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BEYOND NATIONAL INSTITUTIONS: LABOR TAXES AND REGIONAL UNEMPLOYMENT IN ITALY

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Abstract

By focusing on the Italian experience, we ask whether the relationship between labor taxes and unemployment varies across regions. In spite of similar national labor market institutions, we show that this relationship is significantly stronger in the highly industrialized North than in the under-developed South, where unemployment is much higher. An important source of variation in the regional responsiveness of unemployment originates from the fact that regional gross wages in the North increase more than in the South in response to a hike in labor taxes. Regional wage setting affects regional employment (and unemployment) both directly and indirectly, via its impact on regional profits and the capital stock.

Keywords: Regional unemployment, labor taxes

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1 Introduction

A popular explanation of the observed differences in the behavior of the rate of unemployment across European countries focuses on the interaction of negative shocks with national institutions (Blanchard and Wolfers (2000)). These institutions include employment protection measures, the unemployment benefits system and the degree of centralization of the wage bargain. In a recent example of this approach, Daveri and Tabellini (2000) show that the impact of labor taxes on the rate of unemployment depends on the national institutions regulating wage bargaining. In particular, they argue that the impact of higher taxes is lower in countries where bargaining is either decentralized (Anglo-Saxon countries) or very centralized (Scandinavian countries). Most continental European countries have wage setting institutions that lie between these two extremes: in these countries the negative impact of an increase of labor taxes on unemployment is highest.

In this literature, the empirical evidence is based on comparisons of aggregate data across countries. Moreover, labor market institutions have a national dimension. A key feature of unemployment in some continental European countries in the 1980s and 1990s (most notably Italy and Spain, but also Germany), however, has been the high dispersion of regional unemployment rates (see Bentolila and Jimeno (1998) for Spain and Brunello, Lupi and Ordine (2001) for Italy). To explain this dispersion the "institutions by shocks" approach needs either to emphasize regional shocks within the same country, or to rely on the presence of asymmetric regional responses to aggregate shocks interacting with national institutions, or finally to acknowledge the importance of regional institutions.

By regional institutions we mean labor market institutions that are either region - specific or that are not equally important across regions. In this paper we study two such institutions, the wage drift and the hidden economy, and show how their uneven distribution within a country can affect the relationship between changes in regional labor taxes, a typical labor demand shock (see Blanchard (1998)), and regional unemployment[1]. Our empirical study focuses on the Italian experience. We believe that Italy, with its high regional unemployment dispersion and rising labor taxes, provides an interesting case study for the problem at hand.

In spite of similar national labor market institutions, we show that the relationship between unemployment and labor taxes in Italy varies significantly across groups of regions and is stronger in the highly industrialized North than in the under-developed South. This result has the somewhat unpleasant

[1]Regional shocks are discussed in detail in Brunello et al. (2001).

implication that labor tax cuts have, ceteris paribus, a proportionally higher impact where unemployment is perceived to be less of a problem.

A key source of variation in the regional responsiveness of unemployment to changes in labor taxes is that regional gross wages in the North increase more than in the South in response to a hike in labor taxes. We explain the higher sensitivity of gross wages in the North both with composition effects (between industrial sectors) and with regional differences in the relative importance of the wage drift and of the hidden economy (within industrial sectors), two relevant regional labor market institutions.

Regional differences in wage setting affect regional employment (and unemployment) both directly and indirectly. By means of a simple exercise, we show that the estimated regional differences in the elasticity of private employment (and unemployment) to changes in labor taxes can be fully accounted for only if the regional capital stock also adjusts in response to these changes. The economic mechanism at work has been illustrated by Alesina et al. (1999b): an increase in labor taxes that raises wages and labor costs reduces profits and private investment, thus affecting capital accumulation. Since capital and labor are complements in production, employment is negatively affected not only directly by the increase in labor costs but also indirectly because capital accumulation declines[2].

The paper is organized as follows. In the next section we present the available evidence on the relationship between regional unemployment and regional labor taxes. In section 3 we ask how can the uncovered differences be explained. Section 4 considers in detail the role of regional wage setting institutions. The last section presents a simple accounting exercise. Conclusions and implications follow.

2 Labor Taxes and Unemployment

2.1 The Data

The record on unemployment has differed markedly among Italian regions since the early 1970s. We plot in Figure 1 the average annual unemployment rate in the Northern (N from now on) regions and in the less developed South (S from now on) from 1965 to 1995[3]. The data clearly show that regional

[2]The negative effect of higher labor taxes on private investment requires that the negative income effect (lower profits) prevail on the positive substitution effect (labor becomes more expensive than capital).

[3]The North includes: Piemonte, Lombardia, Veneto, Trentino, Friuli, Liguria and Emilia. The South includes: Abruzzo, Molise, Campania, Puglia, Basilicata, Calabria,

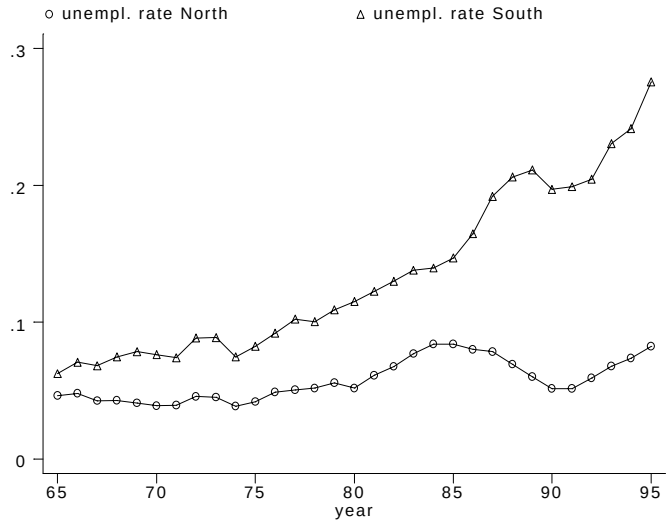

Figure 1: Unemployment rates by area.

unemployment differentials have widened, especially since the mid 1980s (see Brunello, Lupi and Ordine (2001) for a detailed discussion).

During the same period, the evolution of the average labor tax wedge, measured as the ratio between estimated labor tax payments and the average gross wage, has also differed across regions (see Figure 2). In particular, the payroll tax wedge after 1968 increased in the N regions and declined in the South: by the early 1980s, the gap between the two wedges was close to 9 percentage points, at less than 0.25 in the South and at close to 0.34 in the N regions.

During the 1980s and the early 1990s, the payroll tax wedge increased more or less at the same pace in both areas, and the gap remained close to 8 percentage points. As a result of these developments, the payroll tax wedge increased from 0.323 to 0.381 in the N areas and declined during the same period from 0.325 to 0.301 in the South. A broadly similar pattern emerges when we consider the total tax wedge (Figure 3), that includes both social security contributions paid by employees and labor income taxes. In this case, the gap between the two macro regions in 1995 was higher than 7 percentage points.

The main reason for the significant gap in the regional labor tax wedge is the introduction of tax breaks targeted especially (albeit not exclusively) at the Southern regions in the late 1960s, when net wages in these regions started

Sicilia and Sardegna.

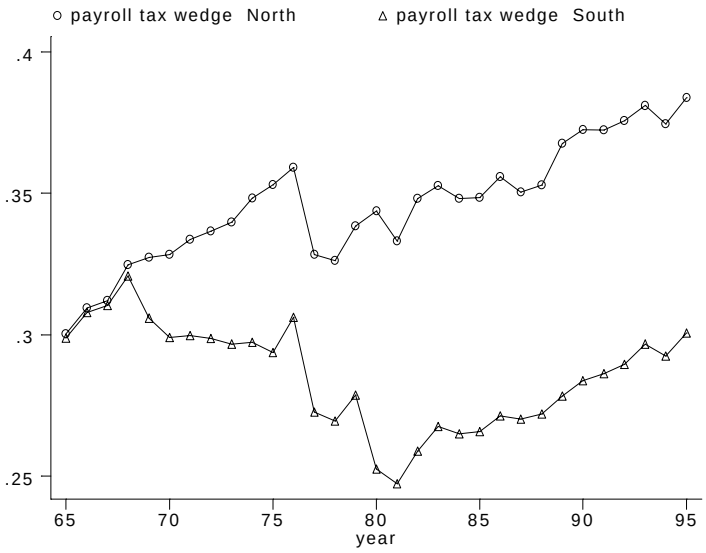

Figure 2: Payroll labor tax rates by area.

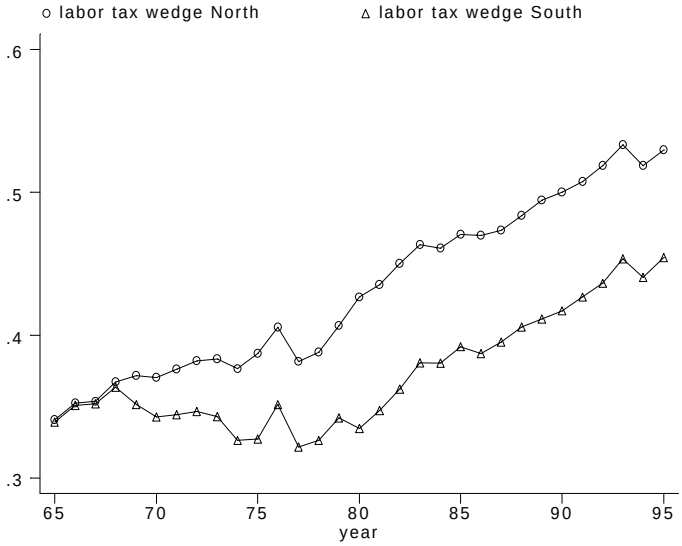

Figure 3: Labor tax wedge by area.

to increase after the abolition of regional differences in wage contracts (See Faini (1993) and Malfatti (1994) for a detailed discussion of these measures).

The figures suggest that in the past thirty years the rate of unemployment and the labor tax wedge in Italy have exhibited significant variation both over time and across groups of regions. We exploit this variation to investigate whether there are significant differences in the relationship between unemployment and labor taxes in the two areas of the country.

2.2 The Empirical Evidence

Following the approach popularized by Layard *et al.* (1991), we characterize the long run evolution of regional labor markets with a pair of equations, a regional (pseudo) labor demand and a regional wage setting equation. Private firms operating in regional markets set employment by taking factor prices as given and by minimizing production costs. Using small letters for logs, employment in the private sector is defined by

$$e_{it} = e\left(r_{it}, p_{mit}, (w-p)_{it}, y_{it}\right) \tag{1}$$

where i is for the region and t for time, e is employment, p is prices, w is gross wages, r is the real rate of interest (in levels), p_m is the real price of energy and y is real value added.

In unionized labor markets, wages are set by bargaining between unions and employers. Unions care about wage gains over the alternative wage and firms care about profits. Bargaining in the private sector can occur both at the sectorial and at the local level. A typical outcome of the bargain is that gross wages increase with the alternative value of time (b) and with labor productivity ($y-e$) and decrease with the rate of unemployment (U) (see Booth (1995)). A higher labor tax wedge increases gross wages if there is real wage resistance and unions are able to shift part or all of the tax burden away from net wages (see Pissarides (1998) for a discussion).

In implicit form, regional gross wages in the private sector are given by

$$(w-p)_{it} = w\left(b_{it}, U_{it}, \tau_{Lit}, (y-e)_{it}\right) \tag{2}$$

where τ_{Li} is the (log) regional labor tax wedge in the private sector, inclusive of payroll and labor income taxes.

Assuming that $U_{it} = 1 - e_{it}$, where the regional labor force has been normalized to unity, regional equilibrium unemployment is obtained by using (2) into (1), which yields in implicit form[4]

[4]We follow Layard et al (1991) in imposing the restriction that, in the long run, equilibrium unemployment is not affected by real output per head.

$$U_{it} = u(\tau_{Lit}, p_{mit}, r_{it}, b_{it}) \tag{3}$$

In this literature, the alternative value of time b has been defined as the expected income from alternative options in the event that the bargain fails to reach a settlement (see Layard, Nickell and Jackman (1991)). If these options are either unemployment or public employment, expected income is equal to the weighted average of income from unemployment and from public employment, where the weights are the probabilities of unemployment and employment in the public sector.

An alternative option is to measure b with real per capita income from social wealth, ζ (Fitoussi el at (2000)). The underlying idea is that the higher this income, the lower the incentive to work in the private sector and the higher the wage that needs to be paid to attract workers from the unemployment pool and the public sector to private employment. Fitoussi et al. define ζ as real income from social assistance and social insurance, inclusive of unemployment benefits. We also add the net real wage bill in the public sector and compute ζ as the ratio of total (regional) real income from social wealth to (regional) active population.

Notice that our measure is similar to the expected income from alternative options outside the private sector. We mainly add to it per capita real pension income. This income provides opportunities for inter-household redistribution from the retired old to the unemployed young and contributes to increasing the reservation wage attached to jobs in the private sector[5].

We measure the labor tax wedge in the private sector τ_{Lit} as social security contributions paid by employers and employees plus estimated income taxes paid by employees as a percentage of the gross wage. Details on the construction of the regional labor tax wedge are provided in the Appendix at the end of the paper. Our empirical evidence is organized into two subsections: the first subsection is devoted to region by region estimates, the second subsection looks at pooled regional data and considers panel cointegration tests.

2.2.1 Evidence based on region by region estimates

In this section we estimate a dynamic version of (3) region by region. Using a standard notation we define

$$\alpha(L)u_{it} = c + \mathbf{x}_{it}\boldsymbol{\beta}(L) + \nu_{it} \tag{4}$$

[5] Bentolila and Ichino (1998) discuss intra-household transfers in the context of Southern European unemployment.

where $\mathbf{x}_{it} = (\tau_{Lit}, p_{mit}, \zeta_{it}, r_{it})$ and ν_{it} are residuals. In order to gain efficiency, the model is reparametrized and estimated as a (generalized) ECM (error correction mechanism). Since most of the variables in (4) are likely to be non-stationary, we test for cointegration using a version of the Banerjee, Dolado, and Mestre (BDM) test, and compute exogeneity tests for the contemporaneous right hand side regressors. The exogeneity tests are based on the following procedure: the residuals of (pseudo) marginal models, specified in the form of VARs, are introduced in the conditional models, and the (joint) significance of the parameter(s) of the residuals is tested. Exogeneity is rejected when the parameters are significantly different from zero.

Our results are summarized in Table 1. The findings are broadly consistent with our previous work (see Brunello *et al.*, (2001)) and indicate that, on average, the impact of the tax wedge in the N regions is more than double the average impact in the S regions. Using labor force weights, the average long run elasticity of unemployment to labor taxes is 3.897 (0.627) in the North and 1.142 (0.077) in the South[6]. The difference in the elasticities turns out to be significantly different from zero.

It is useful to compare these estimates to those obtained by Daveri and Tabellini (2000), Table 9, page 75, who find that in continental Europe the coefficient of labor taxes in the unemployment equation ranges between 0.29 and 0.54. Using the average values of unemployment and labor taxes by area, our elasticities imply that the estimated coefficient is 0.53 in the Northern regions and 0.39 in the South, within the range found by Daveri and Tabellini[7].

Compared to the findings in the literature (Nickell and Van Ours (2000)), these elasticities are quite large. They suggest that a 10% reduction in the labor tax wedge, given real income from social wealth, would reduce Northern equilibrium unemployment by 38.9% and Southern equilibrium unemployment by 11.4%[8]. If we allow real income from social wealth to adjust with the change in labor taxes, the labor tax wedge elasticities of unemployment

[6] Weighted standard errors within parentheses.

[7] In the North we have that $\frac{\partial U}{\partial \Upsilon} = 3.897\frac{0.058}{0.429} = 0.5\dot{3}$, where Υ is the level of the labor tax wedge. In the South we obtain $\frac{\partial U}{\partial \Upsilon} = 1.142\frac{0.129}{0.375} = 0.39$.

[8] By equilibrium unemployment we mean the unemployment rate that would prevail in a steady state, when all short term variations, including changes in the rate of inflation, are set to zero.

decline in both areas but more significantly in the South[9].

We also find that per capita real income from social wealth ζ has a negative influence in the North and a positive influence in the South. As argued in Brunello et al. (2001), the main effect of a higher ζ in the South has been both to reduce the incentive to migrate of the young unemployed and to increase their reservation wages, thus encouraging wait unemployment and queueing for public sector jobs. This negative effect has prevailed over the positive effect on unemployment induced by higher public employment[10]. In the North, instead, the prevailing factor behind the increase in ζ has been employment substitution of the retiring old with young labor market entrants, especially in the manufacturing industry during the second part of the 1980s. Compared to the South, labor force outflows due to retirement in the North have been accompanied by employment inflows rather than by wait unemployment. Therefore, the positive effects on unemployment via higher public sector employment have dominated the negative effects via the higher reservation wage in the private sector.

The price wedge p_m appears to have been more important in the North, and has had a significant impact in the South only for Sardegna[11]. Finally, and only for some regions, we find evidence of a negative association between the real rate of interest and regional unemployment. We speculate that a higher real interest rate increases the cost of capital and reduces profits and investment, with negative effects on unemployment.

Turning to the evidence in favor of cointegration among the variables in (3), results are more clear-cut for northern regions, where we find always cointegration. In southern regions results are mixed. There are two regions (Campania and Puglia) for which we could not find any long run relationship among the selected variables; in other two instances (Molise and Basilicata) we have found a significant long run relationship, but the p-values of the cointegration tests resulted close to 25%[12].

[9] When social wealth is allowed to vary with the labor tax wedge, we obtain

$$\frac{d \ln U}{d\tau} = \frac{\partial \ln U}{\partial \tau} + \frac{\partial \ln U}{\partial \zeta}\frac{\partial \zeta}{\partial \tau}$$

We estimate $\frac{\partial \ln U}{\partial \zeta} = -1.038$, $\frac{\partial \zeta}{\partial \tau} = 0.235$ in the North and $\frac{\partial \ln U}{\partial \zeta} = 0.395$, $\frac{\partial \zeta}{\partial \tau} = -0.830$ in the South. Details on the estimates are available from the authors upon request.

[10] Recall that our definition of ζ includes also public employment.

[11] This asymmetry can help explain the asymmetric behavior of regional unemployment from the 1980s onwards, when the real price of energy dramatically declined from the peak reached during the Iranian revolution.

[12] Exogeneity tests cannot reject the null in all the regions.

Table 1: Static long-run parameters in regional regressions

Region	τ	p_m	ζ	r	UR	Ex
			Northern Regions			
Piemonte	3.621	0.160	-0.710		-4.179*	
(SE)	(1.048)	(0.053)	(0.417)			
Lombardia	5.895	0.215	-1.712	-0.040	-4.895*	0.721
(SE)	(1.677)	(0.043)	(0.594)	(0.020)		
Trentino A.A.	3.724	0.297	-1.486		-4.280*	0.300
(SE)	(1.336)	(0.073)	(0.623)			
Veneto	2.181	0.220	-0.682		-6.286**	0.546
(SE)	(0.457)	(0.023)	(0.208)			
Friuli V.G.	3.878	0.216	-0.992		-7.275**	0.187
(SE)	(0.405)	(0.021)	(0.177)			
Liguria	1.942	-0.040	-0.023	-0.032	-4.948*	0.925
(SE)	(0.872)	(0.027)	(0.304)	(0.017)		
Emilia R.	2.529	0.151	-0.661	-0.024	-6.540**	
(SE)	(0.503)	(0.018)	(0.177)	(0.007)		
			Southern Regions			
Abruzzo	0.626		0.394	0.011	-4.268*	
(SE)	(0.302)		(0.071)	(0.006)		
Molise	2.161		1.095		-2.248	0.502
(SE)	(0.949)		(0.204)			
Campania		-0.088			-0.685	0.334
(SE)		(0.935)				
Puglia						0.539
(SE)						
Basilicata	1.879		0.681		-2.632	
(SE)	(0.682)		(0.154)			
Calabria	1.779		0.836		-4.325*	0.790
(SE)	(0.297)		(0.081)			
Sicilia	2.756		0.811		-4.431*	0.398
(SE)	(0.210)		(0.073)			
Sardegna	2.290	0.195	0.693		-3.682	0.996
(SE)	(0.564)	(0.058)	(0.200)			

The parameters reported in this table correspond to the parameters of the long run solutions of (4). "UR" is the BDM test for cointegration: one asterisk and two asterisks indicate 5% and 1% level of significance, respectively. "EX" is the p-value of the test of exogeneity of the contemporaneous regressors. The test is not computed when only lagged variables enter (4). SE is the standard error.

Table 2: Nonlinear least squares. Fixed effects. Sample period: 1965-1995. Dependent variable: $\Delta\ u_{it}$

	North	South
$u_{i,t-1}$	0.352 (0.00)	-0.209 (0.00)
$\tau_{Li,t-1}$	3.945 (0.00)	2.654 (0.00)
$\zeta_{i,t-1}$	-0.997 (0.00)	0.659 (0.00)
$p_{m,t-1}$	0.187 (0.00)	0
$r_{i,t-1}$	-0.043 (0.00)	-0.042 (0.02)
Wald Test	(0.022)	
Nobs	217	248
R^2	0.37	0.24

Note: P-values within parentheses. Each regression includes regional dummies, the current and the lagged change in inflation and dynamic terms of the right hand side variables.

2.2.2 Evidence from pooled data

A potential problem with the empirical estimates in the previous sub - section is that sample sizes are small. In this section we exploit both the time series and the cross section variation in the data by pooling regions into two groups, the N and S group, and by estimating two separate equations, one for each group, by nonlinear least squares, using regional dummies as fixed effects. The specification is based on the error correction mechanism, and we try to model the short-term dynamics by including in each regression the current and the lagged changes in the rate of inflation, as suggested by Layard *et al.* (1991). The results are in Table 2.

The table confirms that the long run elasticity of unemployment to labor taxes is significantly higher in the North than in the South (3.945 versus 2.654). Moreover, a Wald test rejects at the 5% level of confidence the null hypothesis that the difference between these elasticities be equal to zero.

We test cointegration in panel data after pooling the available time series and cross section information separately for the North and the South. Our tests are based on the technique developed by Pedroni (1999). Pedroni's tests apply to panel data and consist of computing residuals-based statistics to test the null hypothesis of no cointegration against the alternative of cointegrating (and heterogeneous) vectors. The cointegration tests are originally seven, but

Table 3: Panel cointegration tests

Northern Regions		
	no trend	heterogeneous trend
panel v-stat	1.976	0.295
panel ADF	-1.818	-2.388
group ADF	-1.742	-2.557
# regressors		4
Nobs		217
Southern Regions		
panel v-stat	2.014	2.439
panel ADF	-3.053	-3.727
group ADF	-3.181	-3.888
# regressors		4
Nobs		248
Note: All statistics are one-tailed tests. Critical value at 5% level is 1.645 for panel v-stat and -1.645 for the remaining tests.		

we rely on those with higher power in the specific context of our panel[13]. In particular, we use the panel variance, the panel ADF and the group ADF statistics, after allowing two lags in the dynamic specification. While the former two statistics pool across regions the autoregressive coefficients of the residuals, the latter test allows the autoregressive coefficient to vary across regions under the cointegration hypothesis, thereby adding an additional source of heterogeneity in the panel. Table 3 reports our results. When we do not include a trend among the regressors, all the tests reject the null of no cointegration at 5% level. If an heterogeneous trend is included, panel and group ADF still reject lack of cointegration.

To summarize, the key finding in this section is that the long run elasticity of unemployment to changes in the labor tax wedge is significantly higher in the Northern regions than in the under-developed South. A natural policy implication is that a uniform reduction in the labor tax wedge across the country would reduce equilibrium unemployment in the North proportionally more than in the South, where equilibrium unemployment is presumably much higher. Another implication is that uniform changes in the labor tax wedge affect the regional distribution of equilibrium unemployment.

[13]Pedroni (1997) simulates the level of significance and power of the tests under several scenarios. Given the fact that we have 31 years and 7 or 8 regions, we rely on the tests which performed better in Pedroni's simulations with 20 years and 20 panel observations.

3 Explaining Uncovered Differences

How do we explain the uncovered difference in the regional responsiveness of equilibrium unemployment to changes in labor taxes? The approach followed by Blanchard and Wolfers and Daveri and Tabellini and based on the interaction between national institutions and shocks would answer this question by arguing that

> "...the unemployment effect of labor taxes depends crucially on the wage setting institutions." (Daveri and Tabellini, 2000, p.52).

Wage setting institutions such as the degree of corporatism, however, are mainly national arrangements. Aside from asymmetric responses to the combination of national or regional shocks with national institutions, wage setting can contribute to explain the uncovered within-country differences only if it exhibits significant regional variation.

Before exploring the potential sources of regional variation in wage setting, however, it is useful to go back to the standard definition of the regional rate of unemployment

$$U_{it} = 1 - N_{it} - Na_{it} - Ng_{it} \tag{5}$$

where N is the private employment/labor force ratio, Na is the self - employment/labor force ratio and Ng is the public sector employment/labor force ratio.

Total differentiation of (5) with respect to the labor tax wedge τ yields

$$\eta_{ui} = -\frac{N_i}{U_i}\eta_{ni} - \frac{Na_i}{U_i}\eta_{na,i} \tag{6}$$

where η is the elasticity with respect to changes in τ_L. Since regional public employment is a policy variable, we do not expect it to be significantly affected by the tax wedge. If any causal relationship between these two variables exist, it is likely to run from public employment to the labor tax wedge. In the presence of substantial redistribution by means of public employment, this relationship can be rather loose at the regional level (see Alesina et al. (1999)).

Expression (6) conveys two simple points. First, even when the employment and self-employment elasticities do not vary across regions, the unemployment elasticity can vary because of differences in the regional distribution of the labor force. Table 4 highlights the important differences in the average distribution of the labor force in the North and South. The Northern

Table 4: Relative Weights by area. Averages 1965-95.

	$\frac{N}{U}$	$\frac{Na}{U}$	$\frac{Ng}{U}$
North	10.06	5.61	2.70
South	3.81	3.39	1.37

regions have significantly lower unemployment rates, and consequently their employment - unemployment ratios are remarkably higher than in the South.

Second, an exclusive focus on the relationship between private sector wages and labor taxes risks to overlook the importance of changes in self-employment when taxes change. These changes have the potential of undoing the impact of regional differences in wage setting, that affect η_{ni}, on the regional unemployment rate.

If we had an estimate of $\eta_{na,i}$, we could use (6) to derive the private employment/labor force elasticity consistent with the estimated unemployment elasticity η_{ui}. To estimate $\eta_{na,i}$, we pool all regions and estimate an ECM model that associates in the long run the regional (log) self - employment / labor force ratio to the labor tax wedge (in logs) and (log) real regional value added per head, $y - e$. We include interactions between the right hand side variables and the dummy S (South=1) and use feasible generalized least squares (FGLS) to deal with the potential presence both of contemporaneous correlation and of region - specific first order serial correlation in the error terms.

After sequential simplification based on dropping the variables with an insignificant coefficient (P-value < 0.10), we obtain the results in Table 5. Owing to the secular decline of agriculture, the share of self-employed individuals declines in both groups of regions when real value added per head increases. The long run elasticity of the self - employment to labor force ratio with respect to changes in labor taxes is 0.288 (p-value: 0.00) in the North and not significantly different from zero (p-value: 0.90) in the South. We expect that an increase in the labor tax wedge in the private sector leads to a substitution of employment mainly with self - employment in the North and with informal employment in the South.

Using our results in Table 1 on the long run unemployment elasticity by area and the weights in Table 2, we can compute the value of η_n in each group of regions that is consistent with (6). It turns out that $\eta_n = -0.547$ in the North and to -0.300 in the South[14]. Hence, our finding that the elasticity of unemployment to labor taxes is higher in the North is consistent with an absolute value of the elasticity of private sector employment to labor taxes

[14]This corresponds to $\frac{\partial N}{\partial \Upsilon} = -0.689$ in the North and to $\frac{\partial N}{\partial \Upsilon} = -0.318$ in the South.

Table 5: Fixed Effects Estimates of the Self-employment/Labor Force Ratio. Method: FGLS. Sample period: 1965-1995. Dependent variable: Δn_{ait}

	Coefficient	P-value
$n_{ai,t-1}$	-0.352	0.02
$S * n_{ai,t-1}$	0.074	0.07
$(y-e)_{i,t-1}$	-0.161	0.00
$S * (y-e)_{i,t-1}$	0.094	0.00
$\tau_{Li,t-1}$	0.102	0.00
$S * \tau_{Li,t-1}$	-0.107	0.04
$Trend$	-0.002	0.03
Nobs	465	
Note: The regression includes regional dummies; *Trend* is a linear trend.		

that is about twice as high in the North as in the South.

It is useful to define the log share of regional private employment in the labor force n_{it} as $n_{it} = n[w_{it,}\ x_{it}]$, where x is a vector of variables that affect labor demand. Since

$$\eta_{ni} = \left[\frac{\partial n_i}{\partial w_i} + \frac{\partial n_i}{\partial x_i}\frac{\partial x_i}{\partial w_i}\right]\frac{\partial w_i}{\partial \tau_i} \tag{7}$$

the uncovered higher elasticity of private employment (as a share of the labor force) to changes in the labor tax wedge in the North can be due to regional differences in

- the gross wage elasticity of private employment $\frac{\partial n_i}{\partial w_i}$;
- the elasticity of gross wages to labor taxes $\frac{\partial w_i}{\partial \tau_i}$;
- the impact of the labor tax wedge on employment via its effects on x, $\frac{\partial n_i}{\partial x_i}\frac{\partial x_i}{\partial w_i}\frac{\partial w_i}{\partial \tau_i}$.

We consider these differences in the next two sections of the paper.

4 The Role of Regional Wage Setting Institutions

Wage setting in Italy is characterized by three levels of bargaining. General issues, including income policy, pension benefits and rules of the game are

bargained at the national level and involve the government, the representatives of the employer national association and the leaders of the three major national union federations. Collective bargaining takes place at the sectorial level and involves the sectorial union and employer federations, with some degree of government arbitration. At this stage the bargain is about sectorial wage floors, that have wide coverage in the industry. The final stage is local bargaining, that involves a single firm and is about local wage premia over the sectorial floor[15].

While the former two levels are shared by all Italian regions, regional differences can occur in the final stage because the relative importance of wage drift, defined as the wage increase negotiated at the local level above the industrial tariff wage, varies significantly across regions[16]. There are at least two pieces of evidence in support of this variation. First, the percentage of employees in the industrial sector involved in local wage settlements during the years 1995-6 was higher than 40% in the North and close to 15% in the South (Rossi and Sestito (2000)). Second, Corneo and Lucifora (1997) use data from 3000 Italian establishments to estimate a probit model of the probability that local bargaining takes place. They find that this probability is significantly lower in the Southern regions. Overall, this evidence suggests that local bargaining is more widespread in the Northern regions than in the rest of the country.

Another labor market institution that can generate regional variation in the sensitivity of gross wages to labor taxes is the relative importance of the informal labor market. As discussed below, the available empirical evidence shows that informal labor arrangements are significantly more widespread in the South.

In the rest of the section, we discuss the implications on regional wage setting of having wage drift (sub - section 4.1) and an informal sector (sub - section 4.2). Next, we present empirical evidence on the relationship between regional gross wages and labor taxes (sub - section 4.3).

4.1 Regional Wage Drift

We start by presenting a simple model of the wage drift. Consider a firm and a local union that bargain over the local wage by taking the tariff wage, determined at the central or industrial level, as given. We introduce the following notation

$W_{kij} = \left[W^d_{kij} - T\left(W^d_{kij}\right)\right]/Q_i$ = the real take home pay in firm k, sector

[15] One should also add pay increases decided unilaterally by the employer (merit pay).

[16] See Ordine (1996)) for a detailed discussion of wage drift in Italy.

j and region i;

W^d_{kij} = the real wage bargained at the local level in firm k, sector j and region i;

W^c_j = the tariff wage in sector j;

$T(.)$ = the income tax function;

Q_{ij} = the consumption price index in region i;

t_{eij} = the payroll tax rate in sector j and region i;

τ_{ij} = the overall labor tax wedge in sector j and region i.

The firm k produces with the following constant returns to scale Cobb Douglas technology

$$Y_{kij} = L^{\rho}_{kij} K^{1-\rho}_{kij} \tag{8}$$

where Y is real value added, L is labor and K is capital. By operating in a monopolistic environment *à la* Dixit and Stiglitz, the firm sells output along the following demand function

$$Y_{kij} = \chi \left(\frac{P_{kij}}{P_{ij}} \right)^{-\theta} \tag{9}$$

where P_{kij} is the price of firm k's good in sector j and region i, while P_{ij} is the corresponding average price. Profit maximization yields the pseudo labor demand

$$L_{kij} = \left[(1 - \frac{1}{\theta})\rho \right]^{\frac{1}{1-\rho}} \left(\frac{W^d_{kij}}{P_{kij}} (1 + t_e) \right)^{\frac{1}{\rho - 1}} . \tag{10}$$

The local union bargains over the local wage with the firm, by taking (10) into account. The union cares only about the local wage and try to maximizes the distance between this wage and the tariff wage. Preferences are given by

$$U_{kij} = \left(W_{kij} - W^c_j \right) \tag{11}$$

Assume for simplicity that income taxes are linear in income ($T(W^d) = tW^d$, where t is the income tax rate). Then the overall wedge is $\frac{Q_{ij}}{P_{ij}} \tau_{ij}$, where $\tau_{ij} = \frac{(1+t_{eij})}{(1-t_{ij})}$ is the labor tax wedge. Local wage setting maximizes the following Nash function

$$\max_{W_{kij}} U^{\beta_{kij}}_{kij} \Pi_{kij} \tag{12}$$

where β_{kij} is the relative bargaining power of the union and we assume for simplicity that the fallbacks are zero.

The bargained net real wage turns out to be

$$W_{kij} = [1 + \lambda_{kij}]^{-1} W_j^c \tag{13}$$

where

$$\lambda_{kij} = -\frac{\rho(\theta - 1)}{[\theta(1 - \rho) + \rho]\beta_{kij}}.$$

In this simple setup, changes in the tax wedge affect the local wage only if they affect the tariff wage W_j^c. An additional channel of influence can be introduced by dropping the assumption that the technology is Cobb Douglas. When the production technology is CES, it can be shown that λ is a function of the gross wage elasticity of profits and employment. Compared to the simple Cobb Douglas case, both elasticities are not constant and depend on the tax wedge[17]. In the rest of the paper, we capture this more general case by assuming $\lambda_{kij} = \lambda(\tau_{ij})$.

Industrial wages in each region are obtained as weighted averages of the wages of firms belonging to the same industry. Let σ_{ij} be the proportion of firms in region i and industry j that have local bargaining. This proportion can vary with the tax wedge when the parties have an incentive to adjust the net real wage to changes in labor taxes that occur after the tariff wage has been set. In implicit form, this is equivalent to assuming $\sigma_{ij} = \sigma(\tau_{ij})$. The incentive to bargain locally is stronger when the contract length of sectorial

[17] In the case of a CES, we have

$$\lambda_{kij} = -\left(\frac{\varepsilon_{Lkij}}{\beta_{kij}} + \varepsilon_{\pi kij}\right)$$

with

$$\varepsilon_{Lkij} = -\left[\frac{1}{1-\rho} - \frac{1}{1-\rho}\left(1 - \frac{1}{\theta}\right)^{-1} \frac{L_{kij}}{Y_{kij}} W_{kij}\tau_{ij}\right]$$

and

$$\varepsilon_{\pi kij} = \frac{-\frac{L_{kij}}{Y_{kij}} W_{kij}\tau_{ij}}{1 - \frac{L_{kij}}{Y_{kij}} W_{kij}\tau_{ij}}$$

where $\frac{1}{1+\rho}$ is the elasticity of substitution, ε_L and ε_π are the gross wage elasticities of profits and employment.

contracts is significant, as it happens in Italy, where contracts are negotiated every 3 or 4 years, and the labor tax wedge can change between settlements.

With the simplifying condition that the parameters associated to local bargaining, to the technology and to product demand do not vary among the firms belonging to the same region and sector, net real wages in region i and industry j are given by

$$W_{ij} = \left\{ \frac{\sigma(\tau_{ij})}{[1 + \lambda_{ij}(\tau_{ij})]} + [1 - \sigma(\tau_{ij})] \right\} W_j^c \tag{14}$$

Therefore, in any industry and region, the sensitivity of the net real wage to changes in the labor tax wedge depends on the sensitivity of the tariff wage, a common industry effect, on the change in the proportion of firms that bargain locally and on the sensitivity of the local wage to tax changes. Since the latter two effects can vary across regions within the same industry, the presence of wage drift can introduce regional variation in the sensitivity of regional wages to regional labor taxes.

4.2 The Informal Labor Market

According to Williams and Windebank (1998), the term informal employment refers to the paid production and sale of goods and services that are unregistered by, or hidden from, the state for tax, social security and/or labour law purposes, but which are legal in all other respects. As such, informal employment is composed of three types of activity: evasion of both direct (i.e. income tax) and indirect (e.g. VAT, excise duties) taxes; social security fraud where the officially unemployed are working whilst claiming benefit; and avoidance of labor legislation, such as employers insurance contributions, minimum wage agreements or certain safety and other standards in the workplace, such as through hiring labor off-the-books or sub-contracting work to small firms.

An informal or hidden labor market operating side by side to the regular labor market is a feature shared by most developed economies. Almost by definition, the hidden labor market is difficult to measure. The Italian Statistical Office (ISTAT) measures hidden employment and earnings by combining information from the Labor Force Survey, a household survey, with information provided by firms, used to compile the national accounts (see ISTAT (1998)). As a result of this measurement effort, regional gross wages include both earnings and employment in the regular sector and an estimate of earnings and employment in the informal economy.

Importantly, the estimated share of informal employment over total employment is significantly higher in Southern Italy. According to recent esti-

mates produced by ISTAT (1998b), during the years 1985-95 this share was on average equal to 33.8% in Southern regions, almost twice as much as the share in the Northern and Central regions (17.7%).

Regional differences in the relative importance of the informal sector induce additional variation in the sensitivity of regional gross wages to changes in labor taxes. To see why, define

$$(w-p)_{eij} = a_{eij} - b_{eij}u_i + c_{eij}\tau_{Lij} \tag{15}$$

as the wage setting equation in the regular labor market of industry j and region i, a simplified version of (2), and

$$(w-p)_{sij} = a_{sij} - b_{sij}u_i \tag{16}$$

as the corresponding equation for the informal labor market. We have dropped both b and $(y-e)$ from (2) for the sake of simplicity and have assumed that the gross wage is positively affected by labor taxes only in the regular sector. This can occur either because the gross tariff wage varies with labor taxes (real wage resistance) or because of the wage drift. In the informal sector, by definition, there is no need to shift higher taxes onto higher gross wages, because labor taxes are not paid. Therefore, the parameter c is equal to zero in (16). Letting z_{ij} be the proportion of firms in the informal labor market, the average gross wage in industry j and region i is

$$(w-p)_{ij} = (1-z_{ij})(w-p)_{eij} + z_{ij}(w-p)_{sij} =$$

$$[a_{eij} - z_{ij}(a_{eij} - a_{sij})] - [b_{eij} + z_{ij}(b_{sij} - b_{eij})]\, u_i + [c_{eij}(1-z_{ij})]\, \tau_{ij} \tag{17}$$

This expression suggests that the sensitivity of the gross wage to changes in labor taxes can vary across regions even when $c_{eij} = c_e$ (no regional difference in the importance of the wage drift) if there are regional differences in the relative importance of the informal sector. Ceteris paribus, gross wages in regions where the informal sector is more important are less sensitive to changes in the labor tax wedge.

4.3 The Empirical Evidence

A key implication of having wage drift and an informal sector that are not equally distributed over the country is that the relationship between regional wages and labor taxes can vary even in the presence of national contracts that set the tariff wage in a centralized way and have wide coverage.

We study whether gross industrial real wages differ across regions in their sensitivity to changes in labor taxes by using data for 9 industries in the private sector for the period 1980-95 and by pooling regional data for each industry[18]. We use industrial data because the tariff wage W_j^c in Italy is set by collective bargaining at the industrial level. For each industry, we adopt the following strategy: 1) we start from an ECM specification and include among the regressors that characterize the long run relationship $\tau_{Lijt}, p_{mit}, \zeta_{it}, u_{it}$ and real output per head $(y-e)_{ijt}$; 2) we pool all regions and interact the regressors with the dummy S (1 for Southern regions); 3) we assume contemporaneous correlation among regional errors and estimate by FGLS; 4) we simplify sequentially by dropping one by one the regressors with an insignificant coefficient (p-value higher than 0.10).

The results of the final specification are used to compute for each industry and region the long run elasticity of the real gross wage to changes in labor taxes. These elasticities are shown in Table 6. In the last column of the table we insert an asterisk when there is a statistically significant difference in the elasticities across the two groups of regions. The average elasticity in the North and the South is computed by using the relative employment shares as weights.

The table shows a number of results: first, there are significant regional differences within sectors in the long run responsiveness of real wages to changes in labor taxes. With the exception of the textiles industry, where it is (not significantly) lower, this responsiveness is as high in the North as in the South for other manufacturing, private services and chemicals and higher in the North for the remaining sectors. Second, the average responsiveness of wages, weighted by the relative employment share, is lower in the South than in the North. Third, pure sectorial composition effects explain only part of the difference between the North and the South: if we apply to the Southern distribution of employment the elasticities found in the Northern regions, the average elasticity is 0.108, significantly above the effective value (0.015). Therefore, there is a genuine regional variation that originates within industrial sectors. Last but not least, the elasticity of gross wages to labor taxes is negative in two Southern sectors, agriculture and building, where the competition with the hidden employment sector is probably strongest.

Since most of our empirical findings in the rest of the paper are based on data covering the period 1965 to 1995, we complement these results by also estimating aggregate regional wage equations over this longer interval. In these estimates we pool all regions and interact the explanatory variables with the dummy S. Our findings confirm that the elasticity of gross wages

[18]We use a shorter period because of data availability.

Table 6: Long Run Elasticities of Real Gross Wages to Changes in Labor Taxes. FGLS Estimates. Dependent Variable: $\Delta\ (w-p)$. Sample period: 1980 to 1995.

Sector	North	South	Test
Agriculture	0	-0.258 (0.03)	*
Chemicals	0	0	
Engineering:Machinery	0.250 (0.00)	0.209 (0.00)	
Engineering: Vehicles	0.767 (0.00)	0.579 (0.00)	*
Foodstuffs	0.285 (0.00)	0	*
Textiles	0.274 (0.01)	0.468 (0.00)	
Other Manufacturing	0.626 (0.00)	0.626 (0.00)	
Building	0	-0.317 (0.06)	*
Private Services	0	0	
Average Elasticity	0.184	0.015	
Fixed Coefficients Average	-	0.108	

Note: P-values within parentheses. We use a zero whenever the estimated elasticity is not significantly different from zero at the 10% level of confidence. Real wages are deflated by the regional consumer price deflator.

to labor taxes is significantly higher in the North than in the South (0.398 versus 0.235)[19].

5 A simple accounting exercise

Equation (7) decomposes the elasticity of private employment to labor taxes into the tax wedge elasticity of gross wages and an additional component, that reflects the direct and indirect employment effects of wage changes. In order to compute the contribution of either component, we need to estimate the elasticity of the private employment to labor force ratio to changes in gross wages. For this purpose, we specify the employment relationship as follows

$$n_{it} = n\left[w_{it} - p_{it}, r_{it}, pm_{it}, (y - lf)_{it}\right] \tag{18}$$

where $n = e - lf$, lf is the log of the labor force, and we estimate (18) by pooling all regions after including the interactions of all right hand side vari-

[19] These results broadly confirm the results in Brunello et al (2001b). In that paper, we use aggregate regional data and find evidence that real wage resistance is higher in the North than in the South.

Table 7: The (log) employment / labor force function. Dependent variable: Δn_{it}. Period: 1965-1995.

	Coefficient	P-value
$\Delta(w-p)_{-1}$	0.102	0.00
$S*\Delta(w-p)_{-1}$	-0.067	0.10
$\Delta(y-lf)_{-1}$	0.228	0.00
$S*\Delta(y-lf)_{-1}$	-0.175	0.00
n_{-1}	-0.068	0.00
$(w-p)_{-1}$	-0.023	0.02
$S*r_{-1}$	-0.001	0.00
$(y-lf)_{-1}$	0.109	0.00
R^2	0.523	
$Nobs$	496	

ables with the dummy S. Once again, the estimation method is FGLS, and we allow for contemporaneous correlation and first order serial correlation in the regional errors. After sequentially simplifying the original model by dropping variables that attract a coefficient not significantly different from zero al the 10% level of confidence, we obtain the results in Table 7.

The implied long run elasticities of employment both to gross wages and to regional real output do not significantly differ across groups of regions and are equal respectively to -0.332 (P-value $= 0.014$) and 1.584 (P-value $= 0.002$). Let regional real value added in the private sector be a constant returns to scale Cobb Douglas function of private employment, self-employment and the capital stock, all measured as shares of the regional labor force. In the long run, the Cobb Douglas parameters are equal to the factor shares and we can re-write (7) as

$$\eta_{ni}(1-\alpha_i\frac{\partial n_i}{\partial y_i}) = \frac{\partial n_i}{\partial w_i}\frac{\partial w_i}{\partial \tau_i} + (1-\alpha_i-\gamma_i)\frac{\partial n_i}{\partial y_i}\frac{\partial k_i}{\partial \tau_i} + \gamma_i\frac{\partial n_i}{\partial y_i}\frac{\partial n_{ai}}{\partial \tau_i} \qquad (19)$$

where k is the log capital stock to labor force ratio and α and γ are the factor shares. Table 8 reports, for each area, the estimated values of each component of (19)[20]. In the table, the component associated to the capital stock is computed as the residual term.

It is clear from the table that the sensitivity of regional wages to changes in labor taxes accounts *directly* for only part of the tax wedge elasticity of private employment (and unemployment). Changes in the labor tax wedge

[20]The factor share of self-employment is computed by assigning to self-employed labor the average wage in the private sector.

Table 8: Estimated components of (19)

	North	South
η_{ni}	-0.547	-0.300
α_i	0.419	0.355
γ_i	0.198	0.219
$\frac{\partial n_i}{\partial y_i}$	1.584	1.584
$\frac{\partial w_i}{\partial \tau_i}$	0.398	0.235
$\frac{\partial n_{ai}}{\partial \tau_i}$	0.288	0
$\frac{\partial n_i}{\partial w_i}$	-0.332	-0.332
$\frac{\partial k_i}{\partial \tau_i}$	-0.244	-0.133
$\eta_{ni}(1-\alpha_i\frac{\partial n_i}{\partial y_i})$	-0.192	-0.135
$\frac{\partial n_i}{\partial w_i}\frac{\partial w_i}{\partial \tau_i}$	-0.132	-0.078
$(1-\alpha_i-\gamma_i)\frac{\partial n_i}{\partial y_i}\frac{\partial n_{ai}}{\partial \tau_i}$	0.088	0.000
$\gamma_i\frac{\partial n_i}{\partial y_i}\frac{\partial k_i}{\partial \tau_i}$	-0.148	-0.057

affect regional unemployment also because of the impact they have on self-employment and the capital stock in the private sector. The economic mechanism that links labor taxes to the capital stock is described by Alesina et al (1999b) and can be summarized as follows: an increase in labor taxes that is not fully shifted into lower net wages raises labor costs; higher costs reduce (marginal) profits; lower profits lead to a reduction of investment and to a lower capital stock. In the North of the country, this reduction must be strong enough to compensate for the positive effect of changes in labor taxation on the self-employment to labor force ratio.

6 Implications and Conclusions

Recent studies of the European unemployment problem have emphasized the importance of national institutions. Yet in a number of countries the key aspect of high and rising unemployment in the 1980s and 1990s has been the increased regional dispersion of unemployment rates. By looking at regional labor market data within a single country, Italy, we have been able to filter out national institutions, that by definition vary among countries, not among regions, and to focus on the role of regional institutions.

We have shown that, despite similar national labor market institutions, the relationship between unemployment and labor taxes in Italy varies significantly across groups of regions and is stronger in the highly industrialized North than in the less developed South. This result is driven by the higher

sensitivity of regional wages to changes in labor taxes in the North. We have identified two sources of institutional variation in regional labor markets that affect regional wages, the wage drift and the informal economy.

This finding has two interesting policy implications. First, it is often advocated that a higher decentralization of the wage bargain could help ameliorating the European unemployment problem. When decentralization is obtained by adding local to central bargaining (wage drift), it can lead to an increase in the sensitivity of gross real wages to changes in labor taxes. In such circumstances, a tax cut becomes more effective in reducing unemployment. Second, policies that incentivate workers and firms to prefer the regular to the hidden economy have the side effect of increasing the sensitivity of unemployment to changes in labor taxes. As in the previous case, a labor tax cut becomes more effective. Therefore, the efficacy of tax cuts to combat high unemployment can be enhanced by reducing the relative size of the hidden sector and/or by increasing the decentralization of wage bargaining institutions.

Regional wage setting affects employment (and unemployment) both directly and indirectly. Using a simple accounting exercise, we have also shown that an important role in explaining the observed regional differences in the responsiveness of private employment (and unemployment) to changes in labor taxes is played by the adjustment of the regional capital stock in the private sector following these changes.

Our results suggest that, to explain the regional dispersion in the unemployment rate, perhaps the most important feature of recent unemployment in Italy (and in other continental European countries), one needs to go beyond national institutions and look at regional institutions. We have also confirmed recent findings that labor taxes matter for unemployment, and we have added to the existing evidence the fact that in Italy they seem to matter most where unemployment is less of a problem.

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A The data

The data used in this paper are obtained from regional accounts and from labor force surveys. The sample period is 1965-1995. The main sources are:

Regional accounts data:

- ISTAT, Conti economici regionali. Anni 1980-95; SVIMEZ, I conti economici del Centro-Nord e del Mezzogiorno nel ventennio 1970-89, Il Mulino, 1993; ISTAT, Annuario di contabilità nazionale, 1986; Unioncamere, I dati regionali 1963-1974, Franco Angeli Editore, Milano, 1976; Tirloni, C. and Veronese, G., Banca dati regionali 1960-1991, Fondazione ENI Enrico Mattei; CRENOS, Base dati per le regioni italiane

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Labor force data:

- ISTAT, Statistiche del Lavoro, vol. 26, 1986; ISTAT, Occupazione e redditi da lavoro dipendente 1980-1994, 1995; ISTAT; Indagine sulle forze di lavoro.

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- Bank of Italy, Statistical Bulletin, several years

B The Estimate of the Regional Labor Tax Wedge

The regional wedge is the ratio of payroll and labor income taxes over gross wages. Payroll taxes in Italy are paid both by employers and by employees. Social security contributions paid by employers have by far the largest share of payroll taxes. For the period 1980 to 1995 they are directly available from the regional accounts. For the period before 1980, we have computed the national payroll tax rate and adjusted it on a regional basis by using the information on payroll tax rebates (*fiscalizzazione e sgravi degli oneri sociali*) provided by Malfatti (1994).

There are no readily available data on the regional distribution of social security contributions paid by employees. We have assumed that the share of these taxes on gross wages in each region be equal to the national share. Labor income taxes have also been estimated. For the period before the fiscal reform of 1974 the income tax revenue is estimated by adding up different tax items (*imposta sulla ricchezza mobile* and *imposta complementare*). For the period after the tax reform, we have used tax legislation and the information on income distribution by region provided by ISTAT, *Indagine sui consumi delle famiglie italiane*, to estimate total labor tax revenue by region.