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Employment volatility in lagging and advanced regions: The Italian case

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Abstract

The presence of cycles characterizes all economic systems, but economic cycles have differentiated spatial impacts. Some regions have broader cycles with respect to the country, while others tend to be less responsive to shocks and hence have narrower cycles. Being exposed to broader cycles, that is, greater volatility, may increase the strain on a regional economic system. This paper investigates the different responsiveness to cyclical forces and volatility of regions in the long run. It does so by using quarterly employment data for the Nuts2 Italian regions over almost 40 years before and during the period 1978–2016. Explored in particular are the cross-regional variations in employment volatility and the reasons for the patterns observed, as well as whether they have changed the following different macroeconomic policy regimes. The paper identifies the break dates of different regimes, and these regime changes will be related to policy modifications, such as the implementation of the European Monetary Union. The determinants of this regional volatility appear to be quite stable, so that the changes in volatility are explained by how these determinants have changed overtime and how they are unevenly distributed in space. In particular, the lagging regions of the country suffer, in addition to lower production and income, from higher volatility due to a structure which is weaker and more unstable. Volatility can hence be an additional issue for lagging regions.

1 | INTRODUCTION

Over the past two decades the volatility of growth has tended to increase in some countries, while it has decreased in others (Antonakakis & Badinger, 2016). The decrease, where present, has been related in the literature to six concurring and complementary factors, all related to the determinants of cycle exposure: an inventory hypothesis, stating that firms have started to perform better inventory management, which reduces volatility; an industrial diversity hypothesis, assuming that regions and countries with more diversified industrial structures tend to experience less volatility; a "good luck" hypothesis, stating that volatility is smaller only because the shocks are smaller by chance; a monetary hypothesis, stating that volatility is reduced due to a better monetary policy; finally, a demographic change hypothesis, according to which volatility diminishes due to demographic changes overtime.

Far from being homogeneous within countries, volatility is highly differentiated at the regional level. In fact, not only do regions have different levels of GDP within countries and very differentiated growth rates, as all manuals of regional economics and economic geography report, but also volatility within the same country is different. This is due to different regional sensitivities to the same determinants that affect national volatility. It is also due to specific regional factors, which make some regional economies follow a growth path more stable with respect to the others.

One country in which regions are particularly different in economic terms is Italy, a country known for being characterized by a long-standing (more than 150 year old) dualism between the richer North and the relatively poorer South (the "Mezzogiorno"). Lagging regions in Italy have also suffered from higher volatility. Despite policy support and differently from what is recorded in other countries, it seems that the lagging regions in Italy have mostly followed a pro-cyclical pattern, suffering more from the expansion phases and only recovering in periods of recession (Canale & Napolitano, 2015). This may be because the lagging regions are characterized by employment in firms which are small and relatively low in terms of productivity, which makes them less able to have their own endogenous growth patterns. Regional growth may also be affected in the long run, since there is a negative relationship between output volatility and regional growth (Ezcurra & Rios, 2015).

In this paper we seek an explanation of this relatively higher employment volatility in Italian lagging regions. We do so by looking at volatility determinants and how they are differently distributed across regions. We also consider whether these determinants have changed overtime because of macroeconomic institutional changes, primarily the introduction of the Euro, which have affected volatility at country level.

For this purpose, we exploit a novel quarterly database built partly from electronic sources and partly, for earlier data, from old statistics published in paper form and available in libraries. This makes it possible to study the volatility at national and regional levels in the long run (1978–2016).

As its target variable the paper chooses to use employment rather than GDP, for two reasons. One is the availability and comparability of data. Mixing electronic and print sources made it possible to assemble a quarterly regional database dating back to 1978, the first year in which data were published in the same way, whereas GDP data at the regional level are normally not available quarterly, nor are they available as uninterrupted time series for this long run.

The second reason is that, since the purpose is to study how volatility has affected the lagging regions, employment is a more relevant variable because reductions of employment add to the social problems of the region, while reductions of GVA have a more indirect social effect (Fratesi & Rodrìguez-Pose, 2016), also because profits are not necessarily remaining in the lagging regions.

The issue of volatility is complementary to that of resilience. In fact, since the economic crisis, a large number of papers have appeared which no longer investigated regional growth. Instead, they have analysed resilience, defined as "the ability of an entity or system to 'recover form and position elastically' following a disturbance or disruption of some kind" (Simmie & Martin, 2010, p. 28). Following the seminal contributions by Martin (2012) and others, regional resilience has been investigated in many different respects: agency (Bristow & Healy, 2014); quality of government (Ezcurra & Rios, 2019); industrial diversity and regional economic structure (Brown & Greenbaun, 2017; Martin, Sunley, Gardiner, & Tyler, 2016); territorial capital (Fratesi & Perucca, 2018); embeddedness (Kitsos, Carrascal-incera, & Ortega-Argilés, 2019); metropolitan areas (Capello, Caragliu, & Fratesi, 2015; Martin & Gardiner, 2019). An interesting finding of the resilience literature is that, though differentiated, in many cases the factors determining resilience have been quite consistent with the factors determining growth prior to the crisis (Di Caro & Fratesi, 2018).

Investigating volatility puts the problems of the lagging regions under a wider, longer lens with respect to that of resilience. In fact, rather than investigating what happens to the lagging regions following a strong but single shock, we investigate here whether the economy of the lagging regions is more or less stable with respect to that of the others. Since the paper will show that the lagging regions are characterized by lower stability (i.e., higher volatility), this is an issue which is especially important to investigate in times of crisis but also important in the long run.

The paper is organized as follows. In Section 2, the literature on the evolution and determinants of national and regional volatility is reviewed; Section 3 analyses the structural cleavage at the national level in the Italian case: Section 4 shows the evolution of volatility at the regional level; Section 5 investigates the determinants of regional volatility in Italy; Section 6 deals with how they change overtime; Section 7 shows the territorial differences in the factors of volatility; Section 8 concludes the paper.

2 | REGIONAL VOLATILITY IN THE LITERATURE

2.1 | The evolution of economic volatility

The literature on economic volatility at the regional level has focused on two main research questions. One the one hand, various scholars have sought to understand the evolution of economic volatility by analysing whether there is a tendency towards a moderation of volatility (Buch et al., 2004; Kim & Nelson, 1999; McConnel & Perez-Quiros, 2000; Owyang et al., 2008). On the other hand, several other analysts have examined the economic sources of the cross-regional variation of volatility (Baldwin & Brown, 2004; Ezcurra, 2010; Kort, 1981; Malizia & Ke, 1993; Trendle, 2006). In the present subsection, a brief account of the debate on the first question is provided (see also Duran, 2017, and Duran, 2015, for an extended literature review), while the second issue is investigated in the following subsection.

The earlier literature has mostly focused on the evolution of aggregate economic volatility at national level and in particular in the US. The common finding is the "great moderation" of economic cycles since the mid-1980s. (Kim & Nelson, 1999; McConnel & Perez-Quiros, 2000; Owyang et al., 2008; Stock & Watson, 2002). For instance, Blancard and Simon (2001) detect a decline in aggregate volatility overtime. Kim and Nelson (1999) and McConnel and Perez-Quiros (2000) are among the authors who find a discrete break in US output volatility in the mid-1980s. The majority of studies relate the moderation of economic volatility to improvements in inventory management by firms (McConnel & Perez-Quiros, 2000), better monetary policies (Taylor, 1999), or simply smaller economic shocks (Stock & Watson, 2002).

With regard to the studies on other countries, economic instability was found to be declining in them as well (Basu & Taylor, 1999; Bergman, Bordo, & Jonung, 1998). For instance, Buch et al.

(2004) investigated this issue for Germany. They employed quarterly GDP data between 1970 and 2004 and found evidence in favour of decreasing volatility after the East-West unification in Germany.

From a regional perspective, intra-national economic volatility has not yet been extensively studied in the literature. Among the few studies, Carlino, Defina, and Sill (2003) find that non-agriculture employment of 38 US states exhibits lower volatility overtime (from 1952 to 1995, quarterly). Then, Owyang et al. (2008) adopt monthly employment variations between 1956 and 2004 and report evidence of declining the regional differentials in the timing and the degree of volatility across US states. Carlino, Defina, and Sill (2013) find evidence of declining volatility in employment rates of US states. However, the states with initially low volatility experience the largest declines, thus leading to a divergence among states' volatility. Some studies also address the issue in Europe. Ezcurra and Rios (2015) concentrate on relationship between volatility and regional growth in the period 1991–2011, while Fiaschi, Gianmoena, and Parenti (2017) study the determinants, especially macroeconomic and sectoral, of GDP fluctuations in Europe in the period 1992–2008.

In methodological terms, a wide range of time series techniques have been used. The most basic form is the graph that shows the tendency of volatility overtime. More complex procedures like Non-parametric Markov-Switching Model (Owyang et al., 2008) and (G)ARCH models (Buch et al., 2004) have been used to detect the structural breaks and trend declines in volatility.

2.2 | The determinants of cross-regional variation in volatility

The reason why some regions display higher volatility compared to others remains largely an ambiguous issue. Various hypotheses have been discussed in the literature. We can classify them into nine groups and provide rationales for each of them.

2.2.1 | Inventory hypothesis

The idea derives from the fact that in the recent decades US firms have significantly improved the way in which they manage their inventories. This has resulted in just-in-time production, thus smoothing the output overtime. This is one of the discussed reasons for the great moderation of aggregate volatility in the USA (Kahn, McConnell, & Perez-Quiros, 2002; Owyang et al., 2008). From a regional viewpoint, it implies that regions which have an intensive share of durable goods (which is the sector that includes more inventories) are likely to have greater reductions in volatility. This was empirically demonstrated by Owyang et al. (2008).

However, the inventory hypothesis conflicts with the conventional view that durable manufacturing goods are cyclically more sensitive because they are non-urgent goods and can easily be postponed in the case of a negative shock. Moreover, they are more credit dependent, which makes them more vulnerable to changes in monetary policy.

It is also important to understand the distinction between durable investment and consumption goods. Capital goods are theoretically assumed to be more volatile because they represent investment rather than consumption. One may therefore contemplate analysing the volatility of two different goods. Share of investments in an economy, indeed, is a useful indicator of inventory hypothesis such that the industrial production mostly relies on the fixed capital investments. Hence the regions in which investments represents a higher share of GDP, are likely to be more dependent on durable/industrial production and subject to ampler fluctuations as the inventory hypothesis predicts.

2.2.2 | Demographic hypotheses

A second group of studies relate the cross-regional variations in economic volatility to the differences in the demographic structure of regions. Different education, age, and gender groups are likely to have quite different degrees of business cycle exposure.

Among all the other demographic variables, the proportion of active individuals in the total population is one suggested. According to the claim, low values indicate the lack of human capital in a region which increases the risks of being laid off, thus influencing the volatility (Elhorst, 2003; Ezcurra, 2010; Fleisher & Rhodes, 1976). Put differently, within regions in which the population is younger, individuals are more likely to be fired because experienced workers are preferred by employers and young population is possibly more affected by economic swings.

2.2.3 | Industrial diversity hypothesis

This has been considered the oldest and most influential hypothesis (Dissart, 2003; Kort, 1981; Malizia & Ke, 1993). Its main contention is that regions which comprise a diversified set of industries will experience relatively smaller fluctuations because the decrease in employment in one sector will be off-set by an increase in another one (Dissart, 2003; Kort, 1981; Malizia & Ke, 1993). Hence, diversity of sectors will play a stabilizing role. In contrast, the regions which specialize in few sectors are likely to have greater fluctuations. If that is the case, a sectoral shock will directly translate into a regional shock and this will amplify the economic fluctuations.

This hypothesis has been tested by a number of studies in the literature (see Dissart, 2003 for a review). Although the stabilizing role of diversity has been largely confirmed, there is still a controversy.

With regard to supporting studies, Kort (1981) who examines this issue for 106 US Metropolitan Statistical Areas (MSA) between 1967 and 1976, Wundt (1992) for Connecticut between 1964 and 1983, Malizia and Ke (1993) for MSAs in the USA between 1972 and 1988, Ezcurra (2010) for 196 EU regions between 1980 and 2004, Trendle (2006) for 125 local government areas of Queensland between 1996 and 2001, and Baldwin and Brown (2004) for Canadian regions between 1976 and 1997 find a significant stabilising effect of industrial diversity.

2.2.4 | Sheltered economies and sectoral composition hypotheses

A possible explanation for different patterns of volatility has been advanced specifically at the regional level.

This hypothesis is directly dependent on the implementation of policies at subnational level, and especially on the fact that some regional economies may be permanently assisted by the state, because their economies are very weak and because the macroeconomic adjustment mechanisms do not work at the regional level (Camagni, 2002). This generates "sheltered" economies, that is, regions protected from market forces, that is, less sensitive to economic downturns and expansions due to their level of national support and, especially, their specialization in public employment (Trigilia, 1992). The literature has shown that this protection tends to be detrimental to long run growth (Rodrìguez-Pose & Fratesi, 2007) and that this protection has been ineffective amid the hard times of the economic crisis (Fratesi & Rodrìguez-Pose, 2016). In general, however, we can assume that a region specialized in sectors which are more pro-cyclical (like construction) will be more vulnerable to economic fluctuations and sectoral-specific shocks.

2.2.5 | Openness hypothesis

One hypothesis present in the literature emphasises the role played by trade openness (Baldwin & Brown, 2004; Buch & Scholetter, 2013). The effect can operate in two directions. First, being more open to trade may increase the volatility since the region is more exposed to infection by global shocks (Buch & Scholetter, 2013). Another channel works through specialization, so that specialization in manufacturing and/or other industrial goods may induce further economic openness. Opening up the regional markets to trade triggers specialization in some industries which might, in turn, make regions more sensitive to economic swings and sector-specific disturbances (Ohlin, 1933).

Conversely, trade liberalization may play a stabilizing role if domestic and foreign economic shocks are imperfectly correlated (Buch & Scholetter, 2013). In this case, internal and external developments perform a risk sharing role and average out the shocks (Baldwin & Brown, 2004; Buch & Scholetter, 2013). Hence, the fluctuations in employment and output are expected to be smoothed (Baldwin & Brown, 2004; Buch & Scholetter, 2013). Empirically, Baldwin and Brown (2004) have provided evidence for the second argument. In their study of Canadian regions (for the period 1976–1997), they found a negative link between a region's export orientation and its volatility.

2.2.6 | Structural change hypothesis

Another hypothesis regards structural change in the industrial composition of regions. It argues that regions which exhibit the rapid transformation in their sectoral mix display a more volatile economic evolution. This has been tested by Trendle (2006), who found supportive evidence and concluded that structural transformation can end up with destroyed former jobs and newly existing ones. This is likely to create discontinuities in labour markets. Furthermore, it can be argued that structural changes influence the volatility of the cycles, but not the other way around since industrial structure is assumed to be a pre-existing condition.

2.2.7 | Good luck hypothesis

According to this hypothesis, economic volatility can diminish only because the regional or aggregate economy receives smaller shocks. This is referred to as the "good luck" hypothesis (Carlino et al., 2003, 2013; Owyang et al., 2008). The afore-mentioned shocks can take the form of unexpected changes in productivity, costs, energy prices, and/or commodity prices. This implies that the regions that have smaller shocks are likely to experience mild fluctuations.

Empirical support for this hypothesis has been provided by Carlino et al. (2003). In their study, they report evidence that at about 4%–36% of the variations in employment cycles of US states occur due to aggregate productivity and energy shocks.

This hypothesis is the least interesting to test at the regional level, but it will be accounted for through time and regional dummies.

2.2.8 | Monetary hypothesis

It has been claimed that the Great Moderation of employment volatility in the USA was achieved through improved actions of monetary policy during the 1980s and 1990s (Taylor, 1999). However, probably, monetary policy has differential impacts on regions (Carlino & DeFina, 1998, 1999). Its impact on regions works through three main channels. The first one, the *interest rate channel*, indicates that regions with high shares of interest rate-sensitive industries (such as manufacturing, construction, durable, high-tech sectors) are possibly more vulnerable to changes in interest rates (Carlino & DeFina, 1998, 1999). The second and third channels are known as the *broad credit* and *narrow credit channels.* Both have a similar implication: that regions which consist of bigger firms (broad channel) and banks (narrow channel) are likely to be less sensitive to changes in monetary policy (Bernanke & Gertler, 1995; Gertler & Gilchirst, 1993; Oliner & Rudebusch, 1996; Owyang & Wall, 2009). The rationale behind this claim is that it is difficult for smaller plants to find alternative funding opportunities in the case of a monetary tightening (Oliner & Rudebusch, 1996; Owyang & Wall, 2009). By contrast, larger plants can easily access a range of alternative funding sources (like foreign credit markets). Hence, if the hypothesis is valid, one should observe a negative association between a region's plant sizes, its share of employment in interest rate sensitive industries, and the volatility of economic activity.

2.2.9 | Market size hypothesis

Finally, market size has been cited as a potential explanatory variable. For instance, Trendle (2006), Ezcurra (2010), Malizia and Ke (1993) argue that larger regions are likely to absorb shocks more quickly and experience lower fluctuations than small ones. In big market areas, it is easier to have quick job matches which reduces the instability in employment (Elhorst, 2001; Trendle, 2006). It is, therefore, important to consider the size of the regions in any attempt to test for regional determinants of volatility.

3 | NATIONAL EMPLOYMENT VOLATILITY: ANALYSIS AND STRUCTURAL BREAKS

A preliminary step in our analysis was to measure the economic cycles (of regional and aggregate economy) and the economic volatility. We adopted quarterly employment data (in logs) for 21 Italian Nuts2 regions for a period between 1978:1 and 2013:4. We obtained our data from ISTAT (Istituto Nazionale di Statistica) sources by combining the electronic data with data only available in paper form in ISTAT libraries. In particular, the electronic data were taken from "Rilevazione sulle forze di lavoro," whose aggregate data were available online. The paper data came from the printed volumes of "Forze di Lavoro," available at the ISTAT libraries[1] which have regional data from 1978. In order to verify that no discontinuity was present (at least at the level of total regional employment), visual inspection was complemented by the Bai and Perron (1998) multiple breakpoint detection technique.

The data report the number of employed persons by region and quarter of each year. We adjusted the seasonality component in series using a multiplicative ratio to moving average technique.

A first and necessary step in our investigation was to verify the unit root properties of the series. For this purpose, we applied the Augmented Dickey–Fuller test to all our series. The Schwarz criterion was adopted to select the lag length, whose maximum length was set as 8 quarters. The results are presented in Table 1, which shows that all regional employment series are integrated of order 1. While series at levels are mostly non-stationary, all first differenced and Hodrick-Prescott filtered series are found to be stationary (I(0)).

TABLE 1 Unit root analyses, ADF test statistics

Regions	Level	First difference	HP filtered cycle	Result
ABR	−1.79	−12.69****	−8.50****	I(1)
BAS	−2.22	−18.68****	−9.54****	I(1)
BOL	−0.58	−14.26****	−8.74****	I(1)
CAL	−0.52	−11.29****	−9.13****	I(1)
CAM	−1.72	−12.00****	−6.47****	I(1)
EMR	−0.59	−7.26****	−4.62****	I(1)
FVG	−0.98	−12.43****	−6.50****	I(1)
LAZ	−0.73	−5.93****	−5.20****	I(1)
LIG	−3.85****	−13.82****	−5.55****	I(0)
LOM	−0.61	−12.41****	−7.82****	I(1)
MAR	−1.38	−11.20****	−9.39****	I(1)
MOL	−2.78**	−11.64****	−6.55****	I(0)
PIE	−1.99	−5.65****	−4.86****	I(1)
PUG	−3.35***	−10.78****	−6.47****	I(0)
SAR	−1.85	−13.21****	−8.81****	I(1)
SIC	−1.75	−16.45****	−6.67****	I(1)
TOS	−0.45	−14.90****	−9.10****	I(1)
TRE	−1.09	−11.83****	−10.11****	I(1)
UMB	−1.07	−12.68****	−7.48****	I(1)
VDA	−1.75	−13.26****	−10.09****	I(1)
VEN	−1.44	−6.09****	−4.72****	I(1)
Italy	−1.30	−5.40****	−6.40****	I(1)

Notes: Schwarz criterion for lag length has been used where maximum lag is 8 quarters.

****Significance at 1%; ***Significance at 5%; **Significance at 10%.

We then applied a Hodrick and Prescott (HP) (1997) de-trending to the employment series in order to extract the economic cycle. Hodrick-Prescott filtering has been widely used by researchers, for example, Buch et al. (2004), Buch and Shoettler (2013) in their application to German regional GDP and employment series. Specifically, HP filtering is a useful tool that decomposes the time series variables into two basic components: long-term trend and cyclical fluctuations. Our interest in this case was the cyclical fluctuations of the regions rather than long-term trends. (For technical details of HP filtering, see Hodrick and Prescott (1997)). As a smoothing parameter, we used 1,600, as is standard in the literature.

There exist other business cycle measurement techniques in the literature (Baxter and King (BK), 1999; Christiano and Fitzgerald (CF), 2003; Hodrick & Prescott, 1997). Baxter-King and Christiano-Fitzgerald filters are band-pass filters that directly extract the fluctuations from 1.5 to 8 years while removing the very low and high frequency data in series. The drawback of this technique is that its application entails the loss of at least some observations from the beginning of the period. Conversely, the HP filter does not necessitate this, which is one of the strong properties of the HP filter.

Moreover, it represents desired property that it directly smooths the series and estimate a long run trend. Then calculated are the deviations of data from the trend, so that the growth cycle is measured

(Buch et al., 2004; Buch & Shoettler, 2013); Duran, 2014). It is known in the literature to be accurate, simple, and intuitive. Another advantage is that it does not force the linearity and nonlinear evolution of the trend is allowed. Moreover, the fact that it does not create artificial breaks in series is another advantage. Given all these merits explained above, we preferred to use it.

However, the HP filter has been subject to various criticisms in recent years (see Hamilton, 2018). They have centred on concerns about the accuracy of the estimated cycles and their main features, such as persistence, amplitude, and timing properties. As said above, there are alternative measures of cycles proposed by Christian and Fitzgerald (CF) (2003), and Baxter-King (BK) (1999), as used by Montoya and De Haan (2008) in this context. Hence, for the sake of robustness, we also estimated a Baxter-King filtering to observe the evolution of the national employment cycle. After application of HP and BK filtering, the aggregate Italian employment cycle is depicted in Figure 1a.

The Y-axis shows the percentage deviations of employment from its trend. It is evident from the figure that alternating expansion and recession phases quite often take place. The two series seem to move quite consistently. The correlation coefficient between two cycles is 0.835, which clearly shows the synchronicity and robustness of both HP and BK filtering.

Another concern about the data may regard the pro-cyclicality of employment data with respect to GDP. As widely known, most business cycle studies adopt the GDP variable, which represents the overall state of economic conditions. However, GDP is not available at quarterly frequency for regions in our case. However, it is argued that employment is an equivalently important indicator of business cycles. Hence, for the sake of clarity, we estimated the national economic cycle by using both the GDP and the employment.[2]

The evolution of the estimated cycles is presented in Figure 1a,b, from which it is apparent that the employment and the GDP series move very synchronously and consistently regardless of which business cycle extraction method is used. Thus, it is safe to proceed with employment data because they are pro-cyclical and well representative of general economic conditions.

To be able to provide an evolution of volatility, we need to adopt a precise measure. In the literature, several kinds of measure have been suggested. The first one is unconditional volatility of employment, σ_1. Let y be the variable of interest (i.e., de-trended employment), so that volatility is basically obtained by calculating standard deviation of y for the period. It has been used widely by many

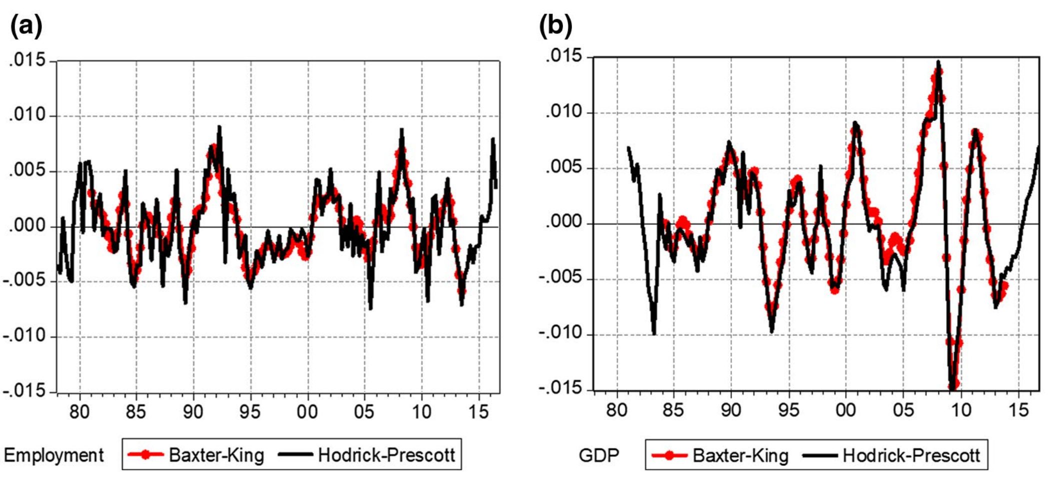

FIGURE 1 (a) Evolution of Italian employment and GDP cycle. (b) Evolution of Italian employment and GDP cycle. *Notes*. Rolling window of 7-year intervals, that is, midpoints of these periods, are presented. For example; 1981Q3 presents 1978Q1-1984Q4 period

researchers (Buch, Doepke, & Stahn, 2008; Čede, Chiriacescu, Harasztosi, Lalinsky, & Meriküll, 2016; Owyang et al., 2008).

Second, in terms of conditional volatility, many different measures are adopted in the literature. (Fang & Miller, 2008) But mainly two types of measure have been suggested. The first one was used by Buch et al. (2004), Carlino et al. (2003), Berument, Dincer, and Mustafaoglu (2011), Bodman (2009). Suppose *y* follows the following process:

$$y_t = \rho y_{t-1} + \in_t \tag{1}$$

standard deviation of errors ($\in$) over a period represents the conditional volatility, σ_2. The second one is the measure of conditional volatility which refers to the following panel regression model (Carlino et al., 2013):

$$y_{i,t} = \propto_0 + d_i + u_t \tag{2}$$

where i represents the region, *i* and *d* represents the regional dummies. Conditional volatility (σ_3) is defined as the absolute values of *u* over a period.

Among the choices, we used both the unconditional (σ_1) and conditional volatility (as in Equation 1) due to their simplicity and widespread use in the literature (Buch et al., 2004, Carlino et al., 2003, 2013; Berument et al., 2011; Bodman, 2009). We calculated it by using rolling windows. Each window has interval length of 7 years. Figure 2 presents the evolution of national employment volatility results.

As a result, the evolution of volatility obtained from both cycle and conditional/unconditional methods is very similar. Figure 2 depicts quite different periods of high and low volatility. First, from 1978 to 1985 it shows a declining tendency, then from 1985 to 1993 an increasing tendency. Thereafter from 1993 to 1997 it records a sharp decline; from 1997 to 2011 an increasing pattern; and finally after 2011 again a tendency to decline.

Detection of the precise break dates was another issue addressed in our study. It is not only interesting per se but also helpful in understanding changes in the timing of policies and the economic

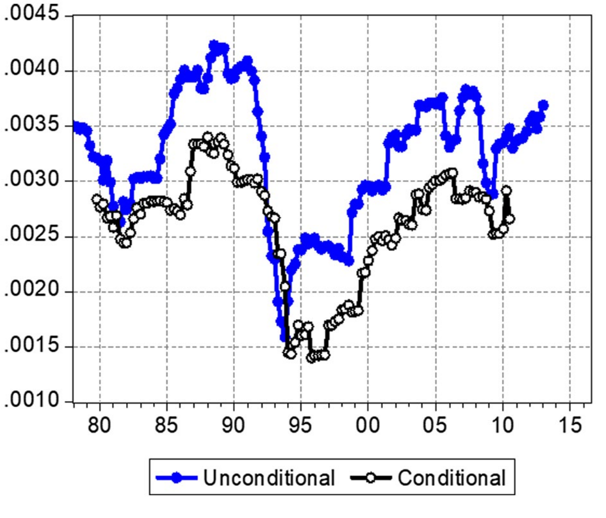

FIGURE 2 Evolution of conditional and unconditional volatilities

reasons for volatility. For this purpose, we referred to an ARCH model (Autoregressive conditional heteroskedasticity), which is a tool commonly used to estimate conditional volatility, break dates and trend of the processes (Engel, 1982; Buch et al., 2004). The adopted AR(4)-ARCH(1) model was specified thus:

$$emp_t = \gamma_0 + \sum_{s=1}^{4} \gamma_s emp_{t-s} + \in_t \tag{3}$$

was the mean equation and *emp* was the employment (Hodrick-Prescott) cycle of the Italian economy. Conditional employment volatility was defined by the second (variance) equation:

$$\sigma_t^2 = w + \in_{t-1}^2 + \beta_1 d + \beta_2 trend + \tau \tag{4}$$

where σ_t^2 is the conditional output volatility, d represents all possible time dummies, but we present only the most significant ones. Table 2 provides a summary of the results.

It shows the estimated parameters in mean and variance equations. The impact of break dates and of time trend were captured in the second equation.

Among all the possible break dates that we tried, the ones with largest magnitude and significance were at 1997Q2, 1999Q4, and 2002Q1. To examine the significance of this last break, which might have been driven by the introduction of the Euro, we performed a test, set out in the last column of Table 2, of the significance of the dummy corresponding to 2002Q1. As a result, it appears highly significant validating this break date.

Finally, in Figure 3, we present β_1 coefficients for all possible time dummies from 1978 to 2016. The ones in gray-shaded areas are the significant ones. Once again, it is evident that there are two

TABLE 2 Detection of breaks in volatility, ARCH test results

	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
Mean equation						
y_1	0.5473****	0.00000	0.6127****	0.00000	0.62315****	0.00000
y_2	−0.00540	0.94830	−0.01180	0.89840	0.00603	0.95000
y_3	−0.1512**	0.09350	−0.07240	0.50190	−0.12271	0.25070
y_4	0.2835****	0.00030	0.2313***	0.01940	0.25508****	0.00820
Constant	0.00020	0.15450	0.00000	0.89450	0.00009	0.67320
Variance equation						
Constant	0.00000534****	0.00300	0.00000	0.00000	0.00001****	0.00010
Arch (1)	−0.1468****	0.00460	0.10600	0.24650	0.09691	0.32100
Dummy_1997Q2	−0.00001640****	0.00000				
Dummy_1999Q4			0.000014****	0.00000		
Dummy_2002Q1					0.00001****	0.00580
Trend	0.00000015****	0.00000	0.0000001****	0.00000	0.00000***	0.01670
R^2	0.37000		0.37000		0.37376	
F-Stat	10.59000		10.52000		10.59359	

****Significance at 1%; ***Significance at 5%; **Significance at 10%.

break periods. The first one runs from 1993Q1 to 1998Q3 and the second one runs from 1999Q4 to2006Q1.

In the rest of the paper, we will always consider the break date in policy change and volatility as the introduction of the Euro in 2002Q1. This break date is significant because it also coincides with the volatility break that we detected above in the ARCH model. The assumption of policy and volatility change in 2002 is also very plausible from an economic standpoint. Since that date, monetary regime, determination of monetary policy, trade and investment patterns have changed throughout Europe.

Overall, using two different methodologies (unconditional volatility and the ARCH model), a very mild tendency of employment volatility to decline was found in Italy, where it generally fluctuates around a constant. Moreover, two periods of breaks are detected. The first one is the break that dampens volatility and the second one is a period which represents an increase in volatility. It is interesting that the most significant break, the one of 2002Q1, largely coincides with the introduction of the Euro, which has changed many significant facts in the Italian economy. The first fact is a halt to the constant devaluation which characterized the Italian Lira in the 1970s and 1980s, and which peaked in the early 1990s with the exit of the currency from the European Exchange Rate Mechanism due to speculative attacks.

The second fact is the final stabilization of inflation, following in this case a downward trend which started in the early 1980s. The third one is a halt to the continuous increase of public debt, which rose from less than 60% of GDP to more than 120% in 15 years, characterized by good GDP growth rates. Finally, strictly related to the previous one, a stop in the increase of the weight of the public sector in the economy after the peak of the 90s. It is interesting that, in regard to the last indicator, it is evident that the Italian economy differs greatly among the country's regions, as the indicators calculated for the different parts (North, Centre and South) provide very different values, much higher for the lagging South.

The literature abounds with analyses of the reasons why the Italian economy is very differentiated internally (see Capello, 2016, for a survey). In this paper, we add the evidence that the employment volatility may not be homogenous across regions. In contrast, it is likely that some regions experience greater instability than others, which is an issue that will be analysed in the next section.

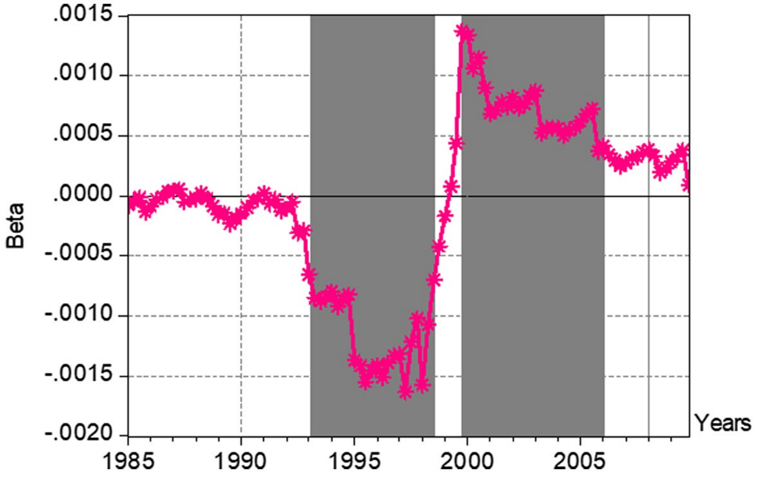

FIGURE 3 Evolution of Beta1. *Note.* Gray shaded areas represent statistically significant zone at 10%

4 | REGIONAL VOLATILITY ANALYSIS

The volatility of the Italian regions (standard deviation of estimated cycles) has been mapped for the period before and after the 2002Q1 (which represents the introduction of the Euro). Figure S1a,b (in the Supporting Information) show a clear pattern of north/south dualism. Hence, the northern regions experience milder employment fluctuations, whereas southern ones have more pronounced ones. The pattern does not significantly change overtime and the picture remains more or less the same. Hence, industrialized northern regions have milder fluctuations, whereas backward regions in the South experience broader ones.

The volatility values are documented in Table 3 as well. In both periods, we observe high dispersion in volatility across regions. In the first period, the region which has the highest volatility is Basilicata with a volatility value of 0.0149. By contrast, the region which has the lowest volatility is Lombardy with a volatility value about 0.0048. Hence, there is an almost three times greater difference in volatility between them. This is hardly surprising, because Lombardy is by far the largest economy of the country, whereas Basilicata is one of the smallest. As a consequence, the economy of Lombardy, although relatively specialized in manufacturing, is still highly diversified when considering the micro-sectors, with the ability to absorb idiosyncratic shocks. The smallest region of the country, Valle d'Aosta is not the most volatile, which might be explained by the fact that its economy

TABLE 3 Volatility across Italian regions

Region	1978Q1–2001Q4	2002Q1–2016Q3	Increase
ABR	0.0086	0.0098	0.0012
BAS	0.0149	0.0077	−0.0072
BOL	0.0099	0.0064	−0.0035
CAL	0.0107	0.0101	−0.0006
CAM	0.0083	0.0068	−0.0014
EMR	0.0058	0.0062	0.0003
FVG	0.0060	0.0069	0.0008
LAZ	0.0063	0.0057	−0.0006
LIG	0.0117	0.0062	−0.0055
LOM	0.0048	0.0033	−0.0015
MAR	0.0060	0.0061	0.0001
MOL	0.0130	0.0106	−0.0024
PIE	0.0061	0.0045	−0.0016
PUG	0.0068	0.0102	0.0033
SAR	0.0079	0.0098	0.0019
SIC	0.0072	0.0072	0.0000
TOS	0.0054	0.0048	−0.0006
TRE	0.0083	0.0054	−0.0029
UMB	0.0086	0.0083	−0.0003
VDA	0.0104	0.0082	−0.0022
VEN	0.0062	0.0052	−0.0010
Mean	0.0082	0.0071	
SD	0.0026	0.0020	

is heavily reliant on the public sector, being granted special institutional status ("regione a statuto speciale").

In the second period, the picture remains almost the same, which results in less volatility on average at the national level although with a slightly lower dispersion across regions. The region which has the highest volatility is Molise with a volatility value of 0.0106, again one of the smallest regions in the country. The region with the lowest volatility is again Lombardia, the largest economy, with a value of about 0.0033. Both the mean and standard deviation of regional volatility decrease, which implies a stabilization and homogenization. Finally, the last column of Table 3 demonstrates the decline in regional volatility across two periods. Thus, (+) sign indicates an increase whereas (−) sign represents a decline volatility. We observe that among the 21 regions, 14 of them exhibit a decrease in volatility, whereas 7 of them record an increase.

The questions which arise at this point are the following: What are the determinants of volatility at the regional level in the country? Have these determinants changed following the policy modifications evidenced in the second section of this paper?

5 | THE DETERMINANTS OF REGIONAL VOLATILITY

In order to investigate the determinants of volatility we followed the theories described in Section 2 of the paper and analysed the various hypotheses put forward in the literature.

In particular, proxies were built for the hypotheses theoretically evidenced in the literature and empirically verified.

A panel was built following Carlino et al. (2013) with regional volatility calculated yearly for each region. In this way, first compiled was a panel which covered 20 regions and 36 years (1981–2016), making it possible to estimate the determinants of volatility at the regional level. The data at the regional level for the determinants all came from various editions of the ISTAT's "Conti Economici Regionali," now "Conti Economici Territoriali."

As a second step, the final panel was constructed with 3-year averages built to correspond to the national volatility structural breaks detected in Section 3 and, with a good fit, also to the peaks and troughs detected for the country by Clementi and Gallegati (2015). These 3-year periods are reported in the Annex (Table S1).[3]

The panel regression specification for the analysis of the determinants was as follows:

$$\begin{aligned} vol_{i,t} = {} & \alpha + \partial vol_{i,t-1} + \beta_1 \text{weightgdp}_{i,t} + \beta_2 investment\_share_{i,t_{i,t}} + \beta_3 young_{i,t} + \beta_4 herfindahl_{i,t} \\ & + \beta_5 public\_consumption_{i,t} + \beta_6 share\_construction_{i,t} + \beta_7 \text{import}_{i,t+} + \beta_8 schange_{i,t} \\ & + \beta_9 share\_finance_{i,t} + \beta_9 relative\_productivity_{i,t} + \sum_{i=2}^{20} \theta_i R_i + \sum_{t=2}^{11} \gamma_t T_t \\ & + \sum_{t=2}^{11} \sum_{i=2}^{20} \alpha_{i,t} nationalgrowth * R_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{5}$$

In particular, the dependent variable $vol_{i,t}$ is the measure of volatility: Given that y is a cycle of a region (de-trended (log) of quarterly employment), $vol_{i,t}$ is the sum of $|y|$ during a year (4 quarters). All independent variables in the regression are in logarithmic and one period (i.e., 3 years) lagged.

The tested independent variables for each group of hypotheses are as follows. (i) The inventory hypothesis was tested through *investment_share*, that is, the level of fixed investments in durable goods (Macchine, attrezzature, mezzi di trasporto e altri prodotti) divided into total employment. (ii) The demographic changes hypothesis was measured by *young*, representing the share of people aged between 15 and 29 years in the working age population. (iii) The industrial diversity hypothesis was measured through *Herfindahl,* which represents the Herfindahl index of diversification $(HERF_{i,t} = \sum (emp_{i,j,t}/emp_{i,t})^2)$, where $emp_{i,j,t}$ is the employment share of sector j in region i at time t. (iv) The sheltered economies and sectoral composition hypotheses were tested through *public_consumption_share:* $\mathrm{NMS}_{i,t} = \mathrm{emp}^{\mathrm{nms}}_{i,t}/\mathrm{emp}^{\mathrm{total}}_{i,t}$, the share of employment (measured in terms of salary) of the public sector, an index of the importance of the public support in the regional economy. Moreover, they were tested through the shares of employment in construction and in financial services (*share_construction:* employment share of construction in regional employment, *share_finance:* employment share of financial services in regional employment). (v) The openness hypothesis was tested through *Import:* this variable is not the perfect variable to represent the openness of a region to the world markets, which should make it more volatile. In fact, exports and imports are not available separately at the regional level over such a long time span, so we needed to use the available variable, which is the share of net imports on GDP (M-X on GDP), which is, more than a measure of openness, a measure of international competitiveness. Because regions with a negative trade balance are weaker, we expected them to be more volatile. (vi) The structural change hypothesis was tested through *schange,* which represents the speed of sectoral transformation in employment: specifically, the structural change index $\left(\frac{1}{2}\sum_j |emp_{j,i,t} - emp_{j,i,t-1}|\right)$. (vii) the Good Luck Hypothesis, which is not really pertinent in this context, was captured through regional time dummies. (viii) The Monetary Hypothesis was tested in two ways: on the one hand by introducing time dummies into the estimations; on the other hand, by testing whether the introduction of the Euro changed the determinants of volatility (Section 6). (ix) the Market size hypothesis was tested through regional size (weightgdp$_{i,t}$: weight of regions within the total GDP in country). This variable was included in all regressions because it may affect the estimations of the others.

As control variables, we also added the regional level of development (through regional productivity) and the level of growth at national level interacted with regional dummies (as in Carlino et al., 2013) $\left(\sum_{t=2}^{11}\sum_{i=2}^{20}\alpha_{i,t} nationalgrowth * R_{i,t}\right)$, regional dummines $\left(\sum_{i=2}^{20}\theta_i R_i\right)$, time dummies $\left(\sum_{t=2}^{11}\gamma_t T_t\right)$.

Estimations were obtained with an Arellano-Bond model, with robust standard errors. Arellano-Bond estimators are known as quite robust panel models in the literature (Arellano & Bond, 1991).

Considering that we applied heteroscedasticity robust estimators, the outcomes can be considered technically robust. Moreover, in the classic Spatial Panel Data Model regressions, fixed/random effects are captured together with spatial spillovers, but endogeneity remains always a problem. The Arellano-Bond Model is considered to be the best model for dealing with such endogeneity. For these reasons, a Panel Arellano-Bond model was the most trustable model in this case. Because of the number of observations and some autocorrelation among the various measures of the hypotheses, the individual hypotheses were regressed separately. This means that the analysis cannot be considered fully causal, but it is nevertheless able to show the association of the various regional characteristics with regional volatility.

The general regressions are presented in Table 4, where the coefficients are mostly significant with the expected sign. Although not reported here to save space, a number of time and regional dummies are significant, as well as the national growth rate's interaction with regional growth as in Carlino et al. (2013), meaning that the good luck hypothesis is not excluded, although it is not the main explanatory hypothesis, since the other hypotheses turn out to be significant.

TABLE 4 The regional determinants of volatility (dummies included but coefficients not reported for reasons of space)

	(1)	(4)	(3)	(2)	(5)	(8)	(9)	(6)	(7)
Vol ($t-1$)	0.044	0.019	0.041	0.030	0.056	0.049	0.026	−0.024	0.020
	0.048	0.021	0.045	0.033	0.061	0.054	0.028	−0.027	0.022
	0.714	0.897	0.737	0.829	0.651	0.723	0,849	0.854	0.886
Regional size	−0.002	−0.001	−0.003	−0.003	−0.003	−0.001	−0.003	0.002	−0.001
	−1.092	−0.581	−1.346	−1.408	−1.529	−0.482	−1.609	0.833	−0.693
	0.376	0.650	0.264	0.404	0.189	0.735	0.217	0.573	0.639
Investments on GDP		0.001****							
		0.467							
		0.003							
Share of 15–29 workers			−0.001						
			−0.200						
			0.527						
Herfindal				−0.335**					
				−0.467					
				0.084					
Share of public consumption					−0.002*				
					−0.519				
					0.109				
Weight of construction sector						0.003***			
						0.491			
						0.024			
Weight of finance sector							0.003***		
							0.910		
							0.023		
Dependence on imports								0.001****	
								0.957	
								0.000	
Structural change									0.004
									0.216
									0.176
Constant	0.024**	−0.000	0.039*	0.107***	0.065***	0.002	−0.000	−0.002	0.017

(Continues)

TABLE 4 (Continued)

	(1)	(4)	(3)	(2)	(5)	(8)	(9)	(6)	(7)
Observations	200	200	200	200	200	200	200	200	200
Number of regions	20	20	20	20	20	20	20	20	20
N	200	200	200	200	200	200	200	200	200
*N*_g	20	20	20	20	20	20	20	20	20
*g*_min	10	10	10	10	10	10	10	10	10
*g*_max	10	10	10	10	10	10	10	10	10
*t*_min	1	1	1	1	1	1	1	1	1
*t*_max	12	12	12	12	12	12	12	12	12
χ^2	1633	1,339	463.5	1,192	535.9	392.0	694.7	657.8	1,371

Notes: ****Statistical significance at 1%; ***Statistical significance at 5%; **Statistical significance at 10%. *Statistical significance at 15%.

The determinants tested are almost all significant with the expected sign: in particular, the dependence of the regions on investments, which is positive and significant, consistently with the inventory hypothesis. Hence, regions with high share of investments tend to experience ampler fluctuations.

The protection of regions, which tested the sheltered economies hypothesis and was measured by the share of the public sector, was negative and significant, as expected.

The coefficient for the structural change of the regions, measured as sectoral reallocation, was positive, meaning that, as expected, regions having to change more to adapt their economic structure, which is probably not adequate, are also more volatile.

The Herfindahl index of concentration had a value in the regressions that was significant and negative, signalling, unexpectedly, that less diversified regions were less volatile than the others. This result is rather surprising, because in most of the literature this coefficient is positive or insignificant; but it is probably related to the way in which the industrial structure of regions is measured, since only six sectors are available as a panel over such a long period of time, which means that this coefficient is higher for more tertiary regions.

The coefficient for the demographic hypothesis is not significant. Contrary to the expectation that younger labour forces are associated with higher volatility, it turns out that this factor is not relevant to the Italian case.

As regards to the net import variable, it has a positive and significant coefficient. Hence, one may argue that the import dependence of regions makes the economy more exposed to global shocks and magnifies the fluctuations.

Finally, specialization in construction (low-value wages and very cyclical) and in finance services (very open and very cyclical) is also associated with higher volatility.

6 | THE VARIATIONS IN THE FACTORS OF VOLATILITY UNDER DIFFERENT POLICY REGIMES

The analysis of volatility has shown that there has been a significant regime change since the arrival of the Euro. In this section we report a test of whether the determinants of regional volatility have changed overtime.[4]

The analysis was performed with an interacted variable to determine whether the coefficient of a variable changes in different periods of time. Due to the sample size, it was in fact impossible to split the sample into two; therefore, the dummy variable was used. Table 5 reports the results for the interaction with the Euro dummy and shows that the determinants have only slightly changed overtime.

The main difference apparent is that the protection (public consumption) has become more important since the Euro, probably because of the reduced role of the state as an employment creator after a policy change which imposed tighter public finances.

By contrast, the impact of openness on volatility diminished after the introduction of the Euro, perhaps because with the Euro there was no longer an exchange rate risk. The same reduction has taken place for structural change. The demographic hypotheses have become more significant in recent years. Finally, the importance of specialization in finance is no longer significant when interacted with the dummy.

This analysis therefore shows that some minor changes in the determinants of volatility took place with the introduction of the Euro, even if most of them remained quite stable.

7 | THE FACTORS OF VOLATILITY ACROSS ITALIAN REGIONS

In this section, since the previous sections showed that factors of volatility have not radically changed in time, we report an analysis of whether different regions are differently endowed with these factors, and in particular whether lagging regions, which seem to suffer more from volatility (Section 4) are more volatile because they concentrate the conditions of high volatility. To this end, we investigated whether the factors of volatility have changed in the different periods of time and in the different parts of the country (north-west, north-east, centre, south).

This was done with an ANOVA analysis whereby the means of these factors were compared and the significance of the difference in the means was tested. Table 6 shows the mean values for the factors of volatility identified in the previous section for the two economic phases and the four macro-regions (i.e., aggregations of regions) into which Italy is normally divided in the statistics. The same table also shows whether the endowment of these factors of volatility has changed overtime, that is, before and after the introduction of the Euro, which represents the main discontinuity in volatility at the national level (Section 3).

The first variable tested was the total share of investments in GDP, which is positively related with volatility. This value has been stable in time at national level and was above the average in the South before the introduction of the Euro, after which it decreased to values in-line with the national averages, also following the major decrease of public investments in the South.

As expected, the variable measuring the weight of the public sector on the economy had a negative impact on volatility, and its value was much higher in the lagging South. It also increased in this area of the country, while it remained rather stable in the rest of the country, with the exception of the centre, in which it decreased. The net imports were much higher in the lagging South, and this was also expected, with no significant change in time. The economy of the South, being more dependent on external goods, is also more volatile.

Regions with weaker structures are also more likely to change them and as such are more volatile. In the case of Italy, the country has reduced its rate of structural change in all areas, but this has remained significantly higher in the south.

The hypothesis on diversity is the only one going against the theory. In fact, more specialized regions should be more volatile, but it is a known fact that the Herfindahl index is affected by the sectoral disaggregation and, for data with the long time span necessary here, the available sectoral disaggregation is very limited. It turns out that the North is more specialized than the rest of the country

TABLE 5 Determinants of volatility before and after the Euro (dummies included but coefficients not reported for reasons of space)

	(1)	(4)	(3)	(2)	(5)	(8)	(9)	(6)	(7)
Regional size	−0.002	−0.001	0.000	−0.003	−0.003	−0.001	−0.003	0.001	−0.001
	−1.092	−0.319	0.013	−1.378	−1.312	−0.558	−1.566	0.343	−0.509
	0.376	0.810	0.992	0.403	0.305	0.671	0.281	0.843	0.725
Investments on GDP		0.001****							
		0.476							
		0.003							
Investments on GDP × dummy Euro		−0.001							
		−0.586							
		0.351							
Share of 15–29 workers			0.001						
			0.414						
			0.392						
Share of 15–29 workers × dummy Euro			−0.001*						
			−1.149						
			0.138						
Herfindal				−0.355**					
				−0.494					
				0.067					
Herfindal × dummy Euro				0.093					
				1.095					
				0.411					
Share of public consumption					−0.000				
					−0.064				

(Continues)

TABLE 5 (Continued)

	(1)	(4)	(3)	(2)	(5)	(8)	(9)	(6)	(7)
					0.866				
Share of public consumption × Euro					−0.001**				
					−1.032				
					0.085				
Weight of construction sector						0.002***			
						0.465			
						0.030			
Weight of construction sector × dummy Euro						−0.001			
						−0.487			
						0.322			
Weight of finance sector							0.002		
							0.512		
							0.371		
Weight of finance sector × dummy Euro							0.001		
							0.676		
							0.366		
Dependence on imports								0.001****	
								0.867	
								0.005	
Dependence on imports × dummy Euro								−0.000	
								−0.179	
								0.206	

(Continues)

TABLE 5 (Continued)

	(1)	(4)	(3)	(2)	(5)	(8)	(9)	(6)	(7)
Structural change									0.005*
									0.285
									0.101
Structural change × dummy Euro									−0.006***
									−0.317
									0.046
Constant	0.024**	0.005	0.000	0.102***	0.044*	0.011	0.009	0.008	0.019
	0.054	0.816	1.000	0.021	0.143	0.598	0.701	0.712	0.219
Observations	200	200	200	200	200	200	200	200	200
Number of regions	20	20	20	20	20	20	20	20	20
N	200	200	200	200	200	200	200	200	200
*N*_g	20	20	20	20	20	20	20	20	20
*g*_min	10	10	10	10	10	10	10	10	10
*g*_max	10	10	10	10	10	10	10	10	10
*t*_min	1	1	1	1	1	1	1	1	1
*t*_max	12	12	12	12	12	12	12	12	12
χ^2	1633	443.0	3,765	1,059	362.1	578.5	457.9	367.6	553.5

*Statistical significance at 15%; **Statistical significance at 10%; ***Statistical significance at 5%; ****Statistical significance at 1%.

TABLE 6 The factors of volatility across Italian regions in the different policy phases

Hypothesis	Area	All time	Euro0	Euro1	*F*	Sig.
	North-West	21.6848	21.6650	21.7124	0.00	
Inventory	North East	22.3167	22.4920	22.0714	0.18	
Investments on GDP	Centre	19.3982	19.9447	18.6332	4.21	**
+	South	24.8965	27.1501	21.7414	26.59	***
	Italy	22.6385	23.6804	21.1799	16.01	***
	F	17.27	20.01	4.09		
	Sig.	***	***	***		
	North-West	18.3031	20.6169	14.2539	124.14	***
Demography	North East	19.1824	21.5372	15.0615	104.20	***
Share of 15–29 workers	Centre	18.7842	20.7359	15.3688	122.30	***
n.s.	South	21.9698	23.7742	18.8119	190.14	***
	Italy	20.0418	22.0877	16.4616	287.04	***
	F	17.81	25.86	51.87		
	Sig.	***	***	***		
	North-West	0.2349	0.2380	0.2305	5.16	**
Diversity	North East	0.2259	0.2282	0.2225	27.19	***
Herfindahl index	Centre	0.2321	0.2336	0.2301	0.70	
−	South	0.2180	0.2161	0.2206	3.09	*
	Italy	0.2258	0.2264	0.2249	0.77	
	F	28.74	37.06	3.84		
	Sig.	***	***	**		
	North-West	17.9109	17.6215	18.3160	0.95	
Protection	North East	17.7888	17.5492	18.1241	1.34	
Share of public consumption	Centre	19.0272	19.0669	18.9716	0.07	
−	South	23.2082	22.4407	24.2825	24.13	***
	Italy	20.2286	19.8238	20.7954	5.74	**
	F	132.34	76.35	69.25		
	Sig.	***	***	***		
	North-West	7.4957	7.2706	7.8108	1.01	
Sectoral specialization	North East	6.9674	6.8796	7.0903	0.78	
Weight of construction sector	Centre	6.6853	6.5468	6.8791	1.58	
+	South	8.9092	9.2225	8.4705	4.45	**
	Italy	7.7933	7.8284	7.7442	0.13	
	F	32.61	22.86	11.26		
	Sig.	***	***	***		
	North-West	12.7727	10.9939	15.2630	38.89	***
Sectoral specialization	North East	10.9275	9.1510	13.4148	84.19	***
Weight of finance sector	Centre	11.5686	9.7075	14.1742	30.55	***

(Continues)

TABLE 6 (Continued)

Hypothesis	Area	All time	Euro0	Euro1	*F*	Sig.
+	South	9.4808	8.1248	11.3793	127.41	***
	Italy	10.8461	9.2204	13.1221	162.67	***
	F	16.67	12.18	25.53		
	Sig.	***	***	***		
	North-West	0.7342	−0.1291	1.9428	0.41	
Openness	North East	0.7326	0.6506	0.8475	0.01	
Dependence on imports	Centre	0.2645	0.9480	−0.6925	0.70	
+	South	24.5028	26.0267	22.3693	3.37	*
	Italy	10.1474	10.7046	9.3673	0.48	
	F	138.28	91.48	48.37		
	Sig.	***	***	***		
	North-West	1.1465	1.3494	0.8623	13.69	***
Structural change	North East	1.0218	1.2402	0.7162	27.80	***
Lawrence index	Centre	1.1683	1.3776	0.8752	15.03	***
+ (n.s.)	South	1.4151	1.6839	1.0388	28.21	***
	Italy	1.2334	1.4670	0.9062	70.24	***
	F	6.20	4.40	6.15		
	Sig.	***	***	***		

Notes: ***Statistical significance at 1%; **Statistical significance at 5%; *Statistical significance at 10%.

(having more manufacturing), but also that this is negatively correlated with volatility, so that again the South is the area which suffers more from volatility.

The demographic hypothesis is not confirmed. Consequently, the relationship of the young population with volatility is negative and insignificant. In this case, the Mezzogiorno is younger than the rest of the country, and this makes it more volatile, although not significantly. The share of young people, however, has been decreasing rapidly in all areas of the country.

Finally, turning to sectors, the share of the volatile construction sector has been higher in the South, although decreasing there more significantly than elsewhere. The volatile finance services sector, on the contrary, is concentrated in the North, with its share growing everywhere.

Summing up, it is possible to observe that the lagging South, which is overall more volatile (Section 4), generally has higher values in those factors which make a region more volatile, including structural change, dependence on imports, young labour force, construction sector, investments (in the first period). This is only partly compensated by a higher share of public consumption and lower importance of the finance sector.

8 | CONCLUSIONS

This paper has investigated the patterns of volatility at the regional level in Italy in the 30 years prior to the big economic crisis and the years of the crisis. It has done so with a dataset difficult to obtain on quarterly employment at the regional level over the period 1978–2016.

The case study is especially interesting because Italy is characterized by a long-time persistent economic dualism, and was characterized by important and a quite sudden macroeconomic policy and economic change linked with the introduction of the Euro, which radically changed the economic policy of the country, and monetary policy in particular.

The paper has shown that the decrease of volatility in the country has been quite important, since a structural break is present in the period including 2002Q1, which coincides with the accomplishment of the political efforts that the country put in place to join the Euro and the actual physical introduction of the Euro in the lives of citizens. Many hypotheses have been put forward in the literature regarding the determinants of regional volatility, and these have been systematized and then empirically tested in the paper for the Italian case. Evidence shows that the determinants which are generally known in the literature also generally apply to the Italian case.

Moreover, innovatively with respect to the previous literature, this paper has analysed these determinants in time and showed that, in Italy, despite a general decrease of volatility coinciding with the introduction of the Euro, this radical macroeconomic policy change did not greatly affect the regional determinants of volatility. Consequently, the reasons for the decrease of volatility and for its being an asymmetrical process had to be found in the regional presence of volatility factors.

Focusing on the well-known and long-standing economic dualism in Italy, the paper has evidenced that lagging Southern regions also suffer from higher volatility. This makes these economies more unstable and, hence, in bad times more likely to lose jobs that are recovered in good times, with consequent social unrest.

This derives from the fact that volatility determinants are differently spatially distributed in the country, and that, although the presence of most of them has changed significantly in time, the differential presence of these determinants in the different parts of the country has remained quite stable.

In particular, the analysis showed that the South, the part of the country which has historically lagged with respect to the others is characterized by higher structural change, less diversity, larger share of the construction sector, more dependence on imports, and investments.

As a consequence of this, the lagging areas of the country suffer, in addition to lower production and income, from higher volatility due to a structure which is weaker and more volatile.

Volatility can hence be an additional issue for lagging regions, at least in the Italian case as analysed in the paper. Policies towards lagging regions, therefore, should target not only growth in order to make them achieve the same levels of income per capita, but also their structure in order to make their economies more stable so that employment suffers less from instability and cyclicity.

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ENDNOTES

[1]These have been scanned and then made electronic with the help of an assistant at Politecnico di Mılano.

[2]GDP data are in volume index format. They are seasonally adjusted and obtained from the OECD database.

[3]Note that, due to the availability of the structural variables, the volatility data were used in the regressions only from 1981.

[4]As a robustness check, we also tested whether the determinants changed with the onset of the economic crisis of 2008. This did not significantly change the determinants and was not policy related, so we decided not to include it in the paper, also for reasons of space.

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