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Abstract: This article provides the estimation of a basic version of the Okun law in the Italian regions, distinguishing between male and female unemployment rate. It shows that relevant differences exist across the regions, concerning not only the size of the Okun coefficients, but also the different sensitivity of male and female unemployment rate to GDP growth. While in Northern regions, the change of female unemployment is more sensitive to the variation of GDP as compared to the male unemployment, the opposite occurs in the Southern regions (characterized by lower GDP and higher unemployment rates), where the Okun coefficient is insignificant for women in several cases.

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JEL Classification: R23, J70.

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Abstract: This article provides the estimation of a basic version of the Okun law in the Italian regions, distinguishing between male and female unemployment rate. It shows that relevant differences exist across the regions, concerning not only the size of the Okun coefficients, but also the different sensitivity of male and female unemployment rate to GDP growth. While in Northern regions, the change of female unemployment is more sensitive to the variation of GDP as compared to the male unemployment, the opposite occurs in the Southern regions (characterized by lower GDP and higher unemployment rates), where the Okun coefficient is insignificant for women in several cases.

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I. Introduction

In its original version, the Okun law (Okun, 1962) predicts a link between the output gap (i.e., the percentage difference between current and full-employment aggregate production) and the unemployment gap (that is, the difference between current and natural unemployment rate). A basic version of the same law can be expressed, by positing a link between the change of unemployment rate and the percentage growth rate of GDP:

(1) $$\Delta u_t = a + b \cdot \dot{y}_t + e_t$$

where u_t denotes the unemployment rate (Δu_t is its first difference, that is the variation in the unemployment rate) and dotted y_t is the percentage growth rate of GDP (in real terms); b is usually labelled as the Okun coefficient and it expresses how sensitive the unemployment rate variation is to GDP growth; e denotes the error term.

The body of theoretical and applied research on the Okun law is huge: the theoretical underpinnings of the law have been largely investigated and criticized; the appropriateness of the simple regression design has been widely discussed; the opportunity of using filtered (de-trended) data has been debated (Lee, 2000); the stability over time of the law has been scrutinized and different estimation procedures have been debated (see, e.g., Attfield and Silverston, 2006, vs. Prachowny, 1993); furthermore, large differences in coefficients' size has been documented across countries (Harris and Silverstone, 2001). All these contributions lead to cast doubts on the fact that a law does exist. Nevertheless, the relation is widely used and relevant policy insights are derived.

If we focus the attention on the literature concerning the Okun law estimation at the regional level, we underline that different coefficients typically emerge for the regions of a country. Freeman (2000) documents the difference across ten macro-regions of the US (resorting to quarterly data over the period 1958-98). Binet and Facchini (2012) estimate the Okun law for the 22 French regions, using annual data over the period 1990-2008. Palombi et al. (2017) assess the difference in Okun's law for the regions in the UK; in this article Okun's law is proved to be significant not only as a business cycle phenomenon, but also in the medium run. Melguizo (2015) uses annual data over the period 1985-2011 to estimate the differences across 50 Spanish provinces. Durech et al. (2014) document the differences in the Okun law for 22 regions in Czech Republic and Slovakia, using a panel of annual data over the period 1995-2011.

A recent strand of applied research shows that male and female unemployment rates react in a different way to GDP fluctuation: Razzu and Singleton (2013), resorting to UK data, show that business cycles are not gender neutral. Bod'a and Povazanova (2015) take into account national data from four countries (Portugal, Italy, Greece and Spain) and show that except for Italy (where the converse is true), economic fluctuations have a stronger impact on male unemployment than on female unemployment. This can be easily explained by the stronger fluctuations in the industrial sector, which predominantly employs men (see Hutengs and Stadtmann 2014).

Our present contribution provides a further piece of evidence, concerning the difference of Okun's coefficients across the regions of a country and the gender asymmetry: Taking Italy as the case study, we document that significant and consistent differences emerge in the sensitivity of male and female unemployment rate to GDP, across the regions.

The gap between Northern and Southern regions in Italy is secular, and a huge body of literature exists concerning the Italian dualism (Fratianni, 2012; see also, among many others, Delmonte and Giannola, 1997; Faini et al, 1992; Daniele and Malanima, 2007). This paper *does not deal* with the roots and characteristics of the Italian dualism. Here we have simply to underline some basic elements: While in all Italian regions the female unemployment rate is higher than the corresponding male unemployment rate, regional differences are wide and persistent: Northern regions show lower unemployment rates (for both males and females) and higher levels of GDP. The dynamics of GDP and unemployment rates have been different between Northern and Southern Italian regions, also in the last decades. For the present analysis, we resort to annual data, over the period 1995-2015. This interval includes years of national macroeconomic growth, as well as well years of recession.

The interesting (and novel, as far as we know) point from our present investigation is that the sensitivity of female unemployment rate to GDP is systematically higher than the male sensitivity in Northern regions while the opposite occurs in Southern regions; in most of them, the Okun coefficient for women is not even significant. In other words, an asymmetry does exist between Northern and Southern regions in Italy as far as the male *vs.* female Okun's law is concerned.

Section 2 provides a description of the data under consideration. Section 3 provides the econometric analysis and some preliminary comments. Conclusions are in Section 4.

II. Data

The data under consideration cover the period 1995-2015 with a yearly frequency; they are from ISTAT, the National Italian Statistical Office.[1] Descriptive statistics of data at hand are provided in Table 1.a,b where the list of regions, along with their code and summary

[1] Data on GDP are available at http://dati.istat.it/Index.aspx?DataSetCode=DCCN_PILPRODT# while data on unemployment rate are at http://dati.istat.it/index.aspx?queryid=20746#. All data are also available from the Authors.

information about size and location are also reported. Notice that we report the cases in which the region is "small" –as defined as having less than 1 million of residents–, and whether it is in the Sothern part of the country, in the so-called "*Mezzogiorno*", which includes regions historically lagging behind with respect to the Northern and Central regions of Italy, as far as the economic situation concerns.

Our interest is in evaluating whether and how the Okun law changes across the Italian regions. It is worth mentioning that a number of available studies concerning Okun's law consider filtered data for GDP, thus underlining the short-term and cyclical nature of the law. Here, we prefer to analyse original non-filtered data, adhering to a choice made by several other available analyses (e.g., Melguizo, 2016; Ibregimov and Ibragimov, 2017). In Table 1.a, it is worth noticing that a great deal of variability exists in average levels of unemployment rate across the Italian regions, ranging from 3.9 in Trentino-AA to 19.6 in Sicily. Unemployment rate also shows a large degree of variability over time in each region: e.g., in Piemonte the unemployment rate ranges from 4.08 (in 2006) to 11.3 (in 2014). As far as the year-to-year variation concerns, one observes both positive and negative figures in each region; the average value is positive in 13 out of 20 regions.

The annual growth rate of real GDP is positive, in average, in 16 out of 20 regions (the four exceptions are Sicily and three very small regions, namely Valdaosta, Umbria, and Molise): the minimum values of real GDP growth rate always pertain to 2009 or 2010, in the hearth of the so-called "Great recession".

Table 1.b focuses on the gender gap in unemployment rate: female unemployment rate is larger than male unemployment rate in *any single region*. Needless to say, this is a sign of the gender bias in the labour market. Looking at the average rates, the minimum difference between the male and female unemployment rates occurs in Valdaosta (less than 1 percentage point of difference between male and female unemployment rate), while the largest gaps are in Southern regions (more than 9 points of difference in Campania and around 8 points in Puglia and Sicilia).

< Table 1.a - Regions and series under consideration (1995-2015): aggregate data >

< Table 1.b - Series under consideration (1995-2015): Male vs. female data >

III. Regression analysis

For each of the twenty Italian regions, we firstly run the regression eq. (1), considering the total unemployment rate (that is, not distinguishing between males and females). Results are reported in Table 2. In the cases where residuals show autocorrelation, according to the LM test (that is, in the cases of Marche and Puglia) we run a regression inserting the first lag of the dependent variable among the regressors, so that the following (partial adjustment) specification is considered:

$$(2) \qquad \Delta u_t = a + b \cdot \dot{y}_t + c \cdot \Delta u_{t-1} + e_t$$

In all cases when the lagged term of Δu_t is inserted, this is sufficient to obtain non-autocorrelated regression residuals. However, as it is clear form Table 2, the inclusion of the lagged dependent variable among the regressors does not change the substantial outcome concerning the Okun coefficient.

As Table 2 shows, the Okun coefficient is negative in all 20 regions and statistically significant in 18 of them, the two exceptions being Valdaosta (the smallest Italian region, in the Northern part of Italy) and Calabria (the poorest Italian region in terms of per-capita GDP, in the South, with population only slightly larger than 1 million). The ranking of the regions based on the Okun coefficient –that is, the sensitivity of unemployment rate to GDP– shows that Sicilia, Puglia, Lazio and Campania are the regions with the highest coefficient (in absolute value): these are large regions and three of them are in the South ("Mezzogiorno"). At the opposite end, the regions with the lowest Okun coefficient (still in absolute value), and hence the lowest sensitivity of unemployment rate to GDP, are Trentino-AA., Friuli-VG and Basilicata, along with Valdaosta and Calabria where the coefficient is even statistically insignificant. The common trait in these regions is the small size: three of them have less than 1 million inhabitants and the other two just above 1 million.

< Table 2 - Regression equation (1) or (2) on aggregate data) >

However, the main point of interest of the present analysis rests in the focus on the gender gap. Table 3.a reports the Okun coefficient for each region, i.e., parameter *b* in equation (1), distinguishing between the male and female unemployment rate. The basic specification is used, if residuals are not auto-correlated; otherwise, in the cases denoted by a # sign in the *"Specif"* column, the lagged dependent variable is inserted, according to eq. (2). The constant term (and the coefficient of the lagged dependent variable, if inserted) are not reported in Table 3.a for the sake of brevity: however, the inclusion of the lagged dependent variable among the regressors never changes the substantial outcome regarding the Okun coefficient. Table 3.b simply reports a grouping of the Italian regions, according to the significance of Okun's coefficients for males and females, as emerged from Table 3.a (statistical significance is considered at the 10% level).

Tables 3.a,b show that the Okun coefficient is negative and statistically significant in 18 out of 20 regions for male unemployment rate and only in 13 regions for female unemployment rate. This first piece of evidence suggests that Okun law appears to be, in Italy, a "strong" law for men but not for women. In particular, the Okun law appears to fail for women in Southern regions of Italy. The two cases where the law fails for both men and women are Valdaosta and Basilicata, the two smallest Italian regions in terms of population. The four cases where Okun's law holds for men but not for women –namely, Abruzzo, Molise, Campania and Calabria– are Southern regions. The second piece of clear evidence concerns the size of the Okun coefficients: the coefficient is generally larger (in absolute value) for women than for men in Northern regions, while it is larger for men than for women in Southern regions. Thus, in general, a picture emerges, according to which Okun's law holds for both men and women in Northern regions, where the female unemployment rate is more sensitive than the male unemployment rate to GDP changes. The Okun law holds for men but not for women in Southern regions, where the female unemployment rate is consistently less sensitive than male unemployment rate to GDP. From an international point of view this is consistent with Signorelli et al. (2012) that show how the impact of major shocks, such as the financial crisis in 2008, has been found more pronounced for women in high-income countries, such as Western European countries as well as Canada, Japan, Korea, New Zealand, Switzerland and the United States.

< Table 3.a - Estimantes of Okun' coefficient for males and females in the Italian regions >
< Table 3.b - Okun's coefficient distribution across Italian regions >

Two interesting economic questions derive from the reported evidence: Why does the Okun law hold for women in the Northern regions of Italy while it does not hold in the South?; Why is the sensitivity of female unemployment rate to GDP higher for women than for men in the Northern regions of Italy while the same does not hold for Southern regions?

We do not know, to the best of our knowledge, specific analyses devoted to these issues, so that we can propose plausible explanations consistent with general investigations on gender gap and regional differences in Italian labour markets. There are different aspects of the labour market that may affect female unemployment and may explain the differences in regional sensitivity to GDP. Besides institutional variables which affect overall unemployment, some specific variables are important for female unemployment.

Female participation to labour market is higher in Northern than Southern regions (see, e.g., ISTAT, 2017, specifically Ch. 4): female participation rate in 2015 was above 60% in all regions of Northern Italy, while it was between 35 and 52% in the Southern regions, with a rate below 40% in four of them (see also the detailed Report in ISFOL, 2012). It is likely that both demand and supply of female labour react to economic fluctuations more strongly in the Northern regions, where participation is higher, as compared to Southern regions, where participation rates are lower: In Southern regions the low female labour market participation is consistent with the fact that a change in the unemployment rate captures only a part of the dynamic effects caused by the business cycle.

Consider that welfare service in general, and welfare service in supporting family and child-care more specifically, are more developed and readily available in the Northern regions than in the Southern ones: this fact could be among the reasons why female labour participation is more limited in the South: women are required to be more involved in family work, regardless of macroeconomic condition change (Saraceno, 1994). This drives to a failure of the Okun law for female in the South of Italy.

Moreover in the South males are predominantly employed by more cyclical industries (manufacturing and construction sectors) than females (whose presence is more massive in the service sector) , so that their unemployment rate reacts more strongly to any change in GDP. Thus a further look at a segregation of the market and the share of female in services and public sector employment can be explains low female GDP sensitivity.

However, and as a matter of fact, the variation of male participation rate appears to be significantly affected by the growth rate of GDP in four regions, while the female participation rate turns out to be affected by the GDP growth rate only in two regions.[2] While it is well known that participations rates are not very sensitive to GDP dynamics, our present evidence, broadly speaking, confirms this outcome, with the feature that the insensitivity is more common for females than males.

Another explanation of the sensitivity of female unemployment rate to GDP higher for women than for men in the Northern regions of Italy is the share of female temporary workers. The composition in terms of temporary contracts as the share of female temporary workers is larger than that of men in the Northern part of Italy. The diffusion of temporary contracts has contributed to rendering the Italian labour market very flexible. Unemployment should be more responsive to changes in output in regional economies with a relatively higher share of workers on temporary contracts, who benefit from less employment protection: during a recession temporary workers are the first to lose their job. Thus, the higher cost of this flexibility is supported by female (and young) workers in the Northern Italian regions.

It is important to notice that wage rates (and opportunity cost of leisure) are larger in Northern than in Southern regions, and this also could provide an explanation of why unemployment rates are more GDP-sensitive in the Northern part of Italy than in the South. Specifically, wage rates and opportunity costs are the lowest for Southern females, and this could explain the fact that the Okun law is very weak for this labour market segment.

Moreover, in the Southern regions, where male unemployment rates are high and female participation rates are low, GDP booms could lead firms to demand male workers in

[2] We run a regression similar to (2) in which the variation of participation rate is considered as the dependent variable instead of the variation of unemployment rate. Coefficient *b* always emerges to be positive (as expected), but is statistically significant only in Abruzzo (1% significance level), Emilia-R, Molise (5%) and Sardinia (10%) for males, and only in Friuli-VG (5%) and Abruzzo (10%) for female participation.

a larger amount than female workers, while the male workers are firstly dismissed when GDP shrinks.

Last but not least, underground and informal economy is more diffused in Southern regions, and hence official statistics are more likely to fail to capture how labour market react to change in macroeconomic conditions (Ardizzi et al., 2013; Boeri and Garibaldi, 2015; the latter also provides a theoretical model to highlight the relation between shadow economy and reduced turnover in labour market).

IV. Conclusions

The fact that the Italian economy presents a marked dualism, with Southern regions lagging behind the Northern regions, is well-known –even if the situation is much more articulated than a simple white-and-black picture. Not only GDP per capita levels are higher in the Northern regions, as compared to the Sothern ones, but a different structural composition exists between North and South, and strongly different conditions characterize the labour markets. In particular, participation rates, and especially female participation rates, are lower in the South, and unemployment rates are larger. The present paper has shown that a relevant asymmetry between Northern and Southern Italian regions does exist, with reference to the difference between Okun's coefficients for men and women.

We have documented that the Okun coefficient for women is generally statistically significant in Northern regions, where it is also larger than the corresponding coefficient for men. In contrast, the Okun coefficients for women are not significant in most of the Southern regions; even if significant, they are lower than the corresponding coefficients for men. Roughly speaking, we have concluded that Okun's law is a strong law for both men and women in Northern regions of Italy, where female unemployment rates are more GDP-sensitive than male rates, whereas the law tends to fail for women in the South.

Though very simple, the statistical evidence seems to be clear. Thus, it is a little bit surprising that no specific analysis is available to this aspect of the Italian regional dualism (at the best of our knowledge). We have provided some tentative considerations. However, deeper statistical investigation is necessary, along with institutional and theoretical investigation, to understand and explain the socio-economic factors behind such a clear asymmetry.

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TABLES

Table 1.a – Regions and series under consideration (1995-2015): aggregate data

Code	*Region*	*Loc, Size*	*u* (level)		Δ*u*		%Δ*GDP*	
			Average	min ; max	Average	min ; max	Average	min ; max
PIE	Piemonte		7.640	4.08 ; 11.29	0.020	-1.57 ; 1.70	0.217	-8.41 ; 3.62
VAA	Valdaosta	^	4.683	2.55 ; 8.91	0.167	-1.20 ; 1.85	-0.290	-6.39 ; 4.72
LIG	Liguria		8.257	4.79 ; 12.36	-0.159	-1.97 ; 1.76	0.110	-6.48 ; 4.83
LOM	Lombardia		5.148	3.33 ; 8.18	0.097	-0.74 ; 1.72	0.797	-6.1 ; 4.47
TAA	Trentino-AA		3.923	2.74 ; 5.66	-0.002	-0.96 ; 1.22	1.06	-2.65 ; 4.24
VEN	Veneto		5.367	3.36 ; 7.59	0.015	-0.87 ; 1.52	0.659	-5.86 ; 4.89
FVG	Friuli-VG		5.701	3.40 ; 8.03	-0.002	-1.32 ; 1.58	0.339	-7.23 ; 6.07
EMR	Emilia-R		4.826	2.54 ; 8.36	0.109	-1.06 ; 1.75	0.948	-6.91 ; 5.51
TOS	Toscana		6.320	4.05 ; 10.11	0.0799	-1.16 ; 1.45	0.621	-4.03 ; 3.72
UMB	Umbria	^	7.63	4.61 ; 11.31	0.0232	-1.34 ; 3.07	-0.085	-8.21 ; 2.98
MAR	Marche		6.375	4.11 ; 10.94	0.159	-1.01 ; 2.26	0.641	-4.93 ; 4.11
LAZ	Lazio		9.975	6.38 ; 12.51	-0.0205	-2.02 ; 1.87	0.613	-3.64 ; 3.97
ABR	Abruzzo	§	9.626	6.16 ; 12.61	0.0355	-2.33 ; 2.25	0.463	-6.19 ; 4.92
MOL	Molise	§, ^	11.13	8.06 ; 15.61	0.108	-2.14 ; 3.64	-0.446	-7.21 ; 3.16
CAM	Campania	§	17.449	11.17; 21.74	-0.0364	-2.05 ; 3.84	0.002	-4.99 ; 3.54
PUG	Puglia	§	15.555	11.08 ; 21.46	0.202	-2.35 ; 4.01	0.221	-4.71 ; 4.13
BAS	Basilicata	§, ^	13.590	9.43 ; 16.56	-0.116	-1.72 ; 2.61	0.571	-5.91 ; 5.6
CAL	Calabria	§	16.541	11.12 ; 23.41	0.410	-2.30 ; 6.71	0.042	-4.09 ; 3.93
SIC	Sicilia	§	19.255	12.89 ; 24.53	-0.0716	-2.97 ; 4.12	-0.007	-4.36 ; 3.71
SAR	Sardegna	§	14.336	9.81 ; 18.62	0.127	-2.05 ; 2.36	0.212	-4.54 ; 3.55

Note: § denotes Southern regions (8 of 20 regions, that consitute the so-called "Mezzogiorno"): ^ denotes small regions (less than 1.000.000 inhabitants: 4 out of 20 regions).

Table 1.b - Series under consideration (1995-2015): Male vs. female data

	Male				Female			
	u (level)		Δu		*u* (level)		Δu	
	Average	min-max	Average	min ; max	Average	min ; max	Average	min ; max
PIE	6.018	3.28;10.65	0.166	-1.05 ; 1.98	9.790	5.13 ; 14.71	-0.189	-2.86 ; 1.96
VAA	4.359	2.07 ; 9.54	0.243	-1.99 ; 2.11	5.139	2.59 ; 8.41	0.0625	-2.05 ; 1.79
LIG	7.443	3.25 ; 2.09	-0.157	-3.26 ; 2.63	9.304	5.63 ; 14.18	-0.163	-2.51 ; 3.05
LOM	4.209	2.51 ; 7.74	0.133	-0.59 ; 1.67	6.470	4.44 ; 8.75	0.0361	-1.47 ; 1.75
TAA	2.924	1.65 ; 5.27	0.064	-0.63 ; 1.06	5.319	3.73 ; 7.95	-0.111	-1.46 ; 1.42
VEN	3.768	2.04 ; 6.14	0.065	-0.61 ; 1.59	7.685	5.07 ; 10.46	-0.082	-1.30 ; 1.85
FVG	3.886	2.16 ; 7.31	0.129	-1.16 ; 1.71	8.388	4.71 ; 14.41	-0.238	-1.72 ; 1.64
EMR	3.586	1.81 ; 7.34	0.173	-0.93 ; 1.93	6.365	3.42 ; 9.64	0.0226	-1.31 ; 1.84
TOS	4.234	1.51 ; 8.71	0.242	-1.20 ; 1.17	9.141	6.31 ; 12.95	-0.161	-2.14 ; 1.79
UMB	6.053	2.68 ; 10.28	0.059	-2.40 ; 3.01	9.681	6.62 ; 13.05	-0.044	-1.84 ; 3.12
MAR	5.336	2.77 ; 9.66	0.150	-2.16 ; 2.37	7.788	4.57 ; 12.53	0.159	-1.99 ; 2.53
LAZ	7.795	4.97 ; 11.96	0.178	-2.26 ; 1.68	13.145	8.08 ; 19.15	-0.345	-2.59 ; 2.28
ABR	8.269	3.79 ; 11.46	-0.015	-2.37 ; 2.14	11.590	8.75 ; 15.46	0.111	-3.12 ; 3.25
MOL	9.214	6.32 ; 15.66	0.251	-1.79 ; 5.29	14.343	9.53 ; 17.61	-0.141	-3.42 ; 2.82
CAM	14.071	9.49 ; 20.12	0.142	-1.75 ; 3.89	23.704	14.50 ; 31.09	-0.375	-3.49 ; 3.44
PUG	12.764	8.81 ; 19.14	0.303	-2.04 ; 3.64	20.754	15.48 ; 26.65	-0.004	-4.45 ; 4.56
BAS	11.773	6.22 ; 15.56	-0.091	-1.93 ; 3.36	16.825	13.09 ; 21.03	-0.186	-3.23 ; 3.31
CAL	14.401	9.28 ; 22.47	0.462	-1.75 ; 5.96	20.581	13.38 ; 29.52	0.287	-4.25 ; 7.87
SIC	16.362	10.61 ; 21.04	0.098	-2.13 ; 4.44	24.882	16.36 ; 34.21	-0.466	-4.27 ; 3.51
SAR	11.995	7.13 ; 18.38	0.273	-1.68 ; 2.70	18.261	14.13 ; 22.54	-0.173	-3.52 ; 2.06

Table 2 - Regression equation (1) or (2) on aggregate data)

	a-coeff (t-stat)	*b*-coeff (t-stat)	R2 [LM]
PIE	0.072 (0.44)	−0.239 *** (−3.91)	0.459 [0.174]
VAA	0.150 (0.84)	−0.059 (−0.8639)	0.039 [0.036]
LIG	−0.130 (−0.71)	−0.262 *** (−3.36)	0.384 [0.021]
LOM	0.273 ** (2.66)	−0.220 *** (−4.98)	0.580 [0.037]
TAA	0.148 (1.28)	−0.141 ** (−2.44)	0.248 [1.292]
VEN	0.145 (1.187)	−0.198 *** (−3.87)	0.454 [0.054]
FVG	0.0566 (0.4193)	−0.172 *** (−3.71)	0.434 [1.606]
EMR	0.320 ** (2.281)	−0.222 *** (−4.21)	0.496 [0.013]
TOS	0.255 * (=1.81)	−0.281 *** (−3.70)	0.432 [0.174]
UMB	−0.006 (−0.05)	−0.345 *** (−7.090)	0.736 [2.402]
MAR	0.347* * (1.99)	−0.295 *** (−4.20)	0.495 [3.931]**
MAR , AR(1)	0.4142 ** (2,236)	−0.323*** (−4,186)	0.523 [2.815]
LAZ	0.219 * (1.74)	−0.391 *** (−6.58)	0.707 [4.228462]
ABR	0.146 (0.71)	−0.238 *** (−2.88)	0.315 [0.029]
MOL	−0.029 (−0.11)	−0.305 *** (−3.20)	0.362 [0.045]
CAM	−0.036 (−0.12)	−0.369 ** (−2.73)	0.293 [2.735]
PUG	0.292 (0.85)	−0.403 ** (−2.461)	0.252 [6.138]**
PUG, AR(1)	0.092 (0,3064)	−0.448 ** (−3,227)	0.525 [LM=1.071]
BAS	−0.013 (−0.06)	−0.1800 ** (−2.39)	0.240 [0.074]
CAL	0.424 (0.89)	−0.342 (−1.55)	0.117 [1.425]
SIC	−0.075 (−0.23)	−0.419 ** (−2.57)	0.268 [0.486]
SAR	0.180 (0.70)	−0.251 * (−1.84)	0.158 [0.069]

Note: *t*-statistics in parenthesis; */**/*** denote significance at the 10%, 5%, 1% level, respectively. In squared brackets the LM test for first-order autocorrelation; **denotes *p*-value under 5%.

Table 3.a – Estimantes of Okun' coefficient for males and females in the Italian regions

	Male		Female	
	Specif	*b* coefficient (t-stat)	*Specif*	*b* coefficient (t-stat)
PIE		−0.206 *** (-3.53)		−0.286 *** (-3.34)
VAA		0.005 (0.05755)		−0.144 (-1.69)
LIG		−0.219 * (-1.95)		−0.317 ** (−2.40)
LOM		−0.220 *** (−5.34)		−0.220 *** (−3.67)
TAA		−0.110 * (−1.998)		−0.191 ** (−2.35)
VEN		−0.188 *** (−4.341)		−0.217 ** (-2.65)
FVG	#	−0.173 *** (-3.27)		−0.176 ** (−2.65)
EMR		−0.197 *** (-3.92)		−0.253 *** (-3.45)
TOS		−0.232 *** (−3.32)		−0.354 *** (-3.19)
UMB		−0.321 *** (-4.23)		−0.381 *** (-5.53)
MAR	#	−0.334 *** (-3.65)		−0.308 ** (-2.85)
LAZ		−0.314*** (-3.77)		−0.506 *** (−8.65)
ABR		−0.227 ** (−2.38)	#	−0.225 (-1.44)
MOL		−0.390 *** (−4.24)		−0.181 (−1.25)
CAM		−0.405 *** (-3.43)		−0.299 (−1.50)
PUG		−0.423 *** (−3.03)	#	−0.502 ** (-2.37)
BAS		−0.158 (−1.54)		−0.209 (-1.67)
CAL		−0.3776 ** (-2.17)		−0.277 (-0.80)
SIC		−0.439 *** (-2.95)		−0.422 * (-2.05)
SAR		−0.293 * (-1.86)		−0.206 (-1.21)

Note: # in *Specif* column denotes a specification including the lagged dependent variable; such a specification is considered in the cases in which LM test on the static specification provides *p*-value lower than 5%.

Table 3.b – Okun's coefficient distribution across Italian regions

		Women	
		Negative *	Not-significant
Men	Negative *	*PIE, LOM, TAA, VEN, FVG, LIG, EMR, TOS, UMB* (^), *MAR, LAZ* *PUG* (§), *SIC* (§)	*ABR* (§), *MOL* (§ ^), *CAM* (§), *CAL* (§), *SAR* (§)
	Not-significant		*VDA* (^), *BAS* (§ ^)

Note: significance is considered at the 10% level. As in Table 1, § denotes Southern regions, and ^ denotes small regions (less than 1,000,000 residents).