with higher reactions registered in the Central and Northern regions and most of the Southern areas remaining below the Italian average. Similar trends have been found in a different study focused on the identification of co-movements in regional business cycles in Italy (Mastromarco and Woitek, 2007).

It is worth mentioning, however, the presence of relevant differences in magnitude across Italian regions. In the North, for instance, the recovery of Piemonte and Liguria was lower than most of the other regions in the same area and than the Italian average. By comparison, Abruzzo and Sardegna registered the highest post-recessionary performances among the regions in the Centre-South.

Figure 3 below compares the sensitivity of Italian regions to the *Lira* crisis and their recovery performance up to the recent recession. Low resilient regions (high sensitive) seem to bounce back (low recovery) less than more resilient regions.

***Insert about here:***
***Figure 3. – Italian sensitivity and recovery.***

Considering the *Lira* crisis and the subsequent post-recessionary period the 20 Italian regions seem to have followed three possible patterns: high resistance and high recovery (most of the regions in the Centre-North); medium resistance and low recovery (Piemonte, Liguria and Sardinia); low resistance and low recovery (most of the Southern regions excluded Abruzzo). A peculiar trajectory was experienced in Lazio, the region of Rome, with high sensitivity and high recovery capability.

## IV. Econometric analysis

### *IV.1 Transient resilience*

Engineering resilience can be captured by estimating the coefficients of both recessions and recoveries at regional level and testing the possible heterogeneity across regions. Following Fingleton *et al.* (2012), in the presence of contemporaneous correlation between units seemingly unrelated given different parameters, i.e. regions in our case, a SUR model can be useful to describe possible underlying relations via the correlation of the error terms, without introducing prior assumptions on the spatial interdependence.

For the annual series ranging from 1977 to 2011, the following SUR model has been estimated in order to describe regional employment growth as determined by: i) region-specific growth rate; ii) recessionary events; and iii) post-recessionary periods:

$$\Delta emp_{it} = \beta_{0i} + \beta_{1i}Rec_{1t} + \beta_{2i}Rec_{2t} + \beta_{3i}Rec_{3t} + \beta_{4i}Post_{1t} + \beta_{5i}Post_{2t} + \varepsilon_{it} \qquad (1)$$

where:

$\Delta emp_{it}$ = employment growth in region $i$ ($i$ =1,….., 20) at year $t$ ($t$ =1978,….., 2011);

$\beta_{0i}$ = region-specific (autonomous) growth rate;

$\beta_{1i}$ = $\beta_{2i}$ = $\beta_{3i}$ = change in employment growth rate as recession dummies: $Rec_{1t}$ (1982-1984); $Rec_{2t}$ (1992-1995); $Rec_{3t}$ (2008-2010);

$\beta_{4i}$ = $\beta_{5i}$ = change in employment growth rate during post-recession periods: $Post_{1t}$ (1985-1991); $Post_{2t}$ (1996-2007);

$\varepsilon_{it}$ = error terms with $E[\varepsilon_{it}\varepsilon_{it}] = \sigma^2_{ii}$ and $E[\varepsilon_{it}\varepsilon_{jt}] = \sigma^2_{ij}$ .

The dating of the recessionary events is exogenously defined for the whole nation on the basis of our datasets and according to the official analyses elaborated by the Bank of Italy and the Italian Institute for Studies and Economic Analyses (ISAE)[3]. Hence, we have adopted the exogenous approach (Harding and Pagan, 2003) rather than the endogenous one (Hamilton, 2003). Regarding the particular structure of the errors, temporal

[3] In contrast with the US where the official dating of economic crises is provided by the National Bureau of Economic Research, a conventional timing of recessionary events is not present for the Italian case. Nevertheless, it has been followed the timing adopted by two of the main national economic institutions and confirmed by the historical knowledge.

homoscedasticity has been previously tested applying the well-known Likelihood-Ratio Test, rejecting the presence of heteroscedasticity.

Estimation results and graphs for all regions are reported in the Appendix. It is evident as the main purpose of this model is to describe the influence of particular moments, recessions and recoveries, on the evolution of Italian regional employment rather than finding out explanations behind the employment growth itself.

The (unrestricted) SUR model in (1) represents a starting point for testing various hypotheses able to identify the spatial patterns of engineering resilience across Italian regions. In particular, in line with Fingleton *et al.* (2012) the following restrictions have been tested:

a) $\beta_{1i} = \beta_{2i} = \beta_{3i}$ : for each region the impact of recessions is constant over time;

b) $\beta_{r1} = \beta_{r2} = \beta_{r3} = \beta_{r4} = \beta_{r5} =$...: the impact of each recession ($r$ = 1,2,3) is the same for all regions;

c) $\beta_{4i} = \beta_{5i}$ : for each region the impact of postrecession recovery is constant across time;

d) $\beta_{s1} = \beta_{s2} = \beta_{s3} = \beta_{s4} = \beta_{s5} =$...: the impact of each postrecession ($s$ = 1,2) is the same for all regions.

Whereas restrictions (a) and (c) contribute to explain possible differentiated effects of both recessions and recoveries introduced in the estimation, testing (b) and (d) means investigating the presence of geographical asymmetry in the shock-absorption and in the recovery phase of Italian regions. For each recession and postrecession the null hypothesis of geographical evenness (same impact for all regions) can be rejected at all levels of significance.

***Insert about here:***
***Figure 4. – Selected regional comparisons SUR annual.***

Selected regional comparisons based on the fitted values of the model in (1) can suggest some interpretations about the evolution of regional resilience in Italy in the last four decades. Graphs reported in figure 4 show six relations among some representative regions.

For each pair of regions two evident aspects are worth mentioning. First, regional heterogeneity during recessions and postrecessions can be observed by the different magnitude of the estimated coefficients. In the first case (Piemonte *vs* Veneto), for instance, this pattern emerges with clarity: employment growth in Piemonte always registers lower levels than Veneto. Second, it shall be recognized the variation across time of both adverse shocks and recovery periods: these events show a time variant evolution.

Comparing Piemonte and Veneto it can be noted the lower resilience of the former, a traditional industrial region, during all negative shocks and their aftermaths. In the second case, Liguria *vs* Marche, changes in employment growth are more varied, with Liguria suffering more than Marche in the first crisis and in the last one, but performing better both in the first postrecession period and during the downturn of the early-1990s.

Despite the presence of differences in magnitude, the four North-South comparisons (Emilia Romagna *vs* Campania; Toscana *vs* Puglia, Lombardia *vs* Sicilia and Friuli V.G. *vs* Calabria) are characterized by a common pattern: all the regions in the South were more resistant to the negative shock of the Eighties, results also confirmed for the Seventies using the auxiliary dataset, but their sensitivity increased in the subsequent two crisis.

This variation in the absorptive capacity of Southern regions could be ascribed to the relative reduction of the share of public employment experienced in the South in the early-1990s. In the same direction, it is interesting to note the contemporaneous introduction of more flexible contracts in the public sector (the so-called 'privatization of public jobs' inaugurated in 1992) which had a major impact in those regions having a large number of public workers.

Being a flexible specification, the SUR model has been adopted for describing the evolution of regional employment at sector level and, more precisely, for analysing the resilience of the industrial sector (excluding building). This choice has been motivated for two reasons: first, the sensitive attitude of the industrial sector has been widely recognized by the literature on business cycles; second, negative shocks present in the national industrial series are closer to the aggregate employment fluctuations, than those in the other sectors such as agriculture, building or services[4].

[4] In this case, employment series are those of the auxiliary dataset elaborated by CRENOS (see footnote n.1).

Observations for industrial employment are available for the period from 1970 to 2010. The same specification in (1) has been estimated, using five sector specific recession dummies, namely: i) 1975-1976; ii) 1981-1987; iii) 1991-1993; iv) 1996-1997; v) 2008-2009. The four periods between these recessions (1977-1980; 1988-1990; 1994-1995; 1998-2007) have been used as the recovery variables of the estimation. After testing the unrestricted model as in the previous case (restrictions a-d), a restricted version has been estimated imposing the common (national) impact of the fourth recession in the sample (1996-1997).

***Insert about here:***
***Figure 5. – Selected regional comparisons SUR industry annual.***

Figure 5 illustrates the fitted values (restricted SUR) of industrial employment growth for the six pairs of regions yet mentioned. Again, differences in regional resilience (i.e. magnitude of shocks and recoveries) and over time are evident.

Apart from the post *Lira* crisis, Piemonte confirms higher sensitivity and lower recovery than Veneto. Concerning this sector specific employment evolution, Marche performs better than Liguria over the whole time period. More articulated results emerge from the other four relations. All the regions in the North seem to perform better in the aftermath of the *Lira* crisis, perhaps due to their higher export propensity and the contemporaneous increased stimulus of Italian products at international level.

For quarterly data ranging from 1992(IV)-2012(I) the following SUR model has been estimated:

$$\Delta emp_{it} = \beta_{0i} + \beta_{1i} Rec_{1t} + \beta_{2i} Rec_{2t} + \beta_{3i} Post_{1t} + \varepsilon_{it} \qquad (2)$$

where:

$\Delta emp_{it}$ = employment growth in region $i$ ($i$ =1,….., 20) at quarter $t$ ($t$ =1993(I),…..2012(I));

$\beta_{0i}$ = region-specific (autonomous) growth rate;

$\beta_{1i} = \beta_{2i}$ = change in employment growth rate as recession dummies: $Rec_{1t}$ (1993(I)-1995(II); $Rec_{2t}$ (2008(II)-2010(III));

$\beta_{3i}$ = change in employment growth rate during alternative post-recession specifications;

$\varepsilon_{it}$ = error terms with $E[\varepsilon_{it}\,\varepsilon_{it}] = \sigma^2_{ii}$ and $E[\varepsilon_{it}\,\varepsilon_{jt}] = \sigma^2_{ij}$ .

In this case, the recovery dummy $Post_{1t}$ has been defined both following the procedure heretofore adopted (1995(II)-2008(I)) and using different time selection criteria such as: one/two years after a recessionary event; number of quarters from the recessionary event to the first technical recession calculated as two consecutive quarters with negative change.

The unrestricted model in (2) has been tested as follows:

a) $\beta_{1i} = \beta_{2i}$: for each region the impact of the two recessions is similar;
b) $\beta_{r1} = \beta_{r2} = \beta_{r3} = \beta_{r4} = \beta_{r5} = ...$: the impact of each recession ($r$ = 1,2) is the same for all regions;
c) $\beta_{s1} = \beta_{s2} = \beta_{s3} = \beta_{s4} = \beta_{s5} = ...$: the impact of the unique postrecession ($s$ = 1) is the same for all regions.

As a result, a restricted SUR has been performed imposing a common national shock ($\beta_2$) for the last recession started in the second quarter of 2008. Estimation results and graphs for all the regions are in the Appendix. Figure 6 shows the fitted values of the six regional comparisons yet discussed, with the postrecession period defined as one year after the first recession (1995(II)-1996(II)).

***Insert about here:***
***Figure 6. – Selected regional comparisons SUR quarterly.***

Most of the results previously discussed for the annual series are confirmed. Regional and time specific evolutions continue to occur. Piemonte is more sensitive than Veneto during both recessions in the sample period, but it experienced a higher recovery in the first year after the *Lira* crisis. Liguria seems to perform worse than Marche during and just after the *Lira* crisis. The additional four pairs of regions support, with differences in magnitude, the North-South divide: regions in the North seem to be more engineering resilient than those in the South.

Again, the SUR model has been applied for describing the evolution of industrial regional employment (excluding building). In this case, data availability is limited including observations from 1992(IV) to 2010(IV). Two sector specific recessionary events have

been chosen, namely: 1992(IV)-1995(I) and 2008(IV)-2010(II). For the identification of the recovery phase, the same strategy adopted for total employment has been used: i) one/two years after a recessionary event; ii) number of quarters from the recessionary event to the first technical recession; iii) quarters between the first and the second recession.

The unrestricted model for industrial data has been tested applying the same methodology used for aggregate employment (a-c). As a result, a restricted SUR has been estimated imposing a common national impact for the second recession in the sample. Regional comparisons are illustrated in figure 7.

***Insert about here:***
***Figure 7. – Selected regional comparisons SUR quarterly.***

As in the previous cases, regional and time variant patterns clearly emerge. Concerning the evolution of industrial employment, Veneto confirms its higher resilience than Piemonte. The same is true for Marche in comparison with Liguria, even if the latter presents a specific dynamic during the *Lira* crisis. All the three main Southern regions (Campania, Puglia and Sicilia) seem to have suffered relevant employment losses one year after the *Lira* crisis. Finally, in the last 20 years the evolution of industrial employment in Calabria has followed a less resilient trajectory than that of Friuli V.G.

Finally, observing the matrix of the residuals for each estimated model two comments are worth nothing. First, most of the Italian regions confirm the importance of spatial proximity: cross-correlation across regions and distance among them are inversely related. Second, some regions seem to be influenced, in terms of magnitude of cross-correlation, by sectorial similarities: regions with analogous industrial structure (e.g. Lazio and Campania) show more relevant connections than those having different economic systems.

### *IV.2 Permanent resilience*

One possible way of analysing the hysteretic effects caused by one time regional employment shock is the Vector Error-Correction Model fitted to the levels of employment. With nonstationary series I(1), as in the case of regional employment, and in presence of cointegrated variables this particular specification allows to distinguish between temporary and permanent effects of a given shock.

A parsimonious econometric strategy requires to precisely defining the presence of unit root in the series, the number of lags in the vector error correction representation and the number of cointegrating vectors. In our case, the stationarity of employment series has been verified using the traditional Augmented Dickey Fuller (ADF) test. The optimal lag length of the model has been chosen comparing different selection criteria: Akaike information criterion (AIC), Schwarz Bayesian information criterion (SBIC) and Likelihood Ratio (LR) test. The number of cointegration relations has been identified by adopting the well-known Johansen trace test[5].

For quarterly data a VECM with one lag and nine cointegrating relationships has been estimated for a subsample of 17 Italian regions: excluding the three smallest regions, namely Valle d'Aosta, Molise and Basilicata. The eigenvalue stability condition supports the cointegrating relationships adopted, finding out 8 unit moduli, obtained as difference between the number of variables ($k$ =17) and the number of cointegrating relations ($r$ =9)[6].

As discussed in Fingleton *et al.* (2012), the VECM specification allows to separate transient and permanent effects, addressing the initial question on the geographical unevenness of employment shocks across regions in the long-run: the main question is whether shocks tend to zero or they show an hysteretic path. Moreover, this approach favours the investigation of particular causal relations among regions by the adoption of a given spatial order (i.e. a specific Cholesky decomposition).

In contrast with the UK case where the presence of a dominant region (i.e. South East) can be justified on the basis of several arguments, the propagation of shocks across Italian regions follows a more varied pattern and, then, it need to be studied adopting a more general perspective. As a consequence, the ecological resilience and the sensitivity of Italian regions to shocks is hereafter described using orthogonalized mean responses derived from impulses emanating by all the region in our sample, which can be understood like an Italian average effect in terms of employment.

The OIRFs are able to provide one possible (not unique) causal interpretation to our system, even in presence of correlation between disturbances. In our case, the orthogonalization has been obtained imposing a recursive structure on the contemporary relationships of the variables, namely investigating a particular Cholesky decomposition

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5 The test results are not reported here but available upon request. For a different approach regarding the cointegrating relationships of Italian regions see Cellini and Scorcu (1997).

6 Estimation results, the Lagrange-Multiplier test for residual autocorrelations and the traditional tests for errors normality (Jarque-Bera, skewness and kurtosis) are available upon request.

able to identify the scheme of the instantaneous correlations. More precisely, the following order of the variance-covariance matrix has been explored: from the North to the South, responses tend to weaken with distance, being strongest within regions and in neighbouring regions[7]. Table 3 reports the mean OIRFs over periods 1-20, given that the specific Cholesky ordering presents nonzero differences in initial responses across regions.

***Insert about here:***
***Table 3. – Mean Responses to Shocks from All Regions.***

From the observation of the mean responses of Italian regions, the presence of differences in magnitude is quite evident. Liguria and almost all the Southern regions confirm their high sensitivity when considering shocks regardless of origin. By contrast, most of the regions in the Centre and in the North seem to be, on average, less affected and, then, more resilient regarding employment shocks. The positive responses registered in Veneto and Trentino A.A. shall be probably ascribed to the specific dynamics experienced in these regions during the period of observation.

***Insert about here:***
***Figure 8 (a-e). – Mean Responses to Shocks from All Regions.***

Figures 8 (a-e) illustrate the mean responses over time in five different macro areas: North-West, North-East, Centre-North, Centre-South and South. For our purposes, two aspects are worth mentioning. First, employment shocks regardless of origin affect each area in a peculiar way in terms of both magnitude and dynamics. Similar trajectories, however, can be observed between the North-West and the Centre-North and between the Centre-South and the South.

Second, region-specific evolutions seem to be also confirmed in the long-run. In the North-West, for instance, a one unit negative shock has a deeper effect, on average, on Liguria rather than on the other regions. In the North-East area, Veneto, Trentino A.A. and Friuli V.G. show fairly different responses, probably due to their diverse economic structures. Regions in the Centre-North share a common dynamic, though in presence of differences in sensitivity. A similar description can be extended to the Centre-South

[7] In concrete, the following Cholesky ordering has been applied: Piemonte, Liguria, Lombardia, Veneto, Trentino A.A., Friuli V.G., Emilia Romagna, Toscana, Umbria, Marche, Abruzzo, Lazio, Campania, Puglia, Calabria, Sicilia, Sardegna.

without taking into account the peculiarity of Abruzzo. Mean responses registered in the South of Italy confirm the high sensitivity of this macro area with the partial exception of Sardegna.

All the results discussed in this section such as graphs and OIRFs are conditional on the specific model that has been applied and on the particular Cholesky decomposition used. In other words, our results rely upon the particular propagation of the shocks that has been adopted and, then, alternative specifications will probably differ. Moreover, it is important to remember the main perspective of this work, a descriptive one, which is not focused on the causes behind the regional variety in long-term resilience. For this reason, our specification is deliberately limited not including additional explanatory variables.

However, the quite simple econometric technique adopted in this paragraph introduces two novel arguments in the debate on regional evolution. First, employment shocks are not only temporary accidents, but they represent structural moments for a given area, being able to originate hysteretic effects. Therefore, the difference between engineering and ecological resilience seems to be plausible. Second, geography matters when considering both recessions and recoveries, given that employment shocks are characterized by region-specific effects. The mosaic of responses observed in the Italian case supports this argument.

## V. Conclusion

Some years ago, Barry Eichengreen discussing the link between Macroeconomics and regional issues sustained the importance 'to think harder than we traditionally have' when applying a particular economic analysis to a given area. The regional resilience framework recently theorized goes in this direction, providing a spatially-aware unified perspective for studying regional economic evolution. Using a flexible econometric approach, this paper has investigated this idea focusing on recessions and recoveries experienced in Italy in the last four decades.

Transient (engineering) and permanent (ecological) resilience has been observed across Italian regions, confirming the presence of a process which is characterized by its geographically unevenness. From our analysis, past and recent employment dynamics in Italy are far from being a homogeneous picture, with region-specific differences quite recognizable in the shock-absorption and during post-recessions. The resilience argument,

then, may contribute to explain the rooted divide present in the Italian modern development: while more resilient regions are able to sustain virtuous growth paths, less resilient areas are affected by negative cumulative processes. It is worth noting that these results partially contrast with a recent contribution (Cellini and Torrisi, 2012), studying the resilience of Italian regions in terms of GDP in the very long-run (i.e. over the period 1890-2009).

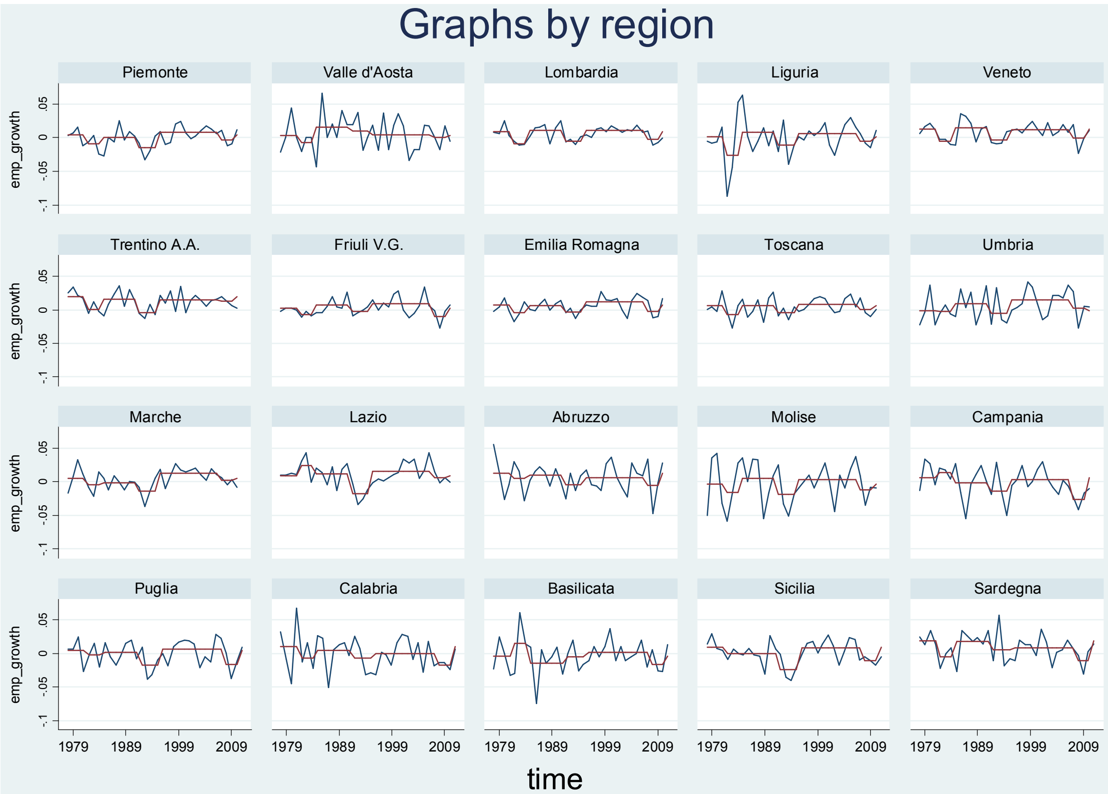
From our discussion, two related questions naturally arise, which also represents possible speculative areas for future research: What are the determinants behind the geographical discrepancies in resilience? What policies are more desirable in presence of regional heterogeneity? The first question has been traditionally answered in several ways, highlighting the role of different industrial structures, the degree of international integration of a particular area and the importance of entrepreneurship spread at territorial level. The second issue concerns the adoption of place-tailored counter-cyclical and structural policies. The former have been discussed during the present crisis both in the US and in Europe, while the latter is the focus of the place-based paradigm in regional development.

# Appendix

## I. SUR Results

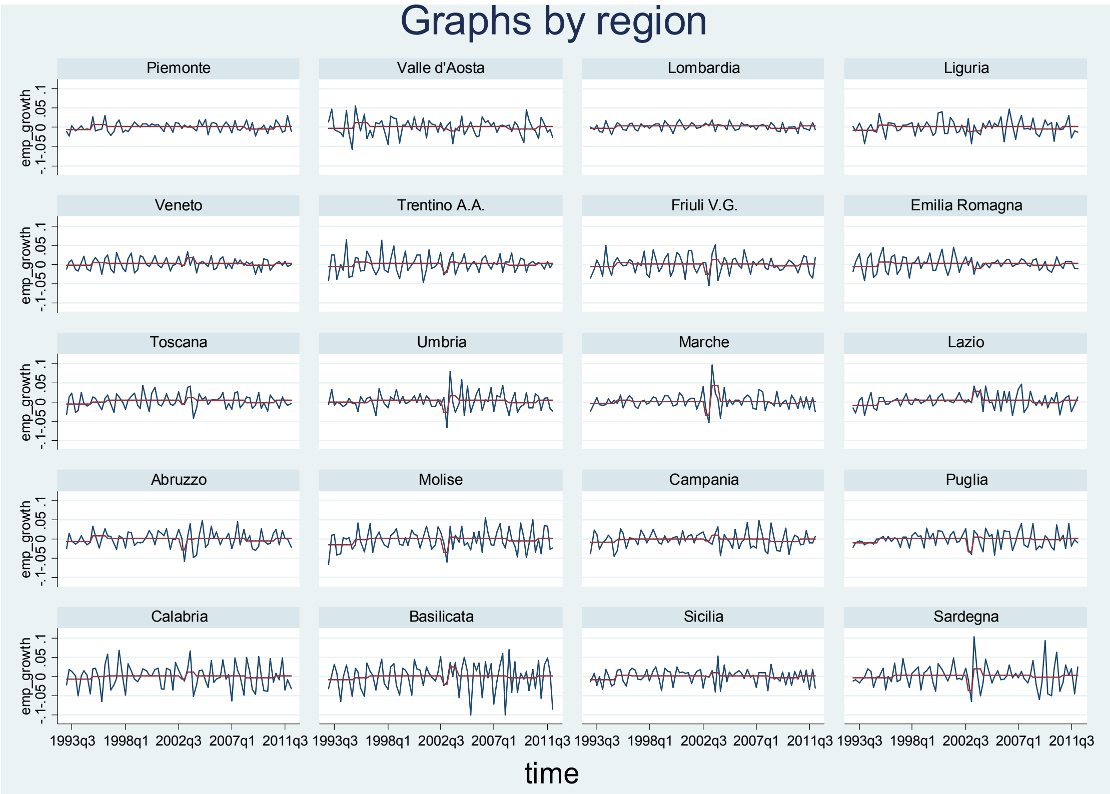
***SUR annual 1977-2011***

| Region | Auton. growth | Recession 1 | Recession 2 | Recession 3 | Post 1 | Post 2 |
|---|---|---|---|---|---|---|
| **Piemonte** | 0.00511 | -0.01394 | -0.01949 | -0.00847 | -0.00508 | 0.0025 |
| **Valle d'Aosta** | 0.00352 | -0.01047 | 0.00616 | -0.00342 | 0.01152 | 0.00125 |
| **Lombardia** | 0.00844 | -0.01718 | -0.01293 | -0.01104 | 0.00312 | 0.00230 |
| **Liguria** | 0.00154 | -0.02759 | -0.01252 | -0.00667 | 0.00105 | -0.00090 |
| **Veneto** | 0.01358 | -0.01890 | -0.01752 | -0.01454 | 0.00598 | 0.00444 |
| **Trentino A.A.** | 0.01984 | -0.01886 | -0.02433 | -0.00747 | -0.00458 | -0.00570 |
| **Friuli V.G.** | 0.00189 | -0.00400 | -0.00916 | -0.01213 | 0.00497 | 0.00712 |
| **Emilia Romagna** | 0.00689 | -0.01158 | -0.01092 | -0.00973 | -0.00039 | 0.00410 |
| **Toscana** | 0.00629 | -0.01385 | -0.01084 | -0.00557 | -0.0002 | 0.00207 |
| **Umbria** | -0.00152 | -0.00067 | -0.00458 | 0.00358 | 0.01057 | 0.01559 |
| **Marche** | 0.00505 | -0.00986 | -0.01865 | -0.00355 | -0.0069 | 0.00755 |
| **Lazio** | 0.00817 | 0.01586 | -0.02674 | -0.00201 | 0.00384 | 0.00801 |
| **Abruzzo** | 0.01276 | -0.00718 | -0.01688 | -0.01820 | -0.00300 | -0.00639 |
| **Molise** | -0.00296 | -0.01337 | -0.01627 | -0.00881 | 0.00838 | 0.00617 |
| **Campania** | 0.00652 | 0.00707 | -0.02032 | -0.03315 | -0.00842 | -0.00376 |
| **Puglia** | 0.00394 | -0.0064 | -0.02118 | -0.01963 | -0.00148 | 0.00226 |
| **Basilicata** | 0.01075 | -0.01717 | -0.01738 | -0.02761 | -0.00647 | -0.01056 |
| **Calabria** | -0.00384 | 0.01892 | -0.00122 | -0.0117 | -0.01040 | 0.00613 |
| **Sicilia** | 0.01007 | -0.0105 | -0.03449 | -0.02099 | -0.00975 | -0.00121 |
| **Sardegna** | 0.01954 | -0.02423 | -0.01410 | -0.02987 | -0.00198 | -0.01142 |



*SUR quarterly 1992(IV)-2012(I)*

| Region | Auton. growth | Recession 1 | Recession 2 | Post 1 |
|---|---|---|---|---|
| Piemonte | 0.00194 | -0.00802 | -0.00493 | 0.00721 |
| Valle d'Aosta | 0.00087 | -0.00537 | -0.00493 | 0.01202 |
| Lombardia | 0.00268 | -0.00579 | -0.00493 | 0.00358 |
| Liguria | 0.00154 | -0.00818 | -0.00493 | 0.00057 |
| Veneto | 0.00323 | -0.00486 | -0.00493 | 0.00139 |
| Trentino A.A. | 0.00390 | -0.00793 | -0.00493 | 0.00529 |
| Friuli V.G. | 0.00179 | -0.00711 | -0.00493 | 0.00551 |
| Emilia Romagna | 0.00290 | -0.00819 | -0.00493 | 0.00447 |
| Toscana | 0.00258 | -0.00729 | -0.00493 | -0.00160 |
| Umbria | 0.00329 | -0.00424 | -0.00493 | -0.00596 |
| Marche | 0.00257 | -0.00626 | -0.00493 | 0.00173 |
| Lazio | 0.00426 | -0.00136 | -0.00493 | -0.00194 |
| Abruzzo | 0.00184 | -0.00695 | -0.00493 | 0.00653 |
| Molise | 0.00099 | -0.01497 | -0.00493 | -0.00341 |
| Campania | 0.00014 | -0.00854 | -0.00493 | -0.00263 |
| Puglia | 0.00139 | -0.09856 | -0.00493 | -0.00177 |
| Basilicata | 0.00061 | -0.01094 | -0.00493 | -0.00309 |
| Calabria | 0.00095 | -0.00980 | -0.00493 | -0.00038 |
| Sicilia | 0.00176 | -0.01301 | -0.00493 | -0.00126 |
| Sardegna | 0.00292 | -0.00949 | -0.00493 | -0.00808 |



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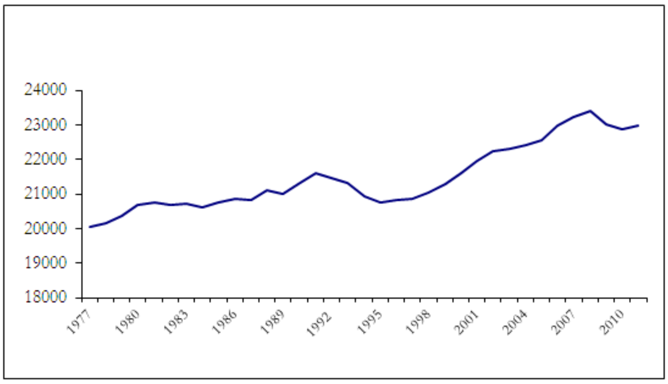
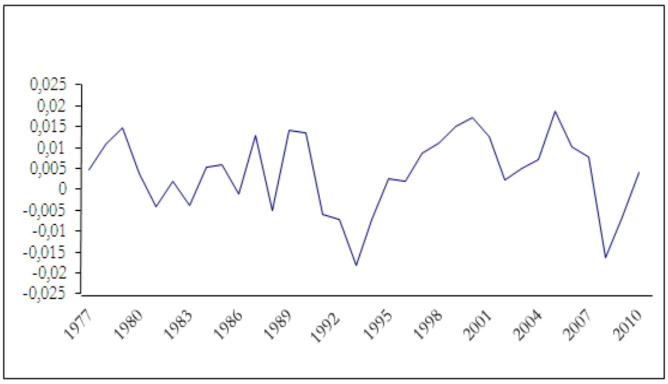
# Figures

## Figure 1. Italy Employment 1977 – 2011

### (a) Level (Millions)




### (b) Growth rate




## Figure 2. Italy Employment growth rate 1992(IV) – 2012(I)

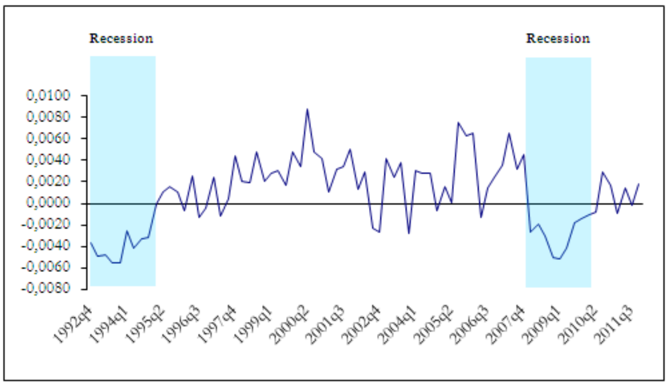


**Figure 3. Italian sensitivity and recovery**

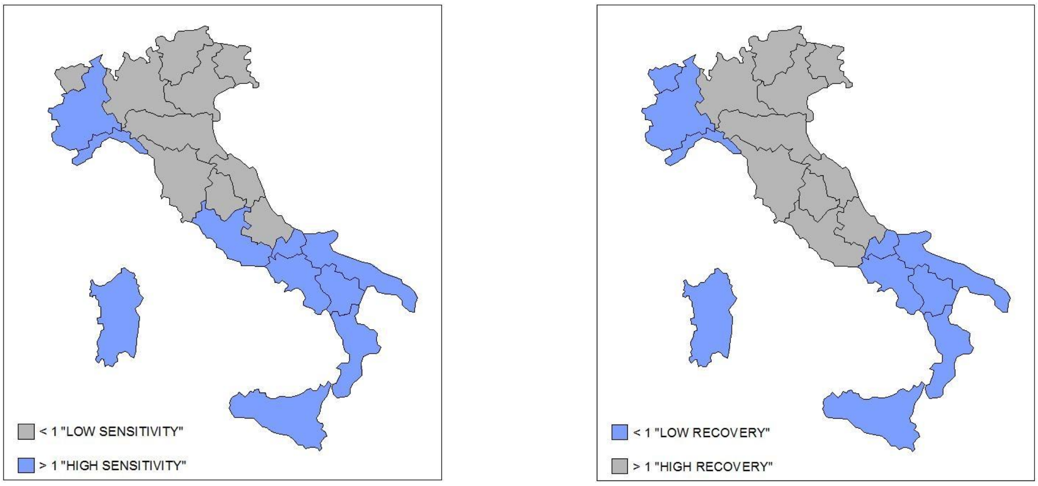
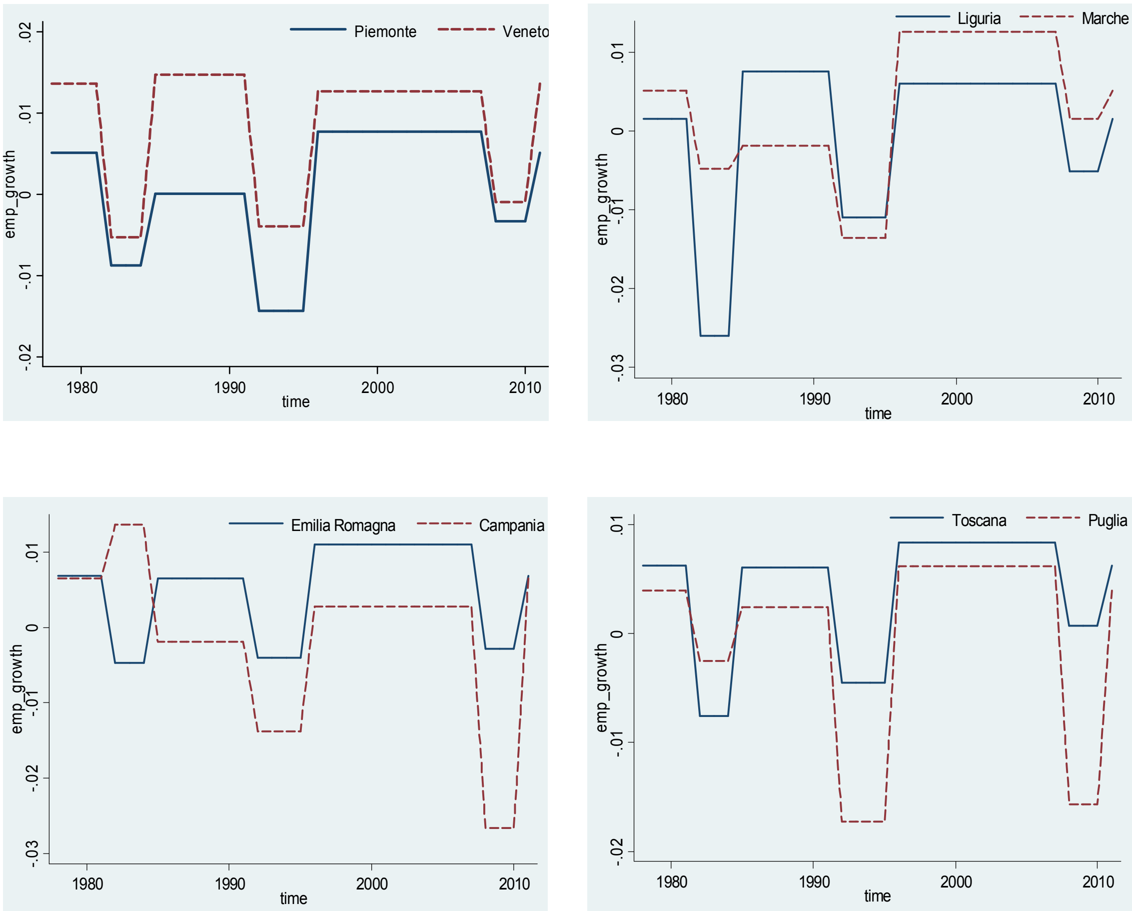
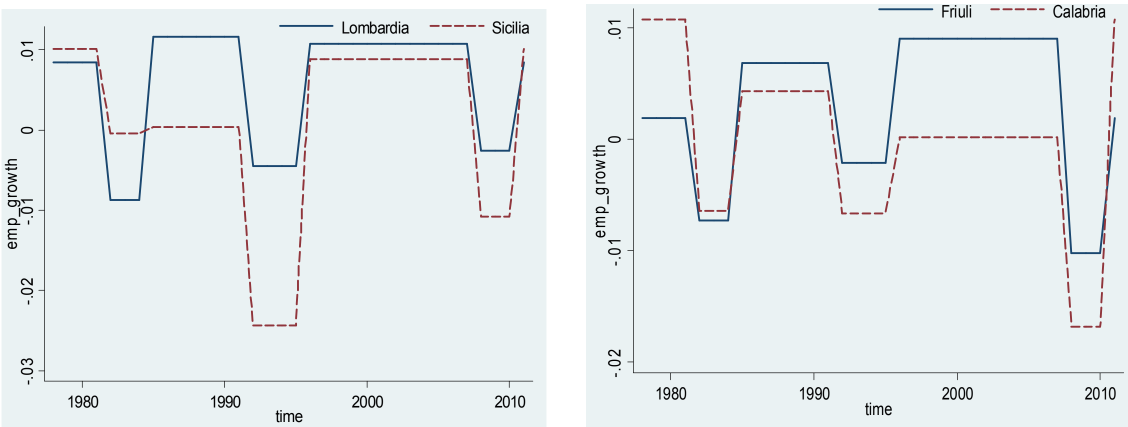


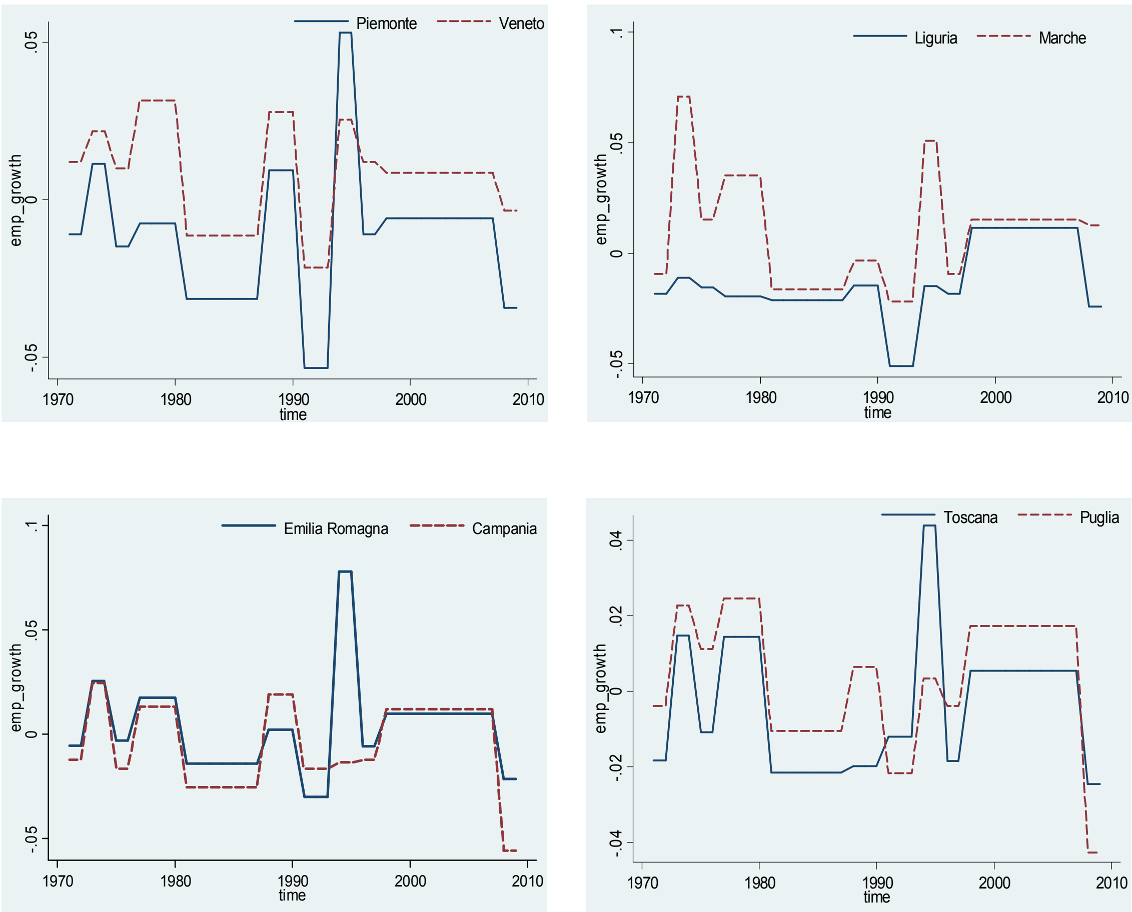

**Figure 4. Selected regional comparisons SUR annual**

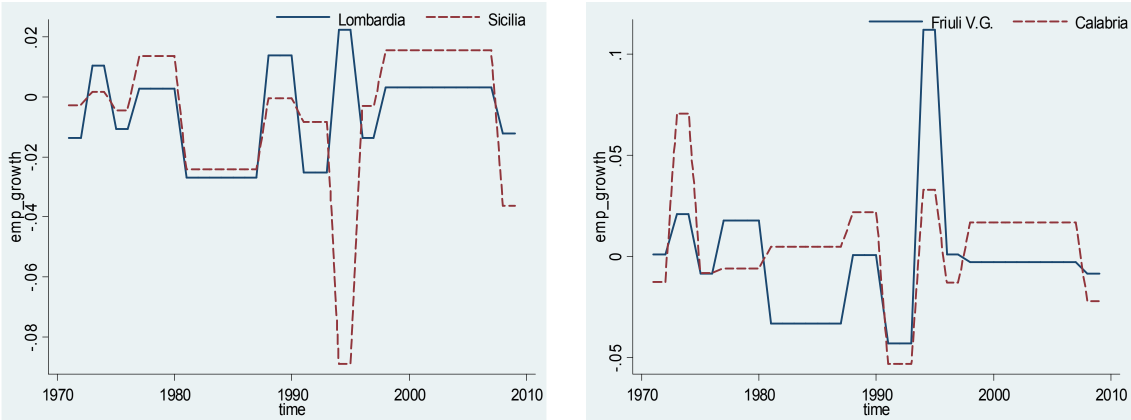





Note: Figure 4 reports the evolution of employment growth (y axis) from 1978 to 2011 (x axis) for selected Italian regions, obtained by estimating the SUR model in (1) for annual data.

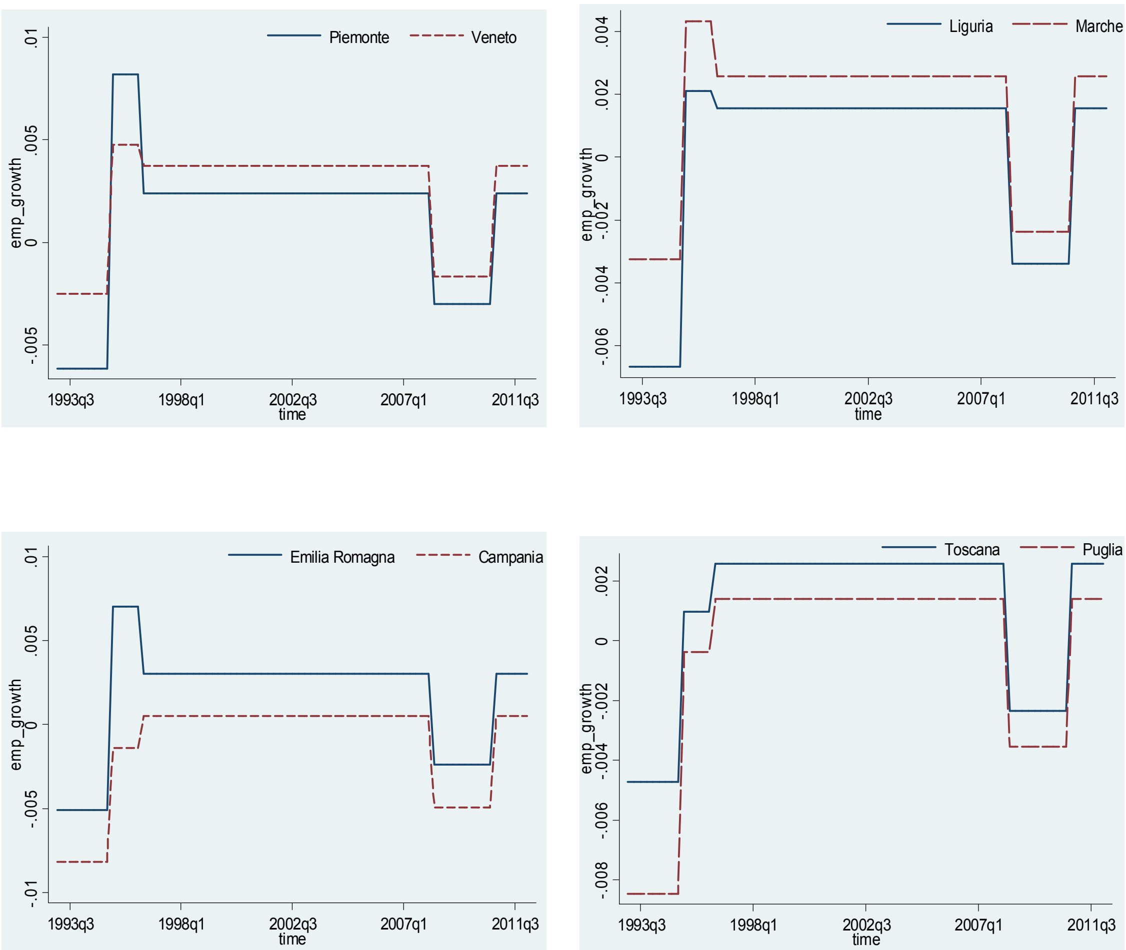
**Figure 5. Selected regional comparisons SUR industry annual**

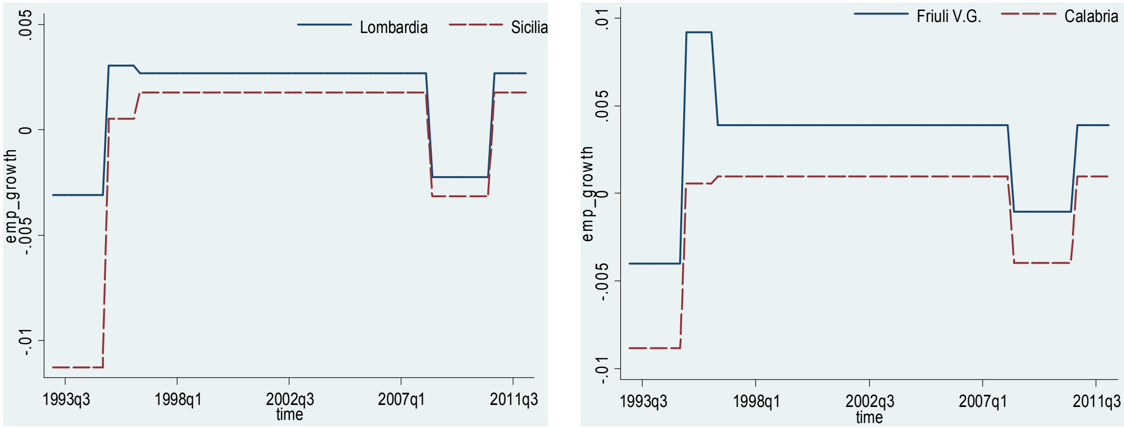





Note: Figure 5 reports the evolution of industrial employment growth (y axis) from 1971 to 2009 (x axis) for selected Italian regions, obtained by estimating the unrestricted SUR model for industrial annual data.

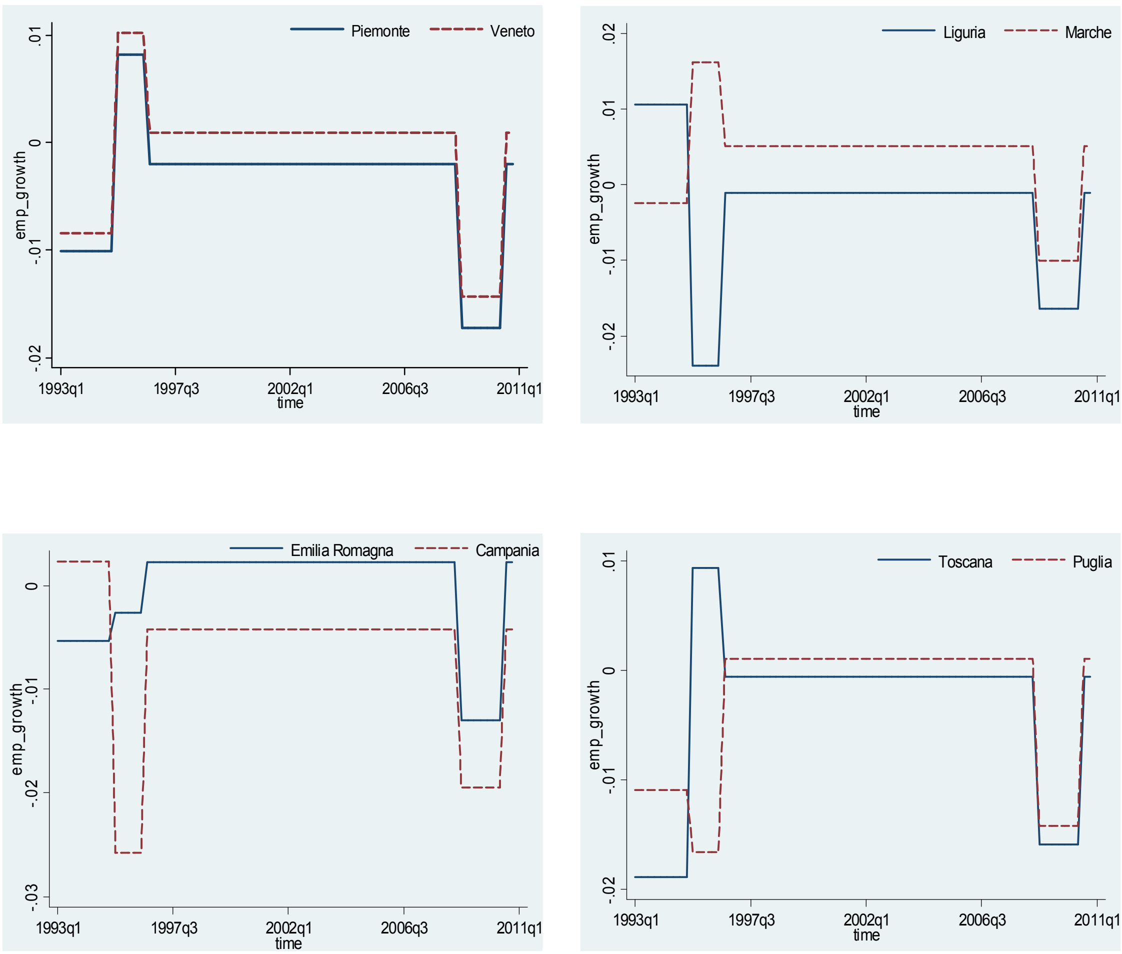
**Figure 6. Selected regional comparisons SUR quarterly**

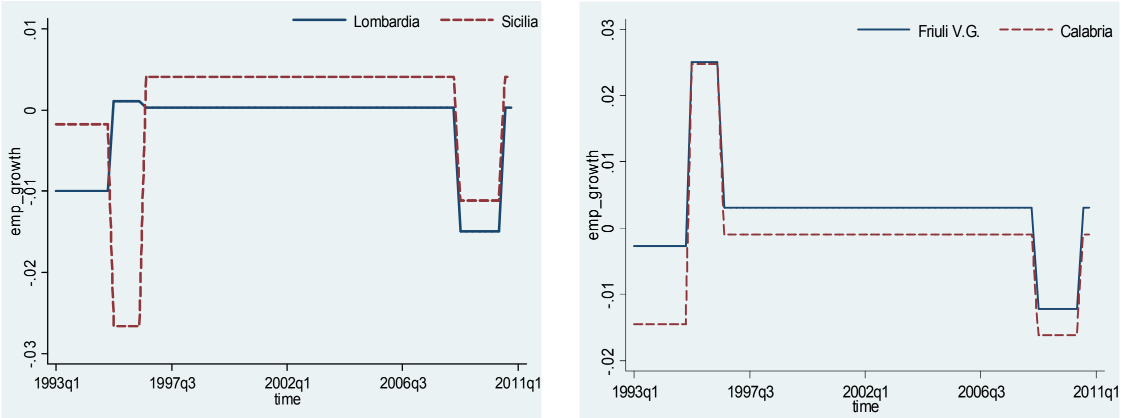





Note: Figure 6 reports the evolution of employment growth (y axis) from 1993(I) to 2011(IV) (x axis) for selected Italian regions, obtained by estimating the SUR model for quarterly data.

**Figure 7. Selected regional comparisons SUR industry quarterly**

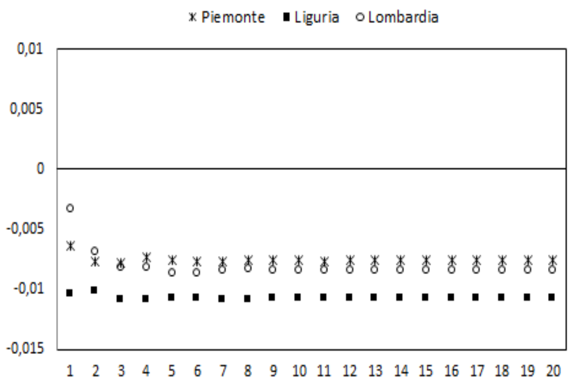




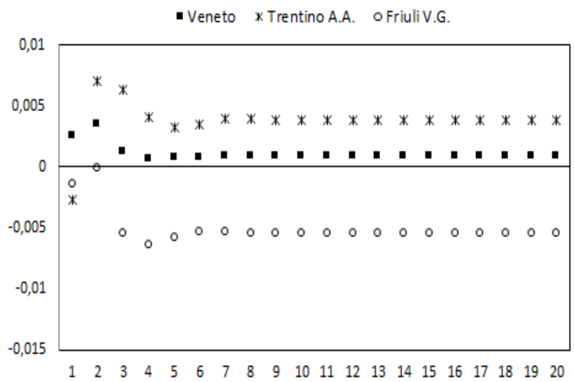

Note: Figure 7 reports the evolution of industrial employment growth (y axis) from 1993(I) to 2010(IV) (x axis) for selected Italian regions, obtained by estimating the SUR model for quarterly data.

**Figure 8. Mean responses to Shocks from All regions.**

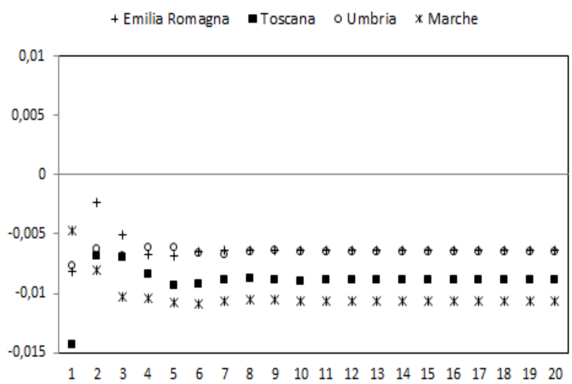
**(a) North-West**



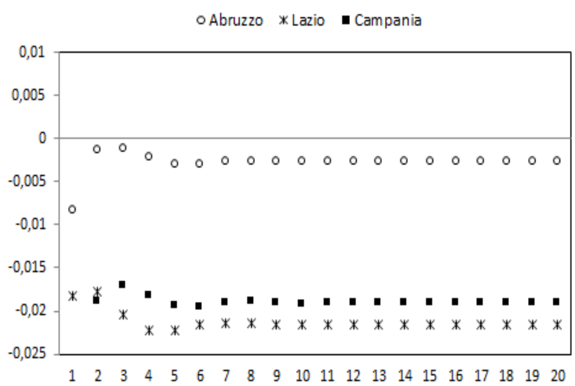

**(b) North-East**



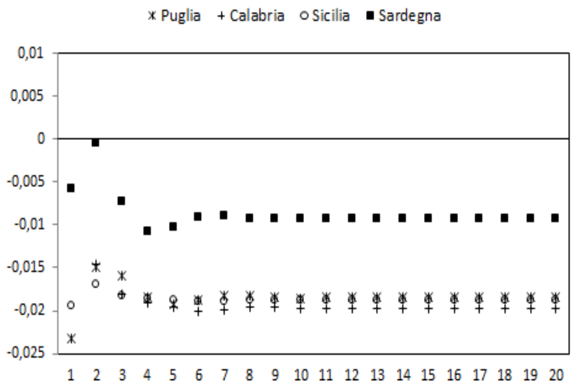

**(c) Centre-North**




**(d) Centre-South**



**(e) South**




Note: Figure 8 (a-e) reports the mean orthogonalized responses (y axis) over periods 1-20 (x axis), for five Italian macro areas, namely North-West, North-East, Centre-North, Centre-South and South.

## Tables

### Table 1. Italian Sensitivity Index

| Region | 1992(IV)-1995(I) | 2008(II)-2010(III) |
|---|---|---|
| Piemonte | 1.00 | 0.87 |
| Valle d'Aosta | 0.74 | 0.28 |
| Lombardia | 0.51 | 1.27 |
| Liguria | 1.10 | 0.77 |
| Veneto | 0.27 | 1.18 |
| Trentino A.A. | 0.66 | 0.21 |
| Friuli V.G. | 0.88 | 1.79 |
| Emilia Romagna | 0.87 | 0.15 |
| Toscana | 0.78 | 0.28 |
| Umbria | 0.16 | 1.53 |
| Marche | 0.53 | 0.74 |
| Lazio | 1.56 | 0.45 |
| Abruzzo | 0.84 | 2.04 |
| Molise | 2.30 | 1.96 |
| Campania | 1.39 | 1.42 |
| Puglia | 1.40 | 1.98 |
| Basilicata | 1.46 | 0.77 |
| Calabria | 1.70 | 0.78 |
| Sicilia | 1.86 | 0.77 |
| Sardegna | 1.08 | 0.87 |

### Table 2. Italian Recovery Index

| Region | 1995(2)-2008(1) |
|---|---|
| Piemonte | 0.88 |
| Valle d'Aosta | 0.84 |
| Lombardia | 1.15 |
| Liguria | 0.70 |
| Veneto | 1.44 |
| Trentino A.A. | 1.67 |
| Friuli V.G. | 1.02 |
| Emilia Romagna | 1.40 |
| Toscana | 1.02 |
| Umbria | 1.71 |
| Marche | 1.33 |

| | |
|---|---|
| Lazio | 1.86 |
| Abruzzo | 1.19 |
| Molise | 0.42 |
| Campania | -0.09 |
| Puglia | 0.59 |
| Basilicata | 0.47 |
| Calabria | 0.03 |
| Sicilia | 0.84 |
| Sardegna | 0.86 |

**Table 3. Mean Responses to Shocks from All Regions**

| Region | Mean OIRF |
|---|---|
| Piemonte | - 0.00755 |
| Liguria | - 0.01080 |
| Lombardia | - 0.00806 |
| Veneto | 0.00105 |
| Trentino A.A. | 0.00379 |
| Friuli V.G. | - 0.00486 |
| Emilia Romagna | - 0.00625 |
| Toscana | - 0.00829 |
| Umbria | - 0.00654 |
| Marche | - 0.01019 |
| Abruzzo | -0.00279 |
| Lazio | - 0.02119 |
| Campania | - 0.01932 |
| Puglia | - 0.01843 |
| Calabria | - 0.01979 |
| Sicilia | - 0.01868 |
| Sardegna | - 0.00864 |