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WAGING REGRESSION ON THE CURVE
AN ITALIAN TALE*

Abstract

In this paper we appraise the existence of an inverse relationship between wages and unemployment (the wage curve) across Italian regions, using data from the Bank of Italy's SHIW from 1977 to 2004. The main advantages of this data-set are its inclusion of information on human capital characteristics of the individuals (such as gender, age and education), and of various kinds of information about hours worked. We carry out a set of econometric estimates along the lines of Bell et al. (2002). Our main findings are that a rather significant inverse relationship between annual wages and unemployment across Italian regions exists, at least after the 1992-93 wage reforms, but that no such relationship exists for hourly wages.

Keywords

Wage Curve, Wage Drift, Panel Wage Equations.

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1. Introduction

In this paper we appraise the existence of an inverse relationship between individual wages and local unemployment across Italian regions. Such a relationship (the wage curve) has been the object of considerable interest in empirical labour economics since the seminal contributions of Blanchflower and Oswald (1990, 1994a, 1994b). By and large (see the survey in Njikamp and Poot, 2005) empirical support has been found for this relationship in many countries, Italy being somewhat an exception in this respect (Lucifora and Origo, 1999; Manacorda and Petrongolo, 2006).

The Italian wage bargaining setup has often been blamed for this state of affairs, being deemed as unable to fully allow for local labour market conditions. Until 1993 this setup consisted of two non-coordinated bargaining levels (industry- and firm-level), on the top of automatic cost-of-living adjustments. However the 1992-93 reforms, and particularly the July 1993 Wage Agreement virtually abolished the cost-of-living allowance and introduced a new bargaining set-up, centred upon two specialized contractual levels. The Wage Agreement had two explicit objectives: curbing the inflationary pressure, and making wages more responsive to local conditions. The first target has been indubitably achieved (Fabiani et al., 1998, Destefanis et al., 2005), while its effectiveness with respect to the second has been often doubted (Casadio, 2003).

Recently Devicienti et al. (2008) have provided some evidence according to which a resurrection of the previously absent wage curve took place in Italy after the wage bargaining reforms. In this paper we intend to provide new evidence on this issue, using different data and procedures. In Section 2 we provide a short survey of the literature on the Italian wage curve. Our data are described in Section 3. Unlike Devicienti et al. (2008), who rely on the INPS data-set, we use data from the Bank of Italy's SHIW from 1977 to 2004. Among the main advantages of this data-set, for the present purposes, are its inclusion of information on human capital characteristics of the individuals (such as gender, age and education), and of various kinds of information about hours worked. The econometric framework is described in Section 4: we carry out a set of econometric estimates along the lines of Bell et al. (2002). Our main results are described in Section 5. We find that a significant inverse relationship between annual wages and unemployment across Italian regions exists, at least after the 1992-93 wage reforms, but that no such relationship exists for hourly wages. Section 6 concludes.

2. The Issue

An immense empirical literature has put to test the existence of various relationships between wages and unemployment. Traditionally, empirical studies have focused on the Phillips curve, the, mainly aggregate, relationship between the *variation* of wages and the rate of unemployment. Since the seminal contributions of Blanchflower and Oswald (1990, 1994a, 1994b), however, much attention has been paid to a long-run "equilibrium" relationship between the *level* of wages and the rate of

unemployment, mainly set at a fairly disaggregated level. This relationship is widely known as the "wage curve" (Card, 1995), and typically pitches individual (or regional) wages against regional rates of unemployment.

We now provide a short survey on the wage curve literature for Italy, concentrating on the analysis of individual wage data.[1] From Table 1 it clearly appears that most works relate to data from the 1980s and find, if at all, a very weak relationship between wages and regional rates of unemployment. The Italian wage bargaining setup has often been blamed for this state of affairs, being deemed as unable to fully allow for local labour market conditions. Until 1993 this setup consisted of two non-coordinated bargaining levels (industry- and firm-level), on the top of automatic cost-of-living adjustments. According to many commentators, this system had the following consequences. First of all, there existed until 1968 the so-called "gabbie salariali", implying a wage differential between Northern and Southern Italy, which gradually disappeared with their demise. In 1994, the North-South wage differential was less than 20 percentage points with respect to its 1970 value. This did not go together with a reduction in the North-South productivity differentials, impacting upon the competitiveness of Southern firms. Simultaneously the unemployment rate gap between North and South underwent a fivefold increase, and the propensity to emigrate from the Mezzogiorno underwent a decisive reduction. Faini (1996) then concludes that the wage convergence induced by the post-1968 bargaining setup did not bring about the desired convergence in other economic aggregates.

However the 1992-93 reforms, and particularly the July 1993 Wage Agreement virtually abolished the indexation system and introduced a new bargaining setup. The nation-wide industry contracts rule now wage determination over a two-year time horizon (while dictating other normative aspects of the labour contract over four years). Wage rises implied by this contractual level should be consistent with a target rate of inflation annually decided by the government. The eventual discrepancy between actual and target rate of inflation is one of the elements taken into account when nation-wide industry contracts are renegotiated after a two-year period. The second contractual layer relates to plant-level bargaining, and should emphasise the nexus between wages and firm productivity. Finally, an indexation scheme of sorts still exists as a guarantee to workers if nation-wide industry contracts are not renegotiated within the prescribed two years. The nation-wide contractual wage rates increase by 30% of the *target* rate of inflation after three months of delay in renegotiation and by 50% after six months. There is some evidence that the IPA achieved its aim of curbing the inflationary pressure (Fabiani et al., 1998, Destefanis et al., 2005). On the other hand, its effectiveness in making wages more responsive to local conditions has been often doubted (Casadio, 2003).

Among the works carried on more recent data, Devicienti et al. (2008) stand out in providing evidence according to which the Italian wage curve, very flimsy in the 1980s and early 1990s, has regained strength after the IPA, due to the greater nexus between wages and firm productivity attached to the second contractual layer. In particular, this mechanism is likely to have been stronger for top-up wage components (comprising overtime wages, collective and individual wage premia). A shortcoming of the data used by Devicienti et al. (2008), the INPS data-set, is however that it cannot allow to distinguish between effects arising from hourly wage rates and number of hours worked. In the present paper, relying on data from the Bank of Italy's SHIW, we aim to provide evidence on this issue.

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[1] Lucifora e Origo (1999), Destefanis (2007) carry out estimates on regional data. Their findings do not imply however substantially different conclusions from those expounded in the text.

Table 1 – The Italian Wage Curve Literature[2]

Authors and datasets	**Sample (structure and numerosity)**	**Specification**	**Wage curve coeff.**
Bodo - Sestito (1994) INPS (*archivio imprese*) 1985-90 (blue-collars)	6(r), 6(t) N. obs.: 459 569	Real annual earnings ln ($U_{R\,t-1}$) 2-stage (only sector*area in 1st stage; no controls in the 2nd stage?) No individual (fixed-) effects No IV procedures	North: -0.042* South: -0.007*
Faini (1995) INPS (*archivio imprese*) 1988-92 (manufacturing)	95(r); (5(t) N. obs.: n.a.	Nominal annual earnings U_{t-1} 2-stage Card (only T-effects in the 2nd stage) No individual (fixed-) effects No IV procedures	large firms: 1.37 small firms: -0.35
Casavola *et al.* (1995) INPS (*archivio imprese*) 1985-93 (small firms)	95(r); 9(t) N. obs.: 42 750	Nominal annual earnings ($1/U_{t-1}$) (+ lagged dep. var.) Mean-cell regr. (2-stage too, but as a check only) No individual (fixed-) effects No IV procedures	North: 0.0378* South: -0.0060
Canziani (1997) SHIW 1989-93	20(r); 3(t) N. obs.: 16 963	Nominal annual earnings ln (U_t) 2-stage Card No individual (fixed-) effects No IV procedures	-0.052*
Lucifora - Origo (1999) INPS (*archivio individui*) 1981-93 (all firms)	95(r); 5(t) N. obs.: 444 600	Nominal weekly earnings (also log. diff.) ln (U_t) (+ lagged dep. var.) 2-stage Card No individual (fixed-) effects IV procedures (as a check only)	blue collars: 0.006 white collars: -0.002 North: -0.002 South: 0.012
Montuenga *et al*. (2003, 2006) ECHP 1994-96	20(r); 3(t) N. obs.: 3 589	Nominal hourly earnings ln (U_t) Random effects (2003) IV (2003) Fixed effects (2006)	RE: -0.075* IV: -0.151* FE: -0.039*
Manacorda – Petrongolo (2006) SHIW 1977-98	2(r); 15(t) N. obs.: 57 446	Real annual earnings ln ($U_{R\,t}$) GLS on repeated cross-sections No individual (fixed-) effects No IV procedures	North: -0.125* South: 0.080
Ammermüller *et al*. (2006) SHIW 1991-04	19(r); 7(t) N. obs.: 28 000	Nominal hourly and monthly earnings (also log. diff.) ln (U_t) (+ lagged dep. var.) 2-stage Card No individual (fixed-) effects IV procedures (as a check only)	hourly = -0.005 monthly = -0.027 North: -0.028 South: 0.190
Devicienti *et al*. (2008) INPS (*archivio individui*) 1985-99 (full-time employees at least 3 months in contin. empl).	20(r); 15(t) N. obs.: 150 000	Nominal weekly earnings Nominal top-up components ln (U_t) Fixed effects No IV, but test for exogeneity	Pre-93: -0.005 Post-93: -0.029* Pre-93 t-u's: -0.002 Post-93 t-u's: -0.076*

[2] **Legend**: N. obs. = number of observations; r = number of areas (95 = provinces; 19 or 20 = regions, 6 or 2 = wider areas); t = number of years. The acronym t-u's stands for top-up components. A * indicates a 5%-significant coefficient. Where available we present disaggregated results: North-South, small-large firms, blue-white collars. Small firms have less than 100 employees in Faini (1995), less than 10 employees in Casavola et al. (1995) and Lucifora and Origo (1999).

3. The Data

We use individual data from the Bank of Italy Survey of Households' Income and Wealth (SHIW) (for a description see Brandolini, 1999, and Cannari and D'Alessio, 2003) from 1977 onwards. The survey has been run continuously from 1977 to 1984, then in 1986, 1987 and in every other year thereafter. Our estimates refer to the period 1977-2004, the longest time span in which we can have a consistent series for both wages and unemployment. We restrict the analysis to full-year employees, aged 18-65. The sample consists of 325,860 individuals. A (rotating) panel component starts in 1987. Thus, each year a proportion of the initial survey sample is dropped from each subsequent interview sweep and replaced with a fresh sample. The complete sample is thus replaced gradually over time, with only 33 families stay continuously in the sample from 1987 to 2004 (Banca d'Italia, 2008).

Among the main advantages of this data-set, for the present purposes, are its inclusion of information on about hours worked and on human capital characteristics of the individuals (such as gender, age and education). The SHIW also contains information on occupation and sector of activity for *all* industries, although at some coarse degree of disaggregation. All these features differentiate our data-set from the INPS wage data that have been most often utilised in the Italian wage curve literature.

Of particular importance is the presence of information about hours worked. When specifying the curve, wages should be expressed in hourly terms in order to eliminate the bias generated by the negative correlation between the response in worked hours to changes in aggregate demand and the local unemployment rate. Indeed, an important reason for the inappropriateness of annual earnings is that working hours tend to are procyclical (Card, 1995). Nevertheless, most empirical estimations of the wage curve are on the basis of annual or monthly data (Nijkamp and Poot, 2005). In the present paper we will demonstrate the size of this effect by using both hourly and annual wages.

The SHIW data base directly provides series for annual wages. We obtain hourly wages through the following formula:

*hourly wages = annual wages / (weekly hours*4*working months)* [3]

Indeed, we calculate real wages for both annual and hourly measures, dividing them by the index of consumer prices. As will become apparent below, it will also be convenient to use the SHIW data to calculate various alternative measures for hourly wages. Hourly wages can be calculated keeping *the number of weekly hours constant*:

hourly wages #2 = annual wages / (150 working months*4)*

Then, hourly wages can also be calculated keeping *the number of working months constant*:

*hourly wages #3 = annual wages / (weekly hours*12*4)*

Furthermore, we can control explicitly for the *role of overtime hours*:

hourly wages #4 = annual wages / [(weekly hours - overtime hours) working months *4]*

[3] Obviously, using the figure of 4 weeks per month is an approximation. As we are going to use a log-linear specification, it has however no impact on the estimates. Similar considerations apply to the use of the figures 150 and 12 in the following expressions.

and also simultaneously for *overtime hours and working months*:

*hourly wages #5 = annual wages / [(weekly hours - overtime hours)*12*4]*

Finally, the information in the SHIW data also allows us to assess the impact upon our results of the development of part-time contracts in recent years. In this case, we do not calculate any particular wage measure, we proceed instead by restricting estimation to a sample for full-time employees.

4. The Econometric Framework

A baseline wage curve can be specified through the following equation:

$$\ln(w_{irt}) = a + b\,X_{irt} + \beta \ln(u_{rt}) + \varepsilon_{irt} \qquad (1)$$

for each individual *i* in region *r* and at a given point in time, *t*, where *w* is the wage, *u* the unemployment rate and *X* a set of individual and labour characteristics (such as gender, education, experience, occupation, etc.). Because both wages and unemployment are expressed in logs, the interpretation of β is the elasticity of wages with respect to unemployment. Blanchflower and Oswald (1994) suggest that this is the preferred specification. Estimating equation (1) potentially implies various problems, as was already made clear in Blanchflower and Oswald (1995a,b) and Card (1995). The main problems can be gathered under four headings. unobserved heterogeneity, endogeneity, dynamics, efficiency.

In order to deal with unobserved heterogeneity, time and region fixed effects have often been included in the wage curve. The former control for business cycle variables, whereas the latter allows for variables that are time-invariant but idiosyncratic to each region. Consequently, the equation to be estimated takes the form:

$$\ln(w_{irt}) = a + f_r + d_t + b\,X_{irt} + \beta \ln(u_{rt}) + \varepsilon_{irt} \qquad (2)$$

where f_r is a regional fixed effect and d_t a time fixed effect. In this way, any permanent component of the relationship between wages and unemployment is captured by region fixed effects, and the unemployment coefficient β only reflects the temporary component of that relationship (see Card, 1995). However, studies using repeated cross-sections do not control for changes in the unmeasured characteristics of the individuals over the cycle. This may be a source of bias in the elasticity of real wages with respect to unemployment (Solon et al., 1994). A number of authors (for example, Bratsberg and Turunen, 1996 and Turunen, 1998) have then proposed that, when possible, equation (2) should be estimated accounting for *individual* heterogeneity. This should allow a further reduction of both aggregation and composition biases. Thus, the estimated equation becomes:

$$\ln(w_{irt}) = a_i + f_r + d_t + b\,X_{irt} + \beta \ln(u_{rt}) + \varepsilon_{irt} \qquad (3)$$

where a_i is the individual effect.

Secondly, the wage curve has often been specified (and estimated) as a reduced form, positing that the rate of unemployment is exogenous. However, the latter hypothesis may be unwarranted. Besides, if the curve is to be interpreted as a structural relation, it is necessary to specify a model of labour-market equilibrium. A relationship presiding to the determination of the unemployment rate (a price equation *à la* Blanchard, or a labour demand schedule) must be included in this model, which can be written as follows (we only keep subscript *r* for simplicity):

$$w_r = \phi [f(u_r) \mid \boldsymbol{X}_r] \quad [4]$$

$$u_r = \Phi (w_r, \gamma_r \mid \boldsymbol{Z}_r) \quad [5]$$

$$E (\upsilon_r) = \boldsymbol{\upsilon}^* \quad [6]$$

where γ is a demand shock, *Z* is a vector of control variables (for the price/labour demand curve [5]), and the other variables have been defined above. The model is closed by the "no-migration condition" according to which, in equilibrium, expected utility (υ) should be equalised across areas.[4] Identifying structural parameters in equation [4] requires the assumption that regional shocks only affect the rate of unemployment (hence, only equation [5] through γ_r). Alternatively, Instrumental Variable techniques can be used to instrument local unemployment. A further option is to consider a recursive model, in which wages depend (only) on lagged unemployment. This opens up of course the wider issue of the dynamic specification of the wage curve.

Many authors have posited that wages follow a dynamic adjustment process, and have subsequently include a lagged dependent variable in the curve, leading a model that nests the wage curve and Phillips curve specifications within the same equation:

$$\ln(w_{irt}) = a_i + f_r + d_t + b\, X_{irt} + \alpha \ln(w_{irt-1}) + \beta \ln(u_{rt}) + \varepsilon_{irt} \quad (7)$$

An oft-debated point in the literature (se for instance Blanchard and Katz, 1997; 1999), is whether α is equal to unity. In the latter case, the curve would take the form of a Phillips Curve. However, an arguably more fundamental issue is whether the time dimension of the panel is high enough to allay fears on occurrence of a Hurwicz bias in the estimation of a dynamic fixed-effect models (Nickell, 1981) are going to be very small. The extent of this bias is also related to the specification of region-specific changes such as those arising from variations in unionisation, product market competition and so on. If these region-specific wage pressures vary systematically both over time *and* across regions, and are not adequately modelled, α will typically turn out to be overestimated. Hence the importance to include region-specific time trends among the X_{irt} in order to control for these factors (see on this Bell et al., 2002).

Finally, the rate of unemployment is usually measured at a more aggregated level than that of the other independent variables, and particularly at a more aggregated level than that of the dependent variable. This may generate a correlation across individuals belonging to the same region, giving rise to an upwards bias in the estimate of the t-statistics (see Moulton, 1986).

A first way to overcome this problem is to estimate a 'cell-mean' wage regression (Blanchflower and Oswald, 1994 and Baltagi and Blien, 1998) where the dependent variable and all explanatory variables are defined by the region and by yearly

[4] Indeed, equation [6] assumes that migration flows are equal to zero and that there is no spatial correlation between areas (that is cov (w_k, w_h)=0 if k≠h, where k and h are regions; Anselin, 1988). However, the existence of spillover effects between areas close to each other cannot be excluded *a priori*.

averages. Unfortunately, since the number of explanatory variables is larger than the number of region-by-year cells, it is not possible to use this estimation method with our data.

Alternatively, a two-step approach, as suggested in Card (1995), can be used. This works as follows. In the first stage, equation (2) is estimated excluding $\ln(u_{rt})$, but including unrestricted region per year dummies. Then, in the second stage the estimated region per year dummies are regressed on year dummies, region dummies, and the regional unemployment rate. This method uses micro-level data to estimate the coefficients of the individual-level variables. The second step then fully accounts for the presence of correlation across individuals in the same market. Note that there may be subgroups in the second stage with no individuals represented in the survey.[5]

More recently, Bell et al. (2002) have refined the two-step approach in two ways. The first way uses the panel nature of the data and estimates an individual fixed-effect equation for each region. The wage equation for region *r* is:

$$\ln(w_{irt}) = a_i + a_{jt} + b_j X_{irt} + \eta_{irt} \qquad (8)$$

Once this equation is estimated, the region-specific time effects $\hat{a}_{jt}$ are used as composition-corrected wages in a regional panel model.

The second way takes a separate cross-section regression for each year, pooling individuals across all regions. The same regressors as in the previous equation, as well as regional dummies, are included in these estimates. For each year *t* we estimate:

$$\ln(w_{irt}) = a_{0t} + a_{jt} + b_t X_{irt} + \nu_{irt} \qquad (9)$$

Then, again, the region-specific time effects $\hat{a}_{jt}$ are used as composition-corrected wages in the second-stage regional panel model.

In the first method, which we shall refer to as "BNQ Panel", the composition parameters differ across regions but remain constant over time. Furthermore, they are not subject to biases because of any correlation between the X_{irt}'s and unobserved individual effects. In the second method, "BNQ Cross-section", the *b* coefficients are the same across regions but differ through time. This allows for more accurate composition correction over a period where industry and skill effects have become increasingly dispersed. However, the *b*'s will reflect any correlation between the X_{irt}'s and the individual effects.

The consequences of these differences for the composition-corrected wages are hard to specify a priori. Yet, it is clear that the increases in dispersion of wages across skills and industries that have taken place over the sample period, allied to the systematic differences in skill and industry mix across regions, will lead to greater regional divergence over time in composition corrected wages if we have constant coefficients than if the industry skill coefficients can vary over time.

It should be emphasised that Bell et al. (2002) estimate a dynamic equation in order to investigate the process of wage adjustment. On the other hand, throughout our paper, we present only the results from *static* estimates, while taking into account the other three aspects of a correct specification. As will be clearer below, this is mostly due to the paucity of the panel component in our data.

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[5] Some authors (Blanchard and Katz, 1997, and Canziani, 1997, among others) have estimated equation (2) excluding the unemployment variable and the time-period dummies. Then, in the second stage the estimated region dummies are regressed on year dummies and the regional unemployment rate.

5. The Results

The main results from our estimations are presented in the Appendix (Tables A.1-A.12). We focus our attention on the wage curve coefficient attached to ln (u_{rt}), and to the existence of structural breaks in this coefficient before and after the 1992-93 wage bargaining reforms. Indeed, like in Devicienti et al. (2008) we want to assess whether these reforms have brought about a reappearance of the wage curve took place in the Italian labour market. To do so, we interact the regional rates of unemployment rate, with a binary variable equal to one from the 1993 wave onwards. This interaction term is labeled post92-ln (u_{rt}) in the Appendix.

Our basic results are gathered in Tables A.1-A.3. The main findings are easily summarised. With all estimation procedures, but for the individual fixed-effect estimates, a rather significant inverse relationship between annual wages and unemployment across Italian regions exists, at least after the wage reforms. No such relationship exists, on the other hand, for hourly wages. If wage reforms have made it easier for wage-setters to adapt wages to local labour market conditions, especially through the adjustment of top-up components, this is apparently linked to wage arrangements affected by the numbers of weekly hours. On the other hand, the lack of significance of the individual fixed-effect estimates can be explained by the paucity of the panel component in our data. The rotating nature of the panel, as already pointed out, leaves us with only 33 families being followed throughout the entire period.

Several robustness checks have been carried out upon our main findings. Of course, the possible endogeneity of unemployment is an issue. As in Devicienti et al. (2008), we have conducted a C-type endogeneity test, estimating an IV model on regionally aggregated data and using lagged unemployment rates as additional instruments. Similarly to Devicienti et al., we cannot reject the null hypothesis of exogeneity of the regional rates of unemployment. For annual wages we get a Chi-sq (2) of 3.55 (p-value=0.17) over the 1977-2004 period and of 0.14 (p-value=0.93) over 1987-2004. For hourly wages (1987-2004 period) we get a Chi-sq (2) of 3.38 (p-value=0.18).

Secondly, we adopt various alternative measures for hourly wages. First, hourly wages are calculated keeping the number of weekly hours constant (hourly wages #2), and keeping the number of working months constant (hourly wages #3). The results are presented in Tables A.4-A.6. The main intuition from the previous results holds forth. Basically, a significant inverse relationship appears between *hourly* wages and unemployment across Italian regions after the wage reforms only if the number of weekly hours is kept constant. This confirms us in concluding that the reforms were instrumental in differentiating wages territorially through variations in weekly hours. Yet again, individual fixed-effect estimates are not significant.

Our findings seem to be in broad agreement with the results in Devicienti et al. (2008). Wages are more responsive to local conditions and top-up wage components are likely to be a fundamental part of the story. Indeed these components are institutionally linked to weekly hours. This link is straightforward for overtime wages, but is also very strong for collective and individual wage premia, which are very often conditional on the achievement of sales and output targets involving variations in working hours. It could now be asked whether a particular top-up component (overtime or premia) is important for our results, or, even more fundamentally, they are at least partially driven by the development of part-time contracts taking place in the Italian

labour market during the 1990s. Quite interestingly, the information contained in the SHIW can be used to answer both questions.

In order to ascertain the role of different top-up wage components (pitting, in particular, overtime wages against collective and individual wage premia), we take advantage of the availability of overtime hours in the SHIW, and construct two measures of hourly wages that control away for these hours, hourly wages #4 and #5, the latter also keeping the number of working months constant. The subsequent results are presented in Tables A.7-A.9. With both these measures, the unemployment rate coefficient becomes significant after 1992 for a congruous number of specifications, this effect being stronger if working months are kept constant too – hourly wages #5. Hence there is evidence of a wage curve after the wage reforms also for hourly wages, if overtime hours are put to zero. It is not possible to conclude, however, that the post-1992 role of top-up components is wholly ascribable to overtime. Compare hourly wages #4 with hourly wages #2. Both let the number of working months vary, but while the number of weekly hours is equal to a given constant (150) for #2, only overtime hours are assumed away in #4. It turns out that the rise of the unemployment rate coefficient after 1992 is always larger (sometimes sizably so) for hourly wages #2. Clearly, collective and individual wage premia, linked to variations in weekly hours, are an important part of the post-1992 story.

Finally, we explore the possibility that our results are driven by the recent development of part-time contracts. In Tables A.10-A.12 we present results for a sample restricted to full-time workers (note that full-time workers are only available from 1987 onwards). Our main finding remains unscathed. A significant wage curve coefficient can be found after the wage reforms for annual, but not hourly, wages. We conclude that the development of part-time contracts, important as it may be in other junctures, is not very relevant for the post-1992 evolution of the wage curve.

6. Concluding Remarks

In this paper we assess the existence of an inverse relationship between wages and unemployment across Italian regions. By and large (see the survey in Njikamp and Poot, 2005) empirical support has been found for this relationship, the wage curve, in many countries, Italy being somewhat an exception in this respect (Lucifora and Origo, 1999; Manacorda and Petrongolo, 2006).

The Italian wage bargaining setup has often been blamed for this state of affairs, being deemed as unable to fully allow for local labour market conditions. Until 1992 this setup consisted of two non-coordinated bargaining levels (industry- and firm-level), on the top of automatic cost-of-living adjustments. However the 1992-93 reforms introduced a new bargaining set-up, centred upon two specialized contractual levels. In We tested whether the demise of the old bargaining has favoured the existence of an inverse relationship between wages and unemployment (the wage curve) across Italian regions. Unlike Devicienti et al. (2008), who rely on the INPS data-set, we use data from the Bank of Italy's SHIW from 1977 to 2004. Among the main advantages of this data-set, for the present purposes, are its inclusion of information on human capital characteristics of the individuals (such as gender, age and education), and, above all, of various kinds of information about hours worked (also allowing us explore the possibility that our results are driven by the development of part-time contracts).

Our main findings are that a rather significant wage curve exists for annual wages, at least after the 1992-93 wage reforms. No such relationship exists, on the other hand, for hourly wages. Thus it seems that the reforms has made it easier for wage-setters to adapt wages to local labour market conditions through the numbers of hours worked. The development of part-time contracts, however, does not seem to be part of this story. Finally, the wage curve is never significant in individual fixed-effect estimates, arguably because of the paucity of the panel component in our data.

APPENDIX

Legend of the Tables:

All specifications include regional and annual dummies, as well as regional trends. Individual controls include age, education, gender. Errors are clustered by region, and the robust standard errors are given in brackets.
W OLS stands for Weighted OLS, Unw OLS for Unweighted OLS., RE for random effects, FE for fixed effects. The labels BNQ Cross-section, BNQ Panel, and Card 95, utilised in denoting two-stage procedures are explained in the text (§ 4). The same applies to the label Mean cell. The label *no ctrls* indicates that no regression controls are included in the second stage. The numerals #2-#5, sometimes attached to hourly wages, are also explained in the text (§ 3).
The term $\ln(u_{rt})$ denotes the (natural log of the) regional rate of unemployment; post92-$\ln(u_{rt})$ is the regional rate of unemployment interacted with a binary variable equal to one from the 1993 wave onwards.
A * denotes 10%-level significance; a ** 5%-level significance, and a *** 1%-level significance.
N. obs. is the number of observations. R^2 is the coefficient of determination. When this is appropriate for the regression procedure, we also provide in the Tables the number of individuals (N. individuals) or the number of regions (N. regions) included in the regression.

Table A.1 – Fixed- and Random-effect estimates.

Hourly Wage 1987-2004

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	W OLS	W OLS	Unw OLS	Unw OLS	RE	RE	FE	FE
$\ln(u_{rt})$	0.015	0.009	0.003	0.000	-0.007	-0.009	-0.036	-0.034
	(0.033)	(0.026)	(0.028)	(0.026)	(0.024)	(0.021)	(0.024)	(0.025)
post92-$\ln(u_{rt})$		-0.037		-0.030		-0.028		0.015
		(0.024)		(0.020)		(0.018)		(0.030)
N. obs.	54807	54807	54807	54807	54807	54807	54807	54807
R^2	0.31	0.31	0.32	0.32			0.02	0.02
N. individuals					39036	39036	39036	39036

Annual Wage 1987-2004

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	W OLS	W OLS	Unw OLS	Unw OLS	RE	RE	FE	FE
$\ln(u_{rt})$	-0.008	-0.020	0.001	-0.005	0.011	0.006	0.029	0.030
	(0.068)	(0.053)	(0.053)	(0.043)	(0.042)	(0.034)	(0.030)	(0.031)
post92-$\ln(u_{rt})$		-0.086		-0.070		-0.057		0.010
		(0.022)***		(0.020)***		(0.017)***		(0.027)
N. obs.	55306	55306	55306	55306	55306	55306	55306	55306
R^2	0.30	0.30	0.30	0.30			0.04	0.04
N. individuals					39389	39389	39389	39389

Annual Wage 1977-2004

	(1)	(2)	(3)	(4)
	W OLS	W OLS	Unw OLS	Unw OLS
$\ln(u_{rt})$	-0.065	-0.042	-0.059	-0.039
	(0.054)	(0.044)	(0.048)	(0.036)
post92-$\ln(u_{rt})$		-0.134		-0.139
		(0.016)***		(0.014)***
N. obs.	89575	89575	89575	89575
R^2	0.31	0.31	0.31	0.31

Table A.2 – Two-stage estimates à la Bell et al. (2002).

Two stage BNQ Cross-section 1987-2004

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Annual Wage	Annual Wage	Annual Wage, no ctrls	Annual Wage, no ctrls	Hourly Wage	Hourly Wage	Hourly Wage, no ctrls	Hourly Wage, no ctrls
$\ln(u_{rt})$	-0.051	-0.045	-0.068	-0.062	0.026	0.030	0.007	0.010
	(0.057)	(0.050)	(0.054)	(0.048)	(0.051)	(0.048)	(0.041)	(0.040)
post92-$\ln(u_{rt})$		-0.070		-0.063		-0.040		-0.040
		(0.029)**		(0.032)*		(0.031)		(0.023)*
N. obs.	175	175	175	175	175	175	175	175
R^2	0.98	0.98	0.97	0.97	0.94	0.94	0.94	0.94
N. regions	20	20	20	20	20	20	20	20

Two stage BNQ Panel 1987-2004

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Annual Wage	Annual Wage	Annual Wage, no ctrls	Annual Wage, no ctrls	Hourly Wage	Hourly Wage	Hourly Wage, no ctrls	Hourly Wage, no ctrls
$\ln(u_{rt})$	-0.008	-0.008	-0.015	-0.014	-0.004	-0.005	-0.002	-0.002
	(0.062)	(0.061)	(0.065)	(0.063)	(0.044)	(0.045)	(0.050)	(0.049)
post92-$\ln(u_{rt})$		0.001		-0.012		0.012		-0.004
		(0.039)		(0.032)		(0.027)		(0.030)
N. obs.	175	175	175	175	175	175	175	175
R^2	0.79	0.79	0.77	0.77	0.78	0.78	0.74	0.74
N. regions	20	20	20	20	20	20	20	20

Table A.3 – Other estimates.

Two stage Card 95 1987-2004

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Annual Wage	Annual Wage	Annual Wage, no ctrls	Annual Wage, no ctrls	Hourly Wage	Hourly Wage	Hourly Wage, no ctrls	Hourly Wage, no ctrls
$\ln(u_{rt})$	-0.103	-0.052	-0.107	-0.050	-0.039	-0.032	-0.056	-0.049
	(0.046)**	(0.049)	(0.044)**	(0.043)	(0.033)	(0.030)	(0.014)***	(0.023)**
post92-$\ln(u_{rt})$		-0.057		-0.047		-0.008		-0.006
		(0.025)**		(0.013)***		(0.016)		(0.012)
N. obs.	175	175	175	175	175	175	175	175
R^2	0.86	0.87	0.83	0.84	0.65	0.65	0.62	0.62
N. regions	20	20	20	20	20	20	20	20

Two stage Card 95 1977-2004

	(1)	(2)	(3)	(4)
	Annual Wage	Annual Wage	Annual Wage, no ctrls	Annual Wage, no ctrls
$\ln(u_{rt})$	-0.089	-0.062	-0.098	-0.069
	(0.040)**	(0.038)	(0.051)*	(0.049)
post92-$\ln(u_{rt})$		-0.123		-0.125
		(0.039)***		(0.034)***
N. obs.	343	343	343	343
R^2	0.90	0.91	0.89	0.90
N. regions	20	20	20	20

Mean cell regressions 1987-2004

	(1)	(2)	(3)	(4)
	Annual Wage	Annual Wage	Hourly Wage	Hourly Wage
$\ln(u_{rt})$	-0.059	-0.056	0.022	0.024
	(0.044)	(0.043)	(0.043)	(0.042)
post92-$\ln(u_{rt})$		-0.042		-0.023
		(0.027)		(0.031)
N. obs.	175	175	175	175
R^2	0.90	0.91	0.77	0.77

Table A.4 – Fixed- and Random-effect estimates. Hourly Wages #2 and #3.

Hourly Wage #2 1987-2004

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	W OLS	W OLS	Unw OLS	Unw OLS	RE	RE	FE	FE
$\ln(u_{rt})$	0.000	-0.008	0.003	-0.002	-0.007	-0.011	-0.023	-0.022
	(0.039)	(0.030)	(0.030)	(0.022)	(0.024)	(0.017)	(0.019)	(0.020)
post92-$\ln(u_{rt})$		-0.054		-0.057		-0.046		0.002
		(0.016)***		(0.015)***		(0.012)***		(0.024)
N. obs.	55051	55051	55051	55051	55051	55051	55051	55051
R^2	0.30	0.30	0.31	0.31			0.02	0.02
N. individuals					39236	39236	39236	39236

Hourly Wage #3 1987-2004

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	W OLS	W OLS	Unw OLS	Unw OLS	RE	RE	FE	FE
$\ln(u_{rt})$	0.001	-0.008	-0.000	-0.004	0.003	0.000	0.013	0.015
	(0.056)	(0.043)	(0.045)	(0.041)	(0.038)	(0.034)	(0.038)	(0.038)
post92-$\ln(u_{rt})$		-0.060		-0.036		-0.034		0.022
		(0.029)**		(0.021)		(0.022)		(0.035)
N. obs.	55055	55055	55055	55055	55055	55055	55055	55055
R^2	0.31	0.31	0.31	0.31			0.03	0.03
N. individuals					39185	39185	39185	39185

Table A.5 – Two-stage estimates à la Bell et al. (2002). Hourly Wages #2 and #3.

Two stage BNQ Cross-section 1987-2004

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Hourly Wage #2	Hourly Wage #2	Hourly Wage #2, no ctrls	Hourly Wage #2, no ctrls	Hourly Wage #3	Hourly Wage #3	Hourly Wage #3, no ctrls	Hourly Wage #3, no ctrls
$\ln(u_{rt})$	0.006	0.011	-0.017	-0.011	-0.035	-0.032	-0.047	-0.044
	(0.040)	(0.034)	(0.031)	(0.025)	(0.057)	(0.053)	(0.052)	(0.050)
post92-$\ln(u_{rt})$		-0.067		-0.066		-0.038		-0.031
		(0.020)***		(0.015)***		(0.035)		(0.035)
N. obs.	175	175	175	175	175	175	175	175
R^2	0.97	0.97	0.96	0.96	0.97	0.97	0.97	0.97
N. regions	20	20	20	20	20	20	20	20

Two stage BNQ Panel 1987-2004

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Hourly Wage #2	Hourly Wage #2	Hourly Wage #2, no ctrls	Hourly Wage #2, no ctrls	Hourly Wage #3	Hourly Wage #3	Hourly Wage #3, no ctrls	Hourly Wage #3, no ctrls
$\ln(u_{rt})$	-0.054	-0.054	-0.057	-0.056	0.034	0.033	0.036	0.036
	(0.036)	(0.035)	(0.041)	(0.040)	(0.069)	(0.070)	(0.074)	(0.073)
post92-$\ln(u_{rt})$		-0.006		-0.016		0.017		0.002
		(0.026)		(0.024)		(0.044)		(0.044)
N. obs.	175	175	175	175	175	175	175	175
R^2	0.77	0.77	0.74	0.74	0.81	0.81	0.79	0.79
N. regions	20	20	20	20	20	20	20	20

Table A.6 – Other estimates. Hourly Wages #2 and #3.

Two stage Card 95 1987-2004

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Hourly Wage #2	Hourly Wage #2	Hourly Wage #2, no ctrls	Hourly Wage #2, no ctrls	Hourly Wage #3	Hourly Wage #3	Hourly Wage #3, no ctrls	Hourly Wage #3, no ctrls
$\ln(u_{rt})$	-0.053	-0.022	-0.065	-0.033	-0.096	-0.073	-0.100	-0.073
	(0.026)*	(0.027)	(0.024)**	(0.028)	(0.049)*	(0.049)	(0.034)***	(0.037)*
post92-$\ln(u_{rt})$		-0.036		-0.027		-0.025		-0.022
		(0.012)***		(0.008)***		(0.021)		(0.013)
N. obs.	175	175	175	175	175	175	175	175
R^2	0.91	0.91	0.90	0.90	0.90	0.90	0.89	0.89
N. regions	20	20	20	20	20	20	20	20

Mean cell regressions 1987-2004

	(1)	(2)	(3)	(4)
	Hourly Wage #2	Hourly Wage #2	Hourly Wage #3	Hourly Wage #3
$\ln(u_{rt})$	-0.001	0.003	-0.040	-0.039
	(0.035)	(0.034)	(0.046)	(0.046)
post92-$\ln(u_{rt})$		-0.047		-0.013
		(0.025)*		(0.031)
N. obs.	175	175	175	175
R^2	0.88	0.89	0.85	0.85

Table A.7 – Fixed- and Random-effect estimates. Hourly Wages #4 and #5.

Hourly Wage #4 1987-2004

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	W OLS	W OLS	Unw OLS	Unw OLS	RE	RE	FE	FE
$\ln(u_{rt})$	0.020	0.013	0.016	0.012	0.004	0.001	-0.040	-0.038
	(0.038)	(0.031)	(0.032)	(0.028)	(0.027)	(0.023)	(0.024)	(0.026)
post92-$\ln(u_{rt})$		-0.045		-0.038		-0.036		0.012
		(0.024)*		(0.022)		(0.019)*		(0.031)
N. obs.	54463	54463	54463	54463	54463	54463	54463	54463
R^2	0.30	0.30	0.31	0.31			0.02	0.02
N. individuals					38862	38862	38862	38862

Hourly Wage #5 1987-2004

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	W OLS	W OLS	Unw OLS	Unw OLS	RE	RE	FE	FE
$\ln(u_{rt})$	0.007	-0.003	0.012	0.008	0.013	0.009	0.009	0.011
	(0.061)	(0.048)	(0.050)	(0.044)	(0.043)	(0.037)	(0.038)	(0.038)
post92-$\ln(u_{rt})$		-0.068		-0.045		-0.042		0.020
		(0.028)**		(0.023)*		(0.023)*		(0.036)
N. obs.	54711	54711	54711	54711	54711	54711	54711	54711
R^2	0.30	0.30	0.30	0.30			0.03	0.03
N. individuals					39011	39011	39011	39011

Table A.8 – Two-stage estimates à la Bell et al. (2002). Hourly Wages #4 and #5.

Two stage BNQ Cross-section 1987-2004

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Hourly Wage #4	Hourly Wage #4	Hourly Wage #4, no ctrls	Hourly Wage #4, no ctrls	Hourly Wage #5	Hourly Wage #5	Hourly Wage #5, no ctrls	Hourly Wage #5, no ctrls
$\ln(u_{rt})$	0.038	0.042	0.017	0.021	-0.025	-0.022	-0.039	-0.035
	(0.054)	(0.049)	(0.042)	(0.040)	(0.062)	(0.056)	(0.055)	(0.052)
post92-$\ln(u_{rt})$		-0.047		-0.047		-0.047		-0.040
		(0.033)		(0.025)*		(0.037)		(0.036)
N. obs.	175	175	175	175	175	175	175	175
R^2	0.94	0.94	0.94	0.94	0.97	0.97	0.97	0.97
N. regions	20	20	20	20	20	20	20	20

Two stage BNQ Panel 1987-2004

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Hourly Wage #4	Hourly Wage #4	Hourly Wage #4, no ctrls	Hourly Wage #4, no ctrls	Hourly Wage #5	Hourly Wage #5	Hourly Wage #5, no ctrls	Hourly Wage #5, no ctrls
$\ln(u_{rt})$	-0.038	-0.038	-0.044	-0.044	0.011	0.010	0.004	0.004
	(0.044)	(0.043)	(0.045)	(0.043)	(0.076)	(0.076)	(0.078)	(0.077)
post92-$\ln(u_{rt})$		0.006		-0.008		0.015		0.001
		(0.031)		(0.029)		(0.048)		(0.044)
N. obs.	175	175	175	175	175	175	175	175
R^2	0.80	0.80	0.77	0.77	0.77	0.77	0.75	0.75
N. regions	20	20	20	20	20	20	20	20

Table A.9 – Other estimates. Hourly Wages #4 and #5.

Two stage Card 95 1987-2004

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Hourly Wage #4	Hourly Wage #4	Hourly Wage #4, no ctrls	Hourly Wage #4, no ctrls	Hourly Wage #5	Hourly Wage #5	Hourly Wage #5, no ctrls	Hourly Wage #5, no ctrls
$\ln(u_{rt})$	-0.033	-0.017	-0.055	-0.035	-0.090	-0.058	-0.100	-0.059
	(0.030)	(0.027)	(0.013)***	(0.020)	(0.047)*	(0.048)	(0.033)***	(0.037)
post92-$\ln(u_{rt})$		-0.018		-0.017		-0.036		-0.034
		(0.015)		(0.012)		(0.020)*		(0.013)**
N. obs.	175	175	175	175	175	175	175	175
R^2	0.89	0.89	0.88	0.88	0.91	0.91	0.90	0.90
N. regions	20	20	20	20	20	20	20	20

Mean cell regressions 1987-2004

	(1)	(2)	(3)	(4)
	Hourly Wage #4	Hourly Wage #4	Hourly Wage #5	Hourly Wage #5
$\ln(u_{rt})$	0.034	0.037	-0.030	-0.028
	(0.044)	(0.043)	(0.047)	(0.047)
post92-$\ln(u_{rt})$		-0.027		-0.019
		(0.032)		(0.032)
N. obs.	175	175	175	175
R^2	0.77	0.77	0.86	0.86

Table A.10 – Full-time Sample. Fixed- and Random-effect estimates.

Hourly Wage 1987-2004

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	W OLS	W OLS	Unw OLS	Unw OLS	RE	RE	FE	FE
$\ln(u_{rt})$	0.010	0.004	0.003	-0.000	-0.009	-0.012	-0.034	-0.033
	(0.039)	(0.032)	(0.033)	(0.030)	(0.028)	(0.024)	(0.022)	(0.024)
post92-$\ln(u_{rt})$		-0.035		-0.032		-0.029		0.016
		(0.029)		(0.020)		(0.018)		(0.032)
N. obs.	51327	51327	51327	51327	51327	51327	51327	51327
R^2	0.33	0.33	0.34	0.34			0.02	0.02
N. individuals					36799	36799	36799	36799

Annual Wage 1987-2004

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	W OLS	W OLS	Unw OLS	Unw OLS	RE	RE	FE	FE
$\ln(u_{rt})$	0.017	0.005	0.021	0.015	0.022	0.017	0.027	0.029
	(0.074)	(0.062)	(0.053)	(0.046)	(0.045)	(0.038)	(0.028)	(0.030)
post92-$\ln(u_{rt})$		-0.069		-0.053		-0.045		0.019
		(0.021)***		(0.023)**		(0.018)**		(0.024)
N. obs.	51640	51640	51640	51640	51640	51640	51640	51640
R^2	0.30	0.30	0.29	0.29			0.04	0.04
N. individuals					39384	39384	39384	39384

Table A.11 – Full-time Sample. Two-stage estimates à la Bell et al. (2002).

Two stage BNQ Cross-section 1987-2004

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Annual Wage	Annual Wage	Annual Wage, no ctrls	Annual Wage, no ctrls	Hourly Wage	Hourly Wage	Hourly Wage, no ctrls	Hourly Wage, no ctrls
$\ln(u_{rt})$	-0.024	-0.021	-0.024	-0.020	0.023	0.026	0.008	0.012
	(0.054)	(0.049)	(0.051)	(0.046)	(0.047)	(0.044)	(0.045)	(0.041)
post92-$\ln(u_{rt})$		-0.056		-0.047		-0.049		-0.049
		(0.034)		(0.031)		(0.030)		(0.024)*
N. obs.	175	175	175	175	175	175	175	175
R^2	0.98	0.98	0.97	0.97	0.95	0.95	0.94	0.95
N. regions	20	20	20	20	20	20	20	20

Two stage BNQ Panel 1987-2004

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Annual Wage	Annual Wage	Annual Wage, no ctrls	Annual Wage, no ctrls	Hourly Wage	Hourly Wage	Hourly Wage, no ctrls	Hourly Wage, no ctrls
$\ln(u_{rt})$	-0.014	-0.014	-0.024	-0.025	-0.006	-0.006	-0.016	-0.015
	(0.070)	(0.070)	(0.076)	(0.075)	(0.038)	(0.037)	(0.050)	(0.047)
post92-$\ln(u_{rt})$		0.007		0.003		-0.000		-0.014
		(0.042)		(0.032)		(0.028)		(0.032)
N. obs.	175	175	175	175	175	175	175	175
R^2	0.80	0.80	0.78	0.78	0.80	0.80	0.76	0.76
N. regions	20	20	20	20	20	20	20	20

Table A.12 – Full-time Sample. Other estimates.

Two stage Card 95 1987-2004

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Annual Wage	Annual Wage	Annual Wage, no ctrls	Annual Wage, no ctrls	Hourly Wage	Hourly Wage	Hourly Wage, no ctrls	Hourly Wage, no ctrls
$\ln(u_{rt})$	-0.065	-0.031	-0.077	-0.042	-0.033	-0.028	-0.051	-0.047
	(0.041)	(0.046)	(0.036)**	(0.036)	(0.032)	(0.029)	(0.012)***	(0.020)**
post92-$\ln(u_{rt})$		-0.036		-0.029		-0.005		-0.004
		(0.018)*		(0.011)**		(0.016)		(0.012)
N. obs.	175	175	175	175	175	175	175	175
R^2	0.70	0.71	0.66	0.66	0.89	0.89	0.88	0.88
N. regions	20	20	20	20	20	20	20	20

Mean cell regressions 1987-2004

	(1)	(2)	(3)	(4)
	Annual Wage	Annual Wage	Hourly Wage	Hourly Wage
$\ln(u_{rt})$	-0.035	-0.033	0.018	0.019
	(0.043)	(0.043)	(0.046)	(0.045)
post92-$\ln(u_{rt})$		-0.031		-0.032
		(0.028)		(0.030)
N. obs.	175	175	175	175
R^2	0.88	0.88	0.75	0.75

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