1 Introduction

The dualistic nature of the Italian economy analysed in many empirical studies has initiated a debate about the existence of two different economies, one in the South and one in the North. The Italian parties have answered to this issue by proposing *federalismo*. The extreme position is taken by *Lega Nord*: Northern regions form indeed a different state, and therefore, should be separated from the Center and the South.

The political discussion about *federalismo* has been focussing on the fiscal autonomy of Italian regions as a first step towards complete political and economic autonomy. Fiscal autonomy would have allowed the richer North to benefit from higher tax returns and to stop financing the inefficient economy of the regions in the South. The importance of this issue from both political and economic points of view has stimulated a body of literature on the dualistic nature of Italy. The focus of our study is not on growth convergence,[1]. Instead, we want to analyse the question whether Italy is an optimal currency area.

According to the traditional theory of optimal currency areas (Mundell, 1961; McKinnon, 1963; Ingram, 1969; Kenen, 1969; Taylor and Masson, 1992), the question of whether to chose a common currency or not depends on exogenous factors such as synchronized business fluctuations. However, recent research suggests that a common currency and the common economic policy create the characteristics of an optimal currency area. In other words, the phenomenon may indeed be endogenous.

[1] Barro and Sala-i-Martin (1991) and Sala-i-Martin (1996) show that in the period 1950-1993, there was a process of absolute convergence taking place at an annual rate of 2%, while other studies come to the conclusion that there is a structural break: a process of absolute convergence did take place in Italy up to the middle of the 1970s. After this date, a divergence process can be observed emerging between the Northern and Southern regions.

One of the determinants of an optimal currency is the degree of sectoral specialization. Regions with similar sectoral structures tend to have synchronized business cycles (Kenen, 1969; Krugman, 1993). Kalemli-Ozcan *et al.* (2001) and Ricci (1997) argue that similar monetary policy leads to a concentration of industries and induces similar economic fluctuations by facilitating international insurance against country-specific shocks, respectively by reducing shock asymmetry. In his framework, optimal currency areas are endogenous and self-reinforcing.

In the traditional theory of optimal currency areas, the exchange rate represents a tool to adjust to asymmetric demand and supply shocks. Differently, Buiter (2000) argues that foreign exchange markets represent a source of external shocks. Through the adoption of a single currency, an optimal currency area will remove one of the main causes of asymmetric macro shocks. Another important mechanism for shock transmission is labour mobility. Since migration is costly, workers are likely to move only in case of a long period of expected higher earning. Therefore, only persistent real shocks determine migration flows.

One of the possibilities to analyse the issue of whether a country is an optimal currency area is to look at the similarity of the regional business cycle. Arguing along the lines of the traditional currency area theory, we can say that if the cyclical structure is similar, i.e. if we can talk about an intra-national cycle, then a common currency seems a reasonable choice: the exchange rate is not necessary to isolate the regional economy from outside shocks coming from other regions. On the other hand, if the optimal currency area is endogenous, synchronised regional cycles would point towards the success of the mechanisms outlined above.

Our method of choice is spectral analysis. This method allows the decomposition of the overall variance of a series into the contributions of harmonic waves. Thus it is possible to identify dominant cyclical structure in the series under analysis. We are especially interested in the "classical" business cycle structure: the Juglar cycle with a length of 7-10 years and the Kitchin cycle with a length of 3-5 years. The cyclical nature of the business cycle remains debated; modern researcher rather talk about "fluctuations" than "cycles" (Lucas, 1977). However, these phenomena seem to be robust and can be found not only in historical data (A'Hearn and Woitek, 2001), but also in modern economic time series (Reiter and Woitek, 1999). Identifying the relative importance of cyclical components in the GDP of Italian regions is a first step in determining whether there is an intra-national business cycle in Italy. The second step of the analysis will be to see whether there is an inter-relationship between regional cycles, and how this phenomenon changed over time.

2 Methodology

As stated in the introduction, we are interested in the classical business cycle, i.e. cycles with a length of 7-10 years (Juglar cylces), which are superiomposed by shorter, 3-5 year cyles (Kitchin cycles). To address the issues listed above, we decided to employ spectral analysis.[2] A stationary time series X_t can be decomposed into superimposed waves with frequencies $\omega \in [-\pi, \pi]$. The spectrum measures the (marginal) contribution of each wave to the overall variance. It is defined as the Fourier transform of the autocovariance

[2] See e.g. Harvey (1993), pp. 175-179, Granger and Newbold (1986), pp. 48-53, Brockwell and Davis (1991), pp. 434-443, Priestley (1981), vol. II, and Koopmans (1974), pp. 119-164.

function $\gamma_x, \tau = 0, \pm 1, \pm 2, \ldots$:

$$f_x(\omega) = \frac{1}{2\pi} \sum_{\tau=-\infty}^{\infty} \gamma_x(\tau) e^{-i\omega\tau};\ \omega \in [-\pi, \pi]. \tag{1}$$

Integrating the spectrum over the frequency band $[-\pi, \pi]$, we obtain the variance of the series:

$$\gamma_x(0) = \int_{-\pi}^{\pi} f_x(\omega) d\omega. \tag{2}$$

After dividing the spectrum by $\gamma_x(0)$, we can calculate the contribution of cyclical components in a frequency band $[\omega_1, \omega_2]$ to the overall variance by integrating over the interval (and multiplying by two). Thus it is possible to assess the relative importance of the cyclical components in the frequency bands of interest e.g. the classical Juglar and Kitchin cycle.

The multivariate spectrum of two stationary time series X_t and Y_t is defined as the Fourier transform of the covariance function $\mathbf{\Gamma}_{xy}(\tau), \tau = 0, \pm 1, \pm 2, \ldots$:

$$\mathbf{F}_{xy}(\omega) = \frac{1}{2\pi} \sum_{\tau=-\infty}^{\infty} \mathbf{\Gamma}_{xy}(\tau) e^{-i\omega\tau};\ \omega \in [-\pi, \pi]. \tag{3}$$

The off-diagonal elements of the spectral density matrix $\mathbf{F}_{xy}(\omega)$, $f_{xy}(\omega)$, are called cross-spectra. The cross spectrum at frequency ω is a complex number and given by

$$f_{xy}(\omega) = c_{xy}(\omega) - i q_{xy}(\omega);\ \omega \in [-\pi, \pi], \tag{4}$$

where $c_{yx}(\omega)$ is the cospectrum and $q_{yx}(\omega)$ is the quadrature spectrum. The cospectrum measures the covariance between the "in-phase" components of

X_t and Y_t, whereas the quadrature spectrum measures the covariance between the "out-of-phase" components. Together with the univariate spectra, the cross spectrum can be used to calculate a measure similar to R^2 in linear regression analysis. This measure is the squared coherency $sc(\omega)$:

$$sc(\omega) = \frac{|f_{xy}(\omega)|^2}{f_x(\omega) f_y(\omega)}; \quad 0 \leq sc(\omega) \leq 1. \tag{5}$$

This measure assesses the degree of linear relationship betwee two series, frequency by frequency. If we are interested in the extent to which the variance of cyclical components of the series X_t in the frequency band $[\omega_1, \omega_2]$ can be attributed to corresponding cyclical components in series Y_t, we can use $sc(\omega)$ to decompose the fraction of overall variance in this interval into an explained and an unexplained part:

$$\int_{\omega_1}^{\omega_2} f_x(\omega) d\omega = \underbrace{\int_{\omega_1}^{\omega_2} sc(\omega) f_x(\omega) d\omega}_{\text{"explained" variance}} + \underbrace{\int_{\omega_1}^{\omega_2} f_u(\omega) d\omega}_{\text{"unexplained" variance}} . \tag{6}$$

We will use this decomposition to compare the degree of linear relationship between cycles in different series for frequency intervals of interest, e.g. given by the Juglar and the Kitchin cycle.

As pointed out by Croux *et al.* (2001), a measure like the squared coherency presented above is not suited for analysing the comovement of time series, because it does not contain information about possible phase shift between cycles in the series X_t and Y_t. In this sense, the correlation coefficient in time domain is more informative, since it is calculated lag by lag, providing both information on the lead-lag structure and the degree of linear relationship between the two series. We can overcome this problem by also presenting the phase spectrum, but the phase spectrum is difficult to interpret, since it is only defined $\mod 2\pi$, and cannot easily be summarised over a frequency band like in the case of the explained variance.[3]

Croux *et al.* (2001) propose an alternative measure, the so-called dynamic correlation $\rho(\omega)$, which measures the correlation between the "in-phase" components of the two series at a frequency ω:

$$\rho(\omega) = \frac{c_{xy}(\omega)}{\sqrt{f_x(\omega) f_y(\omega)}}; \quad -1 \leq \rho(\omega) \leq 1. \tag{7}$$

Using

$$sc(\omega) = \frac{|f_{xy}(\omega)|^2}{f_x(\omega) f_y(\omega)} = \frac{c_{xy}(\omega)^2 + q_{xy}(\omega)^2}{f_x(\omega) f_y(\omega)}, \tag{5'}$$

we can use this idea to further decompose the expression in equation (6):

$$\begin{aligned}
&\int_{\omega_1}^{\omega_2} f_x(\omega) d\omega = \int_{\omega_1}^{\omega_2} sc(\omega) f_x(\omega) d\omega + \int_{\omega_1}^{\omega_2} f_u(\omega) d\omega = \\
&= \int_{\omega_1}^{\omega_2} \frac{c_{xy}(\omega)^2 + q_{xy}(\omega)^2}{f_x(\omega) f_y(\omega)} f_x(\omega) d\omega + \int_{\omega_1}^{\omega_2} f_u(\omega) d\omega = \\
&= \underbrace{\int_{\omega_1}^{\omega_2} \frac{c_{xy}(\omega)^2}{f_x(\omega) f_y(\omega)} f_x(\omega) d\omega}_{\text{"explained" variance (in-phase)}} + \underbrace{\int_{\omega_1}^{\omega_2} \frac{q_{xy}(\omega)^2}{f_x(\omega) f_y(\omega)} f_x(\omega) d\omega}_{\text{"explained" variance (out-of-phase)}} + \\
&+ \underbrace{\int_{\omega_1}^{\omega_2} f_u(\omega) d\omega}_{\text{"unexplained" variance}} .
\end{aligned} \tag{6'}$$

Thus, it is possible to decompose explained variance into the "in-phase" com-

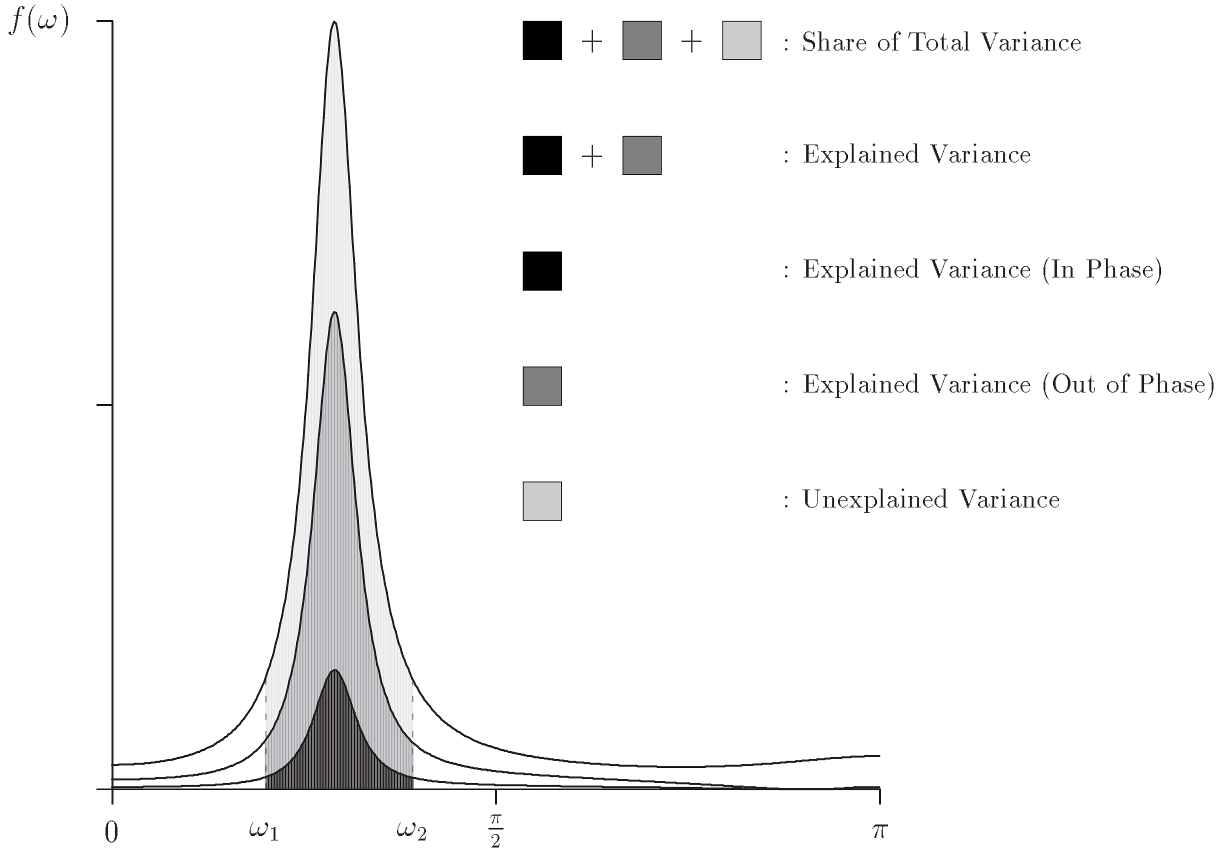
[3]The phase spectrum measures the phase shift between two cycles at frequency ω, and allows to judge the lead-lag relationship between the two series frequency by frequency:

$$\phi_{xy}(\omega) = -\arctan(q_{xy}(\omega)/c_{xy}(\omega)); \ \omega \in [-\pi, \pi].$$

The phase spectrum measures the phase lead of the series X over the series Y at a frequency ω. We will present the phase shift for the frequency where the univariate spectra reach there maximum.

ponent and the "out-of-phase" component, adding some information on the importance of the phase shift in a frequency interval to the R^2 interpretation in equation (6) above.

Figure 1: Variance Decomposition in the Frequency Domain



To estimate the spectra, we fit autoregressive models in the time domain, and calculate the spectra of the estimated models.[4] Assume a univariate AR

[4]This method is based on the seminal work by Burg (1967), who shows that the resulting spectrum is formally identical to a spectrum derived on the Maximum Entropy Principle. This is seen to be a more reasonable approach than the normally used periodogram estimator. The periodogram implies the assumption that all the covariances outside the smple period in the infinite sums in equation (1) and (3) are zero. Given that economic time series are notoriously short, this seems to be a problematic assumption(see

model of order p, with residual variance σ^2. The spectrum is given by

$$f(\omega) = \frac{1}{2\pi} \frac{\sigma^2}{\left|1 - \sum_{j=1}^{p} \alpha_j e^{-i\omega j}\right|^2}; \ \omega \in [-\pi, \pi]. \tag{8}$$

With a VAR model of order p, the spectral density matrix is given by

$$\mathbf{F}(\omega) = \frac{1}{2\pi} \mathbf{A}(\omega)^{-1} \mathbf{\Sigma} \mathbf{A}(\omega)^{-\star}; \ \omega \in [-\pi, \pi]. \tag{9}$$

$\mathbf{\Sigma}$ is the error variance-covariance matrix of the model, and $\boldsymbol{A}(\omega)$ is the Fourier transform of the matrix lag polynomial $\mathbf{A}(L) = \mathbf{I} - \mathbf{A}_1 L - \cdots - \mathbf{A}_p L^p$.[5] But before we can actually estimate the spectrum, we have to solve the problem that the series under consideration are not stationary. The problem we face here is that the widely used filtering methods cause artificial cyclical structure when applied to a series based on a data generating process different form the assumptions underlying the filter.[6] Following Canova (1998), we chose the pragmatic way of comparing the results for the difference filter, the Hodrick-Prescott filter (Hodrick and Prescott, 1980) and the Baxter-King filter (Baxter and King, 1999) with a modification proposed by Woitek (1998).

As stated in the introduction, we want to look at the change of the business cycle phenomenon over time. To do this, we reformulate the VAR model as state space model, treating the VAR parameters as time dependent. The

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the discussion in Priestley, 1981, p. 432, 604-607). For applications to economic time series, see e.g. Hillinger and Sebold-Bender (1992), Woitek (1996), and A'Hearn and Woitek (2001).

[5] L is the backshift operator; the superscript '$\star$' denotes the complex conjugate transpose.

[6] See the discussion in Cogley and Nason (1995), King and Rebelo (1993) and Harvey and Jaeger (1993).

starting point is a VAR of order p

$$\mathbf{x}_t = \mathbf{c} + \sum_{j=1}^{p} \mathbf{A}_j \mathbf{x}_{t-j} + \mathbf{u}_t =$$

$$= \underbrace{\begin{pmatrix} \mathbf{c} & \mathbf{A}_1 & \dots & \mathbf{A}_p \end{pmatrix}}_{\mathbf{A}} \underbrace{\begin{pmatrix} 1 \\ \mathbf{x}_{t-1} \\ \vdots \\ \mathbf{x}_{t-p} \end{pmatrix}}_{\mathbf{Z}_{t-1}} + \mathbf{u}_t = \tag{10}$$

$$= \mathbf{A}\mathbf{Z}_{t-1} + \mathbf{u}_t; \ \mathbf{u}_t \sim iid\,(\mathbf{0}, \mathbf{H})\,.$$

Vectorizing the above equation, and allowing the parameters of the VAR to be time dependent, gives

$$\mathbf{X}_t = \left(\mathbf{Z}'_{t-1} \otimes \mathbf{I}\right) \underbrace{\mathrm{vec}\mathbf{A}_{t-1}}_{\boldsymbol{\alpha}_{t-1}} + \mathbf{u}_t. \tag{11}$$

which is the measurement equation in our state space version of equation (10).[7] The transition equation for the VAR parameters is given by

$$\boldsymbol{\alpha}_t = \mathbf{T}\boldsymbol{\alpha}_{t-1} + \boldsymbol{\eta}_t; \ \boldsymbol{\eta}_t \sim iid(\mathbf{0}, \mathbf{Q}). \tag{12}$$

We assume the matrix $\mathbf{T}$ to be a diagonal matrix with elements $\rho = 0.9$ on the diagonal, forcing the time path for the parameters to be a damped AR(1) process. The elements in the covariance matrices $\mathbf{H}$ and $\mathbf{Q}$ are treated as hyperparameters, and the likelihood function derived based on the cumulated prediciton errors is maximised with respect to these parameters. The solution of this estimation procedure implies a time path for $\boldsymbol{\alpha}_t$, Thus allowing the

[7] For the following, see Harvey (1992).

spectral density matrix in equation (3) to be time dependent. We assume that the univariate spectra in equation (1) are constant, since we are not interested in the change of the length of the cycle in the first place. We want to use the time dependent cross spectra to derive a time dependent version of the explained variance and the phase shift, which enables us to judge the extent to which the regional business cycles move together over time.

3 Results

The first step in the analysis is to compare the univariate cyclical structure of the regional GDPs in the Centre-North and the Mezzogiorno.[8] Following Canova (1998), we judge the robustness of our results by comparing the outcome for three detrending methods: the difference filter, the Hodrick Prescott filter (Hodrick and Prescott, 1980), and the Baxter-King filter (Baxter and King, 1999) in a slightly modified version (Woitek, 1998). In addition, we also perform a significance test of the share of total variance.[9] The results of this exercise are displayed in Table 1.

[8]The series are annual, at 1990 prices. For the observation period 1951-1993, the data are from Paci and Saba (1998). Based on the data from Svimez (2000), we extended the series to include observations up to 2000.

[9]The distribution of the test statistic is constructed based on 1000 replications of a white-noise process.

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Table 1: Italian Regions, Univariate Cyclical Structure

	Cycle Length					
	BKM		HP		D	
	Centre-North	Mezzogiorno	Centre-North	Mezzogiorno	Centre-North	Mezzogiorno
	7.56	5.67	8.59	8.33	8.40	6.86

	Proportion of Total Variance					
	BKM		HP		D	
	Centre-North	Mezzogiorno	Centre-North	Mezzogiorno	Centre-North	Mezzogiorno
7-10 years	0.29***	0.10	0.60***	0.36***	0.20*	0.13
5-7 years	0.18	0.35***	0.08	0.15	0.12	0.17
3-5 years	0.33	0.31	0.15	0.13	0.31	0.26

Notes:
BKM: modified Baxter King filter; HP: Hodrick Prescott filter; D: difference filter.
*/**/***: share of total variance is significant at the 10/5/1 per cent level.

The business cycle in the Centre-Nort region is obviously longer than in the Mezzogiorno. Looking at the proportion of total variance, we find that the long cycle is more prominent in the North than in the South, in the sense that it is robust with respect to the detrending procedure. This result can be explained with the differences in the economic structure: for economies with a dominant agricultural sector, the business cycle is shorter (A'Hearn and Woitek, 2001).[10]

We can go a step further, and present the univariate cyclical structure for all 20 Italian regions. We compare the proportion of variance in the 5 frequency intervals corresponding to the business cycles lengths of 0-∞ years, 7-10 years, 5-7 years, 3-5 years, and 2-3 years. The results (BKM filter) are displayed in Table 2; the 5 columns of this table contain the proportion of total variance in each of the 5 cycle intervals. The result from above is confirmed: for regions in the Mezzogiorno, the longer cycles are less important. However, this picture is not as clear-cut as one would expect.

[10]Another explanation could be a political business cycle in the South of Italy. But although we find a political business cycle in 15 Italian regions (the growth of GDP is significantly higher than the average one year before a regional election, 1970-1990), a dummy measuring the difference of regions in the South with respect to elections turns out to be insignificant.

Table 2: Italian Regions, Univariate Cyclical Structure

	Region	(1)	(2)	(3)
Centre-North	PIE	0.31***	0.12	0.33
	VDA	0.12	0.24**	0.45**
	LOM	0.35***	0.15	0.34
	TAA	0.10	0.27**	0.45**
	VEN	0.14	0.32***	0.27
	FVG	0.15	0.30***	0.34
	LIG	0.10	0.28***	0.29
	EMR	0.25***	0.16	0.39*
	TOS	0.14	0.29**	0.31
	UMB	0.12	0.11	0.51***
	MAR	0.23**	0.18	0.42*
	LAZ	0.18*	0.18	0.34
Mezzogiorno	ABR	0.31***	0.16	0.29
	MOL	0.12	0.20*	0.31
	CAM	0.20**	0.29**	0.22
	PUG	0.08	0.17	0.40*
	BAS	0.06	0.36***	0.29
	CAL	0.07	0.11	0.35
	SIC	0.11	0.37***	0.26
	SAR	0.29***	0.28**	0.15

Notes:
PIE: Piemonte; VDA: Valle D'Aosta; LOM: Lombardia; TAA: Trentino Alto Adige; VEN: Veneto; FVG: Friuli Venezia Giulia; LIG: Liguria; EMR: Emilia Romagna; TOS: Toscana; UMB: Umbria; MAR: Marche; LAZ: Lazio; ABR: Abruzzo; MOL: Molise; CAM: Campania; PUG: Puglia; BAS: Basilicata; CAL: Calabria; SIC: Sicilia; SAR: Sardegna.
Cycle lengths: (1): 7-10 years, (2): 5-7 years, (3): 3-5 years.
*/**/***: share of total variance is significant at the 10/5/1 per cent level.

To gain more insight into the similarities between the regional cycles, we employ cluster analysis, based on the Euclidean distance for each of the 5 columns in Table 2. The resulting dendrograms can be found in Figure 2. The following robust result emerges:[11] Trentino/Alto Adige and Valle D'Aosta

[11] "Robustness" is judged according to whether the result comes trhough under both the

are the most similar regions. Other robust pairs are Friuli/Venezia/Giulia and Toscana, Veneto and Liguria, Emilia Romagna and Marche, and finally, Piemonte and Abruzzo.

On the next level, we find 2 groups of three similar regions: Piemonte, Abruzzo, and Lombardia, and Veneto, Liguria, and Siciliy. These two groups are the core of two large groups of regions which are relatively similar. The first group is Friuli/Venezia/Giulia, Toscana, Veneto, Liguria, Basilicata, and Sicily. The second group consists of Emilia Romagna, Marche, Piemonte, Abruzzo, Lombardia, and Lazio.

If we would want to split Italy into three regions according to the similarity of the business cycle, we would end up with the following groups:[12]

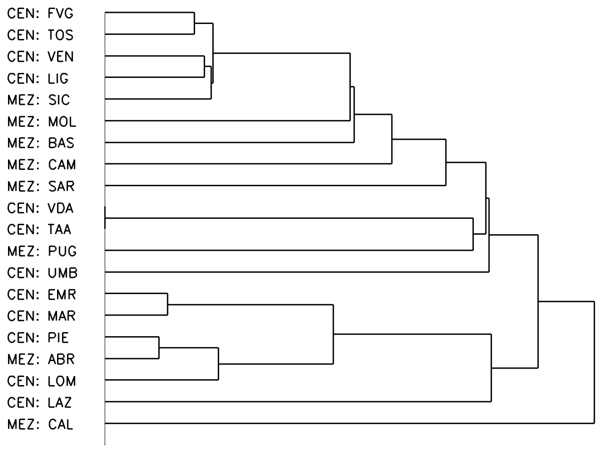
- Group 1: Valle D'Aosta, Trentino/Alto Adige, Veneto, Friuli/Venezia/Giulia, Liguria, Toscana, Campania, Basilicata, Sicily, and Sardegna
- Group 2: Piemonte, Lombardia, Emilia Romagna, Marche, Lazio, Abruzzo
- Group 3: Calabria

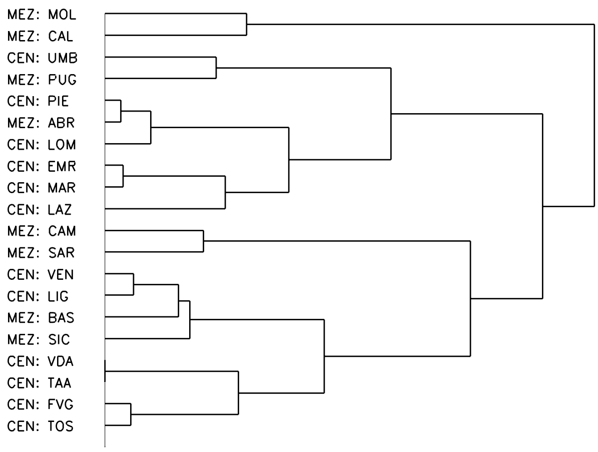
Geographical proximity seems to matter, but only to some extent. The clusters based on the univariate characteristics of the business cylce do not divide Italy into two regions in the North and the South.

single-link and the complete-link method. For a description of cluster analysis, see e.g. Krzanowski (1990).

[12]For Umbria, Molise, and Puglia, the results are not robust.

Figure 2: Business Cycle Structure in Italian Regions





Notes:
The upper graphic contains the dendrogram for the single-link method, the lower graphic for the complete-link method.
PIE: Piemonte; VDA: Valle D'Aosta; LOM: Lombardia; TAA: Trentino Alto Adige; VEN: Veneto; FVG: Friuli Venezia Giulia; LIG: Liguria; EMR: Emilia Romagna; TOS: Toscana; UMB: Umbria; MAR: Marche; LAZ: Lazio; ABR: Abruzzo; MOL: Molise; CAM: Campania; PUG: Puglia; BAS: Basilicata; CAL: Calabria; SIC: Sicilia; SAR: Sardegna.

In the next step, we compare the interaction between business cycles in the North and in the Mezzogiorno looking at explained variance. The observation period is 1950-2000. The results are displayed in Figure 3.[13] We show time series of explained variances for the classical business cycle range (i.e. 7-10 and 3-5 years), and for the range in between (5-7 years). As a first result, we see that explained variance in the 5-7 years range is on average higher than for the other cycle lengths. This is not astonishing, given that this range has the most significant results in Table 2. Over time, explained variance decreases, while it increases in the 7-10 years range, a cycle range which is associated with fixed investment. The South catching up with the already post-industrial North could have such an effect.

Explained variance starts at a relatively high level of about 80% in the 50s, but the cycles are out of phase. This changes in the period 1960-65, where the overall measure decreases, but with an increasing in-phase component. In 1960-70, explained variance stays almost constant, with the in-phase component dominating. The period 1970-75 is characterised by a sharp decrease of the in-phase explained variance. After 1975, the overall measure starts to increase again until 1982, with dominating out-of-phase component. The subsequent fall of explained variance until 1985 is accompanied by an increase in the importance of the in-phase component. After 1985, the overall measure increases steadily almost to the level reached in 1960, but the out-of-phase component starts to dominate.

What can be an explanation of the changing nature of the regional cycle transmission?[14] Explained variance seems to be especially high in years where economic policies were adopted which affected the entire country. For

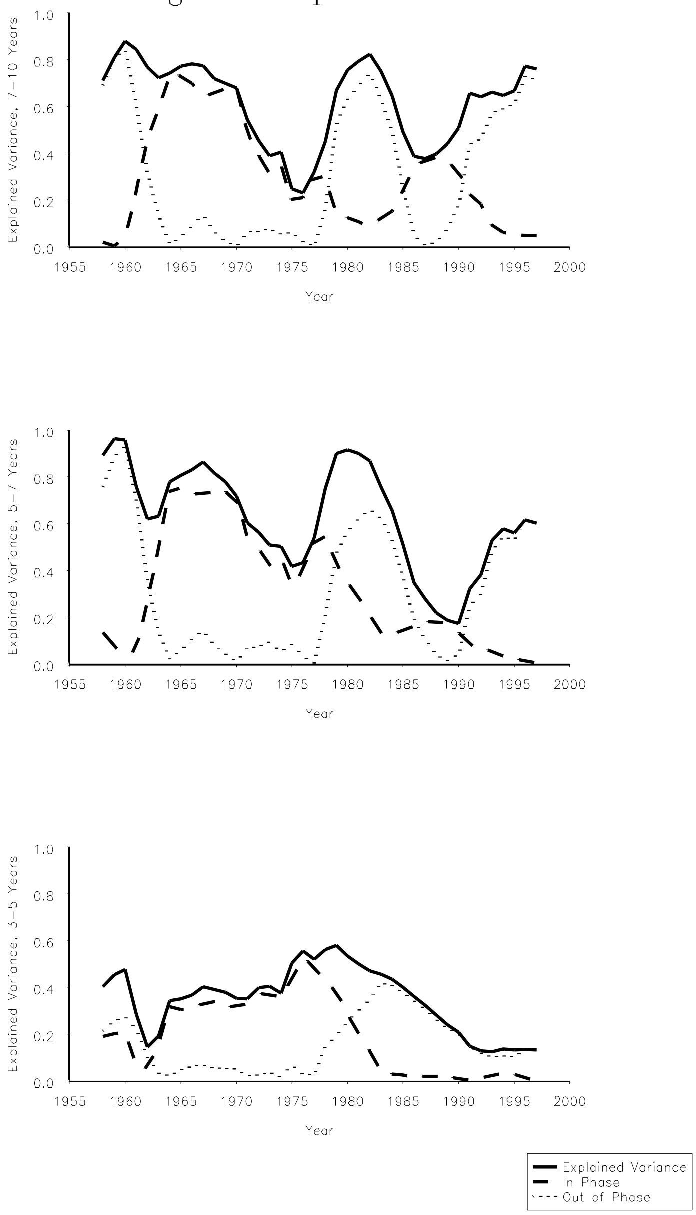
[13]The data were detrended using the modified Baxter-King filter (Woitek, 1998). The results for the other filtering methods show that the outcome is robust.

[14]For the following, see Zamagni (1993) and Rossi and Toniolo (1996).

example, the Italian government tried to overcome structural problems by implementing the Vanoni Plan (1954) and founding the *Cassa del Mezzogiorno* (1950), which could have led to a closer relationship between the regional cycles. The decreasing association in the periods 1970-75 and 1982-85 can be attributed to the impact of the first and second oil crisis. The difference in the structure of the industrial sector, with the state-owned heavy industries in the South, might have triggered different responses to these shocks. The increase in explained variance after 1985 can be interpreted as a consequence of the increasing similarity between the industrial sectors in the two regions (Del Monte and Giannola, 1997). If the industrial sectors become more similar over time, one would expect a increasing relationship between the cycles. Another factor leading to this increase is the diminishing importance of the agricultural sector not only in the North, but also in the South. The agricultural sectors are very different in terms of products and markets; hence, declining agriculture will lead to a closer association.

The change in explained variance describes changes in the association of the regional cycles. Whether the cycles are in phase or not shows the nature of the transmission mechanism. The period before 1978 is characterised by a dominace of in-phase explained variance, while the out-of-phase component dominates after this date, with the exception of a short period around 1987. These fluctuations of the two components can be linked to a change in inter-regional migration as an important component of the transmission mechanism. Migration between the regions decreases over the observation period, although the unemployment differential increases (e.g. Padoa Schioppa, 1991; Faini *et al.*, 1997). Hence, despite the growing similarity between the industrial structure in the South and the North, regional specific shocks like the asymmetric public infrastructure investment (Del Monte and Giannola, 1997, p.105-108) are only transmitted with a lag. The increase in trade between the regions (Del Monte and Giannola, 1997) is obviously to small to compensate for this effect.

Figure 3: Explained Variance



4 Conclusion

We find clear evidence that regional business cycles in Italy in the period 1950-2000 cannot be seen as similar. Given the political discussion, one would expect an obvious difference between cycles in the North and cycles in the South. However, this is not the case: the regional clustering of cyclical characteristics is not in-line with the geographical division into North-Centre and Mezzogiorno. The intra-national transmission of the business cycle shows some variation over time: we find a strong interaction in the 50s, while during the 60s and 70s, the relationship becomes weaker. Since the beginning of the 80s, the relationship between the cycles in the North and the South increases again. Despite this increase, the cycles are out of phase.

The description of the correlation between business cycles in Italian regions and how these co-fluctuations are linked with policies allows drawing some conclusion about the validity of exogenous and endogenous optimum currency area theories. Our result supports the endogenous version: common policies lead to a synchronisation of the cycle, which characterises an optimum currency area.

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