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DEREGULATION AND "LAFFER EFFECT": THE ITALIAN CASE OF ACTIVE EMPLOYMENT POLICIES AND SOCIAL SECURITY CONTRIBUTIONS' CUTS IN THE PERIOD 1998-2001

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Abstract

The Active Employment Policies (AEP), introduced in Italy by the centre-left Government with the aim of introducing flexibility on labour market also by means of a reduction of tax incidence on labour costs, showed their main effects over the period 1998-2001.
For the period 1998-2001, we empirically analyse these macroeconomic effects both in terms of new employment and in terms of revenues from social security contributions. We simulate with a VECM approach the level of employment in the absence of AEP. The results are compared with the actual data on employment. We take the difference as a proxy of the employment generated by the AEP. On this basis, we work out the difference between the hypothetical revenues from social security contributions in the absence of AEP (i.e., at the old contributory rate) and the actual revenues from social security contributions. We show that AEP joint with social security contributions' cuts determined a Laffer effect having a substantial tendency to increase through time.

Keywords: Social Security Contributions, Laffer Effect, Active Employment policies

JEL Codes: E24, E27, E62, H27

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1. Introduction

Since the beginning of 1990s the supply side economic positions that took place in Italy pointed out that Italian production and employment were adversely influenced by the high relative wage costs joint with low flexibility of labour contracts. In this context, some firms were induced to substitute capital for labour in production, some others to outsource their labour needs.[1] The situation was argued to be worsened by the heavy compulsory social security contributions and taxes on financial transactions, as well as by company taxes and by a variety of licence fees. In this views, aiming at reversing the unemployment trends, the new centre-left Italian Government of the second half of the 1990s, introduced "atypical" forms of labour contracts at reduced rates of the compulsory social security contributions.

Leaving apart those important issues, such as the possible precariousness of many new jobs and the effective relevance of the Active Employment Policies (AEP) for creating stable employment,[2] we explore whether the package of AEP[3] *cum fiscal cuts* - other than increasing employment - paid for itself in terms of revenues from social security contributions. With this purpose, we first simulate, for the period 1998-2001, the level of employment as expressed in Labour Standard Units (LSU)[4] in the absence of AEP. The resulting employment is then compared with the official data on employment, with the difference indicating the level of employment generated by the AEP. On this basis, we determine the difference between the hypothetical revenues in the absence of AEP and the actual revenues from social security contributions. We show that a *Laffer effect* on the revenues from social security contributions did actually occur and was increasing over the considered period.

2. Some stylized fact

In 1990 the unemployment rate was about 7% and, likely because of the restrictive monetary and fiscal policies required to enter the European Monetary Union, the unemployment rate increased,

[1] In those industries where abroad-wages were much lower, employers relocated their manufacturing side of their operations overseas or "offshore", toward those countries where wages were much lower.

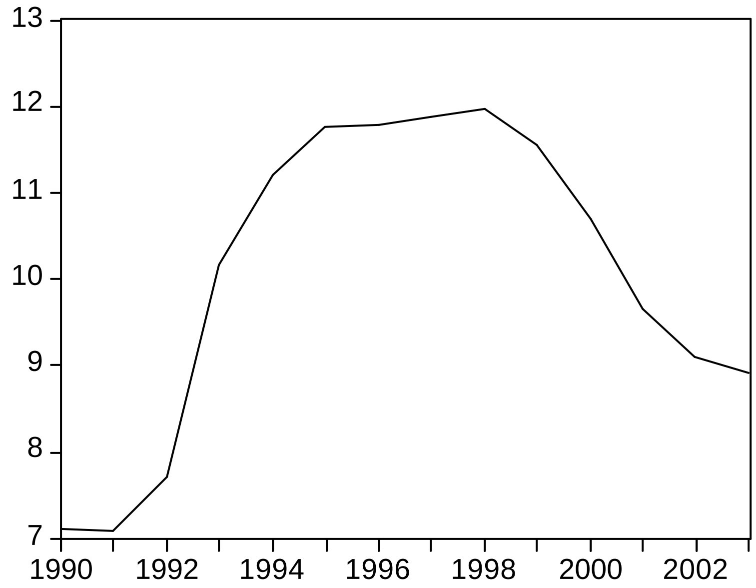
[2] It has been recently highlighted that the atypical jobs of the considered period were an important pre-condition to the creation of the stable and "traditional" jobs.

[3] The "Active" Policies are directed to promote employment while those "Passive" try to mitigate the difficulties deriving from employment.

[4] LSU defines a standardized measure of labour for a given economic territorial entity. It represents the "quantity" of hours of labour of a single full time worker employed during a year, with the number of hours being diversified on the basis of the different activities.
We shall express the employment in terms of LSU because microeconomic data on the different component of employment as properly related to the contributory regime are not available.

peaking at 11.8% in 1998 (see Fig. 1).[5] In September 1996 the centre-left Government, the National Industrial Confederation and the National Unions of Workers signed a trilateral "Pact for Labour" that became the basis of several subsequent laws. Among others,[6] the so called "Pacchetto Treu" (law n.196, 24/6/1997) introduced several important innovations on labour contracts[7] such as the job-on-loan (or *"lavoro interinale"*, as defined by the law n. 488/99) and a new discipline for apprenticeship contracts[8]. Moreover, important measures defined new regulations for work overtime (law n.409, 27/11/1998), for social security contributing incentives for part-time job (decree by the Ministry of Labour, 12/04/2000, applying D.Lgs.61/2000 art.5), and the financial law for 2001 (n.388, 23/12/2000) gave tax credits to those employers increasing the number of employees.[9]

Figure 1. Unemployment Rate in Italy 1990-2004 (Source: ISTAT)



Notice that the positive effects on labour market of these policies seem to be confirmed by the figures reported in Table 1, showing a remarkable employment's growth at the end of 1990s,

[5] Notice that from 1992 to 1994 the "job destruction" in LSU averaged 360 thousands jobs per year. From 1999 to 2001 new LSU in labour market averaged to about 310 thousands per year.

[6] For example, the law 662/1996 (introducing "*Patti Territoriali*" and "*Contratti di Programma*") aimed at promoting economic growth and development.

[7] Among others, notice also the end of the government's monopoly of the employment agency.

[8] To be remembered also the increase of social security contributions for part-time job was abolished (D.L. n.180, 2/4/1996 and D.L. n.510, 1/10/1996, converted into law n.608, 28/11/1996).

[9] This policy was extended by the new centre-right government with the new discipline of the "job-within-term" (D.L. n. 368, 6/9/2001) and the recent "legge Biagi" (Law n. 30, 14/2/2003).

especially in the area of “special” and flexible legal relationships between employees and employers (e.g. part-time, job-on-loan, contracts of coordinated or semi subordinated continuous labour services also called *Co.Co.Co*.). Moreover, from 1998, a decreasing trend of unemployment likely imputable to the AEP begun. Figure 1 shows how in the AEP years (1998-2001), the unemployment rate began a quick downward trend, which slackened in 2001, remaining the unemployment virtually unchanged at the 2002 rate.[10]

Table 2 reports the social contributions paid by workers and firms [the latter composed of effective (i.e., effectively paid to the social security institutions) and figurative (i.e., the setoff of welfare expenditure directly supplied by the employers to their, previous and current, workers)], the gross wages and salaries and the implicit contributory rate for subordinate workers for the period 1990-2001. Notice here the step in the implicit rates as resulting by the reduction of the legal rates occurred in 1998 together with the introduction of IRAP (a tax on value added of income-type with burden on labour, whose revenues were equivalent, on average, to the mentioned reduction of revenues from social security contribution).

Table 1: Impact of different types of labour contractual relations on the employment growth (composition ratios) from 1994 to 2001

		Decomposition of the employment's growth rate					*Decomposition of employment*	
		Oct.94-Oct.97	***Oct.97-Oct.99***	***Oct.99-Oct.00***	***Oct.00-Oct.01***	***Oct.94-Oct.01***	***Level Oct.94 (a)***	***Level Oct.01 (a)***
Total Employment Growth		1.0	2.9	2.8	1.2	8.1	100.0	100.0
Contributions to Growth of:								
Self- Employed		**0.4**	**0.1**	**1.0**	**-0.2**	**1.4**	**28.8**	**27.9**
	Full Time	0.3	0.0	0.8	0.0	1.2	27.0	26.0
	Part Time	0.1	0.1	0.2	-0.2	0.2	1.8	1.8
Subordinate-Employed		**0.6**	**2.8**	**1.8**	**1.4**	**6.7**	**71.2**	**72.1**
	Full Time Permanent	-0.7	0.5	0.7	1.8	2.5	63.6	61.1
	“Atypical”	1.3	2.2	1.1	-0.5	4.2	7.6	11.0
Details on “Atypical”:	Part Time Permanent	0.4	0.9	0.2	0.0	1.6	2.7	4.0
	Part Time Temporary	0.2	0.6	0.2	-0.3	0.7	1.5	2.1
	Full Time Temporary	0.7	0.7	0.8	-0.2	1.9	3.4	4.9

Source: Our elaborations on ISTAT, Statistical Survey About Labor Force

[10] Notice, however that possibly the unemployment rate does not properly assess the changes in labour supply, mainly due to an increase in the participation of the active population to the labour force also enticed by the new opportunities of employment. Indeed, the rate of participation to the labour force of the active Italian population in the 2001-2003 period has increased to 55,3% from the average of 52,3% of 1993-2002.

Table 2. Social Contributions, Gross Wages and Salaries, Implicit Rates(millions of euro)

Year	*Social Contributions paid by the firm*			*Social Contributions Paid by Subordinate Workers*	*Social Contributions Paid by Self-Employed Workers*	*Gross Wages and Salaries*	*Implicit Total Rate Subordinate Workers*	*Implicit Rate For the firm (effective)*	*Implicit Rate For the Subordinate Workers*	*Gross Wages and Salaries (per thousand LSU)*
	Effective	*Figurative*	*Total*							
1990	75182	16849	92031	17.059	8857	222.748	48.9	33.7	7.6	13,8
1991	81791	18246	100037	19.733	10850	244.345	49.0	33.5	8.1	15,0
1992	86079	20516	106595	20.359	12740	255.321	49.8	33.8	8.0	15,8
1993	87743	21925	109668	21.653	14782	260.475	50.4	33.7	8.3	16,5
1994	89616	22434	112050	22.435	15542	265.942	50.6	33.7	8.4	17,0
1995	95141	22609	117750	23.298	17279	275.082	51.3	34.6	8.5	17,6
1996	116645	10960	127605	25.852	17452	290.108	52.9	40.2	8.9	18,5
1997	124451	10943	135394	27.713	17351	302.386	53.9	41.2	9.2	19,2
1998	110322	11220	121542	26.884	13502	313.903	47.3	35.1	8.6	19,7
1999	113438	11475	124913	27.162	15234	326.730	46.5	34.7	8.3	20,2
2000	119188	11806	130994	28.368	16760	343.262	46.4	34.7	8.3	20,9
2001	124447	12126	136573	29.904	17326	360.630	46.2	34.5	8.3	21,5

In general, the new atypical labour contracts implied lower social security contribution rates, so that the question is whether there is a gain or a loss of public revenues as compared with a situation without these changes. In other words, we check whether the revenue arisen from the increased tax base, due to increased employment, did compensate the loss of revenues due to the reduction of rates on the taxable basis as measured by the hypothetical employment in the absence of the AEP package.

In order to provide an accurate gauge of the economy's reaction to the mentioned measures, we consider 1998 as the first full year and 2001 the last full year of application of the centre-left government's AEP package.[11] National political elections were held in May 2001 and a new package of labour policies, promoting further flexibility, was subsequently introduced by the new (centre-right) Government, together with new tax reductions affecting labour costs (chiefly via income tax cuts).[12] The empirical analysis of the period 1998-2001 appears to us as convenient "laboratory-like" testing for assessing the success or failure of centre-left government AEP package *in terms of Laffer effects.*

[11] Our analysis is referred to the period 1998-2001 also because the data for 2002-2003 are not fully reliable, being still subject to a substantial revision by part of ISTAT.

[12] In this study we compare the economic performance in the pre-AEP years (1984-1997) and the centre-left-government's AEP years (1998-2001), leaving the analysis of the right-wing-AEP to future research.

BOX 1: Labour Market Dynamics 1990-2001

We summarizes the relevant information on labour market as related to Italian economy during the 1990s. In particular, notice that the recession at the beginning of the 1990s determined a relevant fall in employment, mainly due to restructuring phenomena in several sectors (especially the industrial ones). This reorganization induced firms, first, to use the labour force more intensively and to cautiously reduce their productive basis. When these opportunities exhausted firms turned to the labour market (Banca d'Italia, 1998, 101). Therefore, there was a change in the reactivity of the demand for labour to GDP. The main reasons of the increase of the cyclical elasticity of employment to GDP have, thus, been found, not only, in the wider possibilities of hiring workers (Banca d'Italia, 2002, p.120) due to the effects of AEP, but also in the existence of non-linearity in the choice sets of the firms.

Year	*GDP Growth Rate (Constant Prices 1995)*	*Wages and Salaries per capita*	*Total Compensation of Employees per capita (LSU)*	*Employment (LSU)*	*ECONOMIC CYCLE AND LABOUR MARKET POLICIES*
1990	2.0	10.5	10.7	1.0	Employment growth in a contest of strong acceleration of labour costs. Labour Market Policies: law n. 407/1990 (*contratti di inserimento e reinserimento, riduzioni aliquote contributive contratti formazione e lavoro)*, law n. 223/1991 (*legittimazione richiesta nominativa ed eliminazione del principio della richiesta numerica*).
1991	1.4	8.6	8.5	0.8	
1992	0.8	5.2	5.8	- 0.6	Income growth slowdown and increasing labour cost were determined by restructuring phenomena that, in turn, determined jobs destruction. In 1994 the rate of growth of GDP increased more than expected becoming again positive, but firms did not react by hiring new jobs. Nevertheless, in 1995, after three years, total employment did not decrease. The Labour Market Policies were laid down by the law n. 236/1993 (*Fondo per l'occupazione, Cassa Integrazione Guadagni, deindustrializzazione*) and by the law n. 451/1994 (*contratti di formazione e lavoro, lavori socialmente utili, fiscalizzazione oneri sociali*). Contributory Regulations aimed at restructuring the contributory incentive scheme for the firms.
1993	- 0.9	3.1	3.7	- 3.0	
1994	2.2	3.2	2.9	- 1.0	
1995	2.9	3.9	4.6	0.0	
1996	1.1	5.3	6.1	0.3	The income growth slowdown of 1996 had moderate employment effects. In 1997 the employment showed a higher cyclical reactivity with respect to other cyclical phases (Banca d'Italia, 1998, p. 101 and 1994, p. 91). Labour Market Policies affecting the revenues from social security contributions: Abolition of the contributory surcharge for part-time job contracts, contributory amnesty for 1995-1997, increase of the social contributions for state employees.
1997	2.0	3.6	4.1	0.4	
1998	1.8	2.9	-1.5 (2.9)[13]	1.0	Persistent employment increase analogous to those phases of high GDP growth (Banca d'Italia, 1999, p.97). Labour Market Policies: Introduction of "flexible" forms of labor contracts (law by decree n. 196/1997) and semi-subordinate. Strong growth of part-time-job contracts (introduced by the law n. 863/1984). Notice also the new law about overtime-job (law n. 409/1998) and the introduction of the IRAP (Regional Tax on Productive Activities) that determined some discontinuities in the data, (see footnote 13).
1999	1.6	2.8	2.4	0.8	The unusual employment growth with respect to GDP growth - implying a changed cyclical response of the labour market to GDP- was explained as a spill-over effect of labour-intensive sectors and intensification of the labour market policies (Ministero del Tesoro, 2000, p.70).
2000	2.9	3.1	3.0	1.7	Increased impact of "traditional" jobs on the total employment growth with respect to previous years. New incentives to employment from the financial law (n.388/2000) introducing tax credit for 2001.
2001	1.8	3.0	2.8	1.6	

Source: *Our elaboration on data from Istat, National Accounts and from Ministry of the Treasury, General Report*

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[13] The figure is derived assuming for the labour costs the same behaviour of wages and salaries (Banca d'Italia, 1999, p.106). In other words, because of the discontinuities in the data following the introduction of IRAP, the official -1.5% in the behaviour of the total compensation of employees is not reliable. A better estimate of the growth of that variable is represented by the behaviour of wages and salaries that are only a component of the total compensation, the other being the social contributions to be paid by the employer.

3. The basic assumptions and the procedure used to estimate the effects of AEP on employment

We now turn to the basic features of the empirical model.[14] We follow Jacobson et al. (1997) – as well as most of the standard macro-econometric labour market models, whose microeconomic foundations are in Nickell (1984, 1985, 1986) and Burgess (1988) – that consider a wage function (as depending on labour costs and unemployment), a labour demand function (as depending on labour costs and productivity) and a labour supply function (depending on wages). This model shall be estimated for Italy with quarterly data from 1984 to 1997. Over the period considered, the three years 1995-1997 were affected by the economic cycle characterized by a slow recovery of the economy after the jobs destruction of the beginning of the 1990s, whereas the employment growth of 1998 has been recognised, at least partially, disconnected from the cycle (Banca d'Italia, 1999, p.97, Ministero del Tesoro, 2000, p.70, see also BOX 1). Therefore, 1998 can be taken as the first year the AEP package began to show its effects. With respect to the general optimization models for the firms, this assumption implies that, up to 1997, the firms had gradually solved their inter-temporal optimization problem under uncertainty by fully incorporating (also in terms of expectations) the incentives system defined by stable information sets. Since the beginning 1998 the launching and intensifying of AEP had the same effect of a shock affecting the employment equilibrium (or the firms' optimal contingent plans of investment and employment) by addressing the firms to new different adaptive adjustment schemes.[15]

On the basis of the above empirical model, we, first, perform cointegration analysis with the Johansen method in a multivariate framework in order to estimate the employment equation (in a Vector Error Correction Model, or VECM) up to 1997. We shall refer to the estimated VECM to forecast employment in the absence of AEP over the period 1998-2001. The difference between

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[14] We follow macroeconometric approach to labour market, such as Jabobson et al (1997), Marcellino and Mizon (1997,2000), Bruggemann (2001). A number of paper using microeconometric techniques have studied the effects of AEP under different aspects. A survey of the micro and macro empirical evidence on the effects on labour market policies in Sweden, a traditional case study for AEP, is in Calmfors et al. (2001). According to them, evidence for Sweden, not only highlights the fact that the positive effects of AEP are generally small, but also that, during the '90s, they had a likely negative effect on employment. The only positive effect, statistically robust, seems to be related to the labor force participation. Notice, however that a less pessimistic view of the same evidence can be found in Zetterberg (2001).
Scarpetta (1996) studies the effect of labor market policies and institution on unemployment for a panel of countries. Unlike Layard et al. (1991) and Layard and Nickell (1992), he found that the active policies, measured by the expenditures on active policies per unemployed person relative to output per capita, have a limited (when significant) impact on worker employability. Forslund and Krueger (1994) using panel evidence for 24 countries found very little and imprecise effects of the job training programs and a possible negative substitution effect between public relief workers and other workers.

[15] This simplifying assumption is supported by the observed changed reactivity of the relevant macroeconomic variables in 1998, even if the first signs of firms' muted behaviour of employment with respect to income growth, had been already observed over 1995-1997 (cf. BOX 1 and also see below).
Notice, however, that up to 1998 the centre-left government's AEP did not fully show their effects at an aggregate level. The reforms occurred before of 1998 mainly avoided the worst employment performances. For this reason, our model estimated with data up to 1997 may show some bias in the direction of "excessively optimistic" forecast of employment in the absence of AEP.

forecasted and actual employment shall thus be taken as a *proxy* of the effects of the introduction of AEP on labour market.

In order to carry on cointegration analysis, we have to consider the number and the kind of the long run equations of our reference model. To this respect, since we are not interested in modelling explicitly the labor supply, following Jacobson et al. (1997, p.1783-1787) and Bruggemann (2001) we assume that the labour supply relation is not stationary. Thus, from the cointegration analysis of the labour market, we expect up to two cointegration relationships: a labour demand function and a wage function.

We consider the following variables:[16]

-(the log of) employment, as expressed in LSU (Standard Labour Unit), (e_t), where

$$\text{EMPLOYMENT=SUBORDINATE EMPLOYEES+TOTAL SELF EMPLOYMENT;}$$

-(the log of) productivity given by the ratio between (log of) GDP at constant prices (1995), y_t, and (log of) employment, that is $(y_t - e_t)$;

- (the log of) unemployment rate (ur_t), where: $\text{UNEMPLOYMENT RATE} = \dfrac{\textit{UNEMPLOYED PEOPLE}}{\textit{LABOUR FORCE}}$;

- (the log of) real labour cost per capita at constant prices (w_t), where

$$\text{REAL WAGE (REAL LABOUR COST PER CAPITA)} = \frac{\textit{TOTAL COMPENSATION OF EMPLOYEES}}{\dfrac{\textit{EMPLOYMENT IN LSU}}{\textit{GDP DEFLATOR}}}.$$

Figure 2 plots the four variables and their first differences.

[16] The main source of our data is ISTAT, National Accounts 1970-2002 available at www.istat.it and ISTAT, Labor Force Survey, Annual Publication (series 1978-2002 available upon request). Notice, however, that we exclude from the available sample the period 1970-1983 because of a documented instability of the empirical models of the Italian labour market including this period (see, for example, Marcellino and Mizon, 1997, 2000).

Fig. 2. Quarterly Observations of Italian Labor Market Variables 1984-2002(values in log)

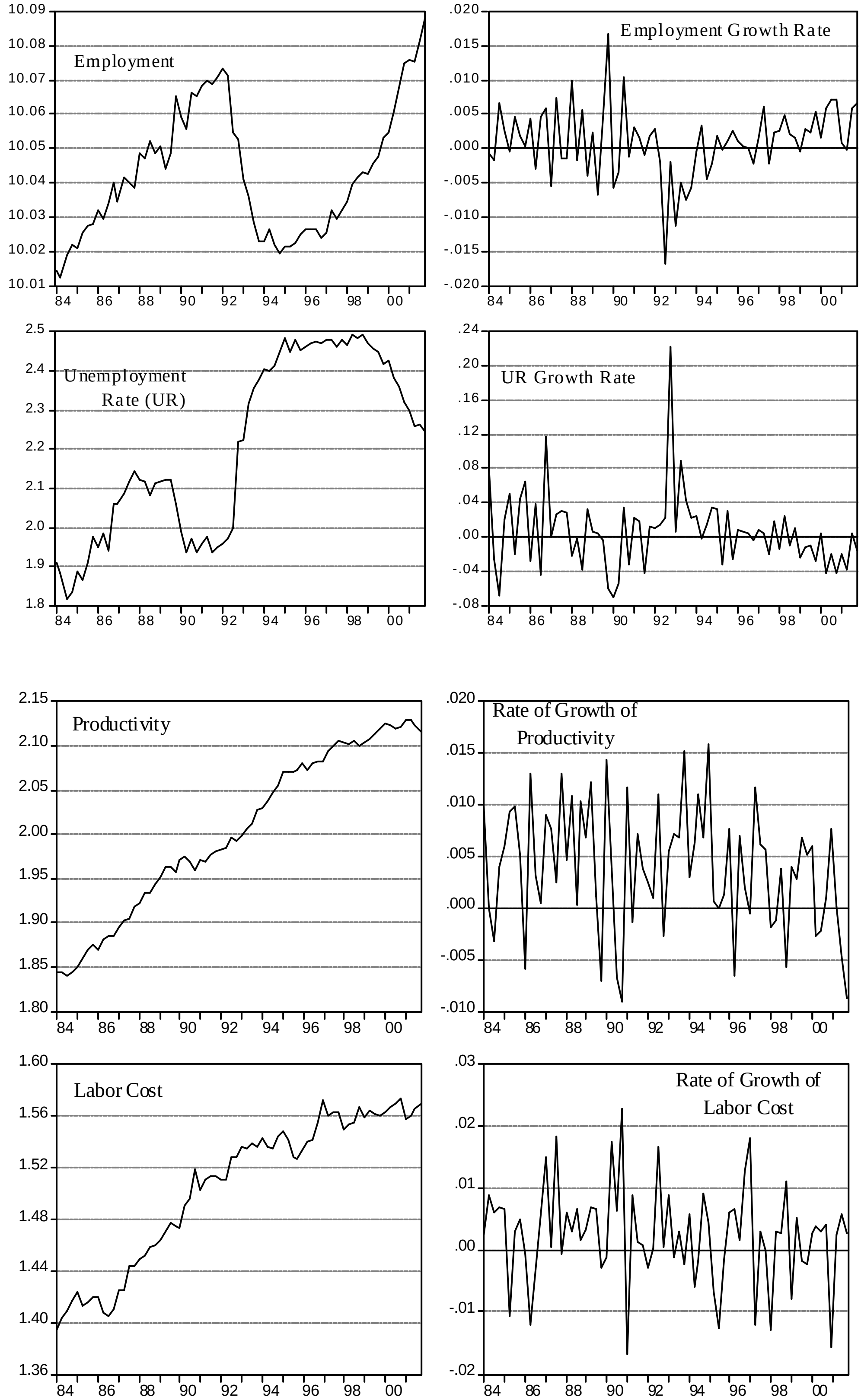

Table 3. Univariate Analysis, ADF Unit Root Test

Variable	*Componenti deterministiche*	*Lags*	*ADF*
Employment	Intercept, Trend	3	-1.88
D(Employment)	Intercept	2	-2.77***
Labor Cost	Intercept, Trend	0	-2.18
D(Labor Cost)	Intercept	2	-5.77*
Productivity	Intercept, Trend	2	-2.23
D(Productivity)	Intercept	0	-8.55*
Unemployment Rate	Intercept, Trend	0	-1.52
D(Unemployment Rate)	Intercept	0	-7.26

*, **, *** denote rejection of the null of unit root at, respectively, 1%, 5% and 10% sig. level

As shown in Table 3, reporting the results of the ADF tests, the levels of the variables do not look stationary, whereas their first differences follow a stationary process, even in the presence of some outliers in the rates of growth of the variables and, in the case of the unemployment rate, of a possible changing variance over time. The results from ADF tests, thus, confirm our choice of relying on VECM.[17] On this basis, the VAR model in our analysis assumes the following form:

$$x_t = \Pi_0 + \Pi_1 x_{t-1} + \ldots\ldots\ldots + \Pi_k x_{t-k} + e_t \qquad t = 1,2\ldots\ldots\ldots\ldots\ldots \tag{1}$$

where x_t is the vector of the endogenous variables, e_t is $Niid_n(0,\Omega)$ and $x_0,\ldots\ldots\ldots,x_{-k+1}$ are considered constants.

When the variables are integrated, I(1), and there exist r<n stationary linear combinations between them $(b' x_t)$, the model can be written as a VECM:

$$\Delta x_t = \sum_{j=1}^{k-1} \Gamma_j \Delta x_{t-j} + a\left(b' x_{t-1}\right) + e_t \qquad t = 1,2,\ldots\ldots\ldots\ldots\ldots \tag{2}$$

where Δ is the difference operator, $\Gamma_j = -\sum_{i=j+1}^{k} \Pi_i$, a e b are matrices $n \times r$ with rank r. The relations among variables emerging on the basis of this scheme shall allow us to properly consider the empirical possibility that the relevant variables for labour market are not stationary, as well as the possibility that one or more long run attractors do exist for the system $(a b' x_{t-1})$.[18]

[17] This category of models is a powerful tool for describing data and for providing reliable multi-step benchmark for forecasting (Stock and Watson, 2001).

[18] The above econometric model recognizes the possibility that the variables can be driven by stochastic trends. This feature of time series might determine a problem of spurious regression. Moreover, there might be a loss of information in simply differencing the variables when they are not stationary. Therefore, we try to isolate and estimate long run relationships that make the estimation of the full system statistically more efficient.

The first step before cointegration analysis is the choice of the proper lag order of the VAR. Table 4 presents the relevant information for this choice, on which basis, we select a model with three lags (see appendix 1).

Table 4. VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	442.0637	NA	1.89E-12	-15.64513	-15.50047	-15.58905
1	743.3996	548.8617	7.09E-17	-25.83570	-25.11236*	-25.55526*
2	761.3238	30.08711	6.68E-17	-25.90442	-24.60241	-25.39964
3	778.4561	26.31032*	6.57E-17*	-25.94486*	-24.06418	-25.21573
4	790.0247	16.11331	8.04E-17	-25.78660	-23.32724	-24.83311
5	797.2418	9.021439	1.19E-16	-25.47292	-22.43489	-24.29509
6	808.7010	12.68696	1.57E-16	-25.31075	-21.69405	-23.90856
7	819.0637	9.992597	2.28E-16	-25.10942	-20.91405	-23.48288
8	834.2447	12.47006	3.03E-16	-25.08017	-20.30612	-23.22928

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Moreover, in order to correct for some outliers in the residuals of the basic estimated model, we introduce among the regressors two dummies representing: (i) the change in the definition of the unemployment rate occurred in the last quarter of 1992 and (ii) the shock in the third quarter of 1992 due to the exit of Italy from EMS (see appendix 2).

Inference for the cointegrating rank is carried out with Johansen test (1995) and the Saikkonen-Lutkepohl test (2000, 2000a, 2000b, 2000c).[19] Table 5 reports the relevant information

Table 5. Cointegration tests

Johansen tests				
Eigenv.	*Trace*	*H0: r*	*95% Critical Value*	*99% Critical Value*
0.454157	61.22986	0	47.21	54.46
0.269700	29.14243	1	29.68	35.65
0.204692	12.48455	2	15.41	20.04
0.006511	0.346186	3	3.76	6.65
S-L tests				
r	*LR*	*90%*	*95%*	*99%*
0	58.4165	36.25	39.71	46.00
1	19.5789	21.58	24.08	29.19
2	6.3003	10.35	12.21	16.16
3	0.0002	2.98	4.14	7.02

[19] The Saikkonen-Lutkepohl test is very similar to Johansen test but it is applied to the model without the deterministic components. One obvious advantage is represented by the fact that the critical values do not depend on the presence of shift dummy variables.

The sequential strategy of both tests first considers the null of no cointegration against the alternative of at least one cointegrating vector. Both tests reject the null. Therefore, we test the null of one vector against the alternative of at least two. The latter null is not rejected. This suggests the existence of one cointegrating vector among the four endogenous variables. Given the asymptotic nature of the critical values,[20] the cointegration analysis is also performed with parametric bootstrapping,[21] a simulation technique that allows to gain some insights on how much the asymptotic distributions approximate the unknown small-sample one. For it[22] the results of the simulations show that, given a statistic equal to 61.23, the null of no cointegration at the 5% (empirical) significance level can be rejected and that with a statistic equal to 29.14 the null of one cointegrating relation against the alternative of at least two cannot be rejected both at 5% and 1% significance level. Our testing strategy, thus, suggests one cointegrating relation, that could be either a labor demand function or a wage function.

New inference must then be conducted to shed light on the cointegrating relation by imposing (over-identifying and so testable) restrictions in an economic interpretable way on the unrestricted estimated cointegrating vector. Our attempts of restricting the cointegrating vector to the labor demand function failed (the LR test rejected at 0.0001 level and the signs of the coefficient were "wrong")[23] and we could only estimate a wage function with the restriction imposed on the cointegration vector.[24]

The next step is to test for the weak exogeneity of the four endogenous variables, that is, we test whether some of them do not react to the "error" deriving from the cointegrating relation.[25] [26] On

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[20] Notice, however, that the critical values of table 5 are not valid for the Johansen test, since our estimation includes two dummies.

[21] Unlike Monte Carlo techniques trying of replicating an actual Data Generating Process drawing from a given distribution (for example normal), the bootstrapping draws the random variables from their observed distribution.

[22] The bootstrapping evidence has been obtained with the econometric software SVAR by Anders Warne.

[23] The difficulties encountered to find an interpretable labor demand function could be explained by its possible instability (Bean, 1994, 597).

[24] In the wage function we imposed a zero restriction for the coefficient of employment and a proportionality 1:1 between per capita labor cost and productivity. The LM statistic for the two restrictions is equal to 5.53 with a significance level of 6%.

[25] We have estimated the model in the more general form allowing for the lagged residuals of the cointegrating relation to enter in each of our four equations of our system. If the system is stationary then at least some of the four variables must react to this disequilibrium. The weak exogeneity tests allow us to verify which variables move when there is a disequilibium in order to make the system stationary.

[26] We test these weak exogeneity assumptions together with the restrictions on the cointegration vector. The two "beta" restrictions and the zero restriction on the loading coefficient of the unemployment series were not rejected (LR(3)=5.82 (0.12)), the same beta restrictions with the zero restriction on the loading coefficient of employment were not rejected at the 1% critical value (LR(3)=8.79 (0.03)) and finally the restrictions on the "betas" and the two "alphas" were not rejected (LR(4)=8.83 (0.07)).

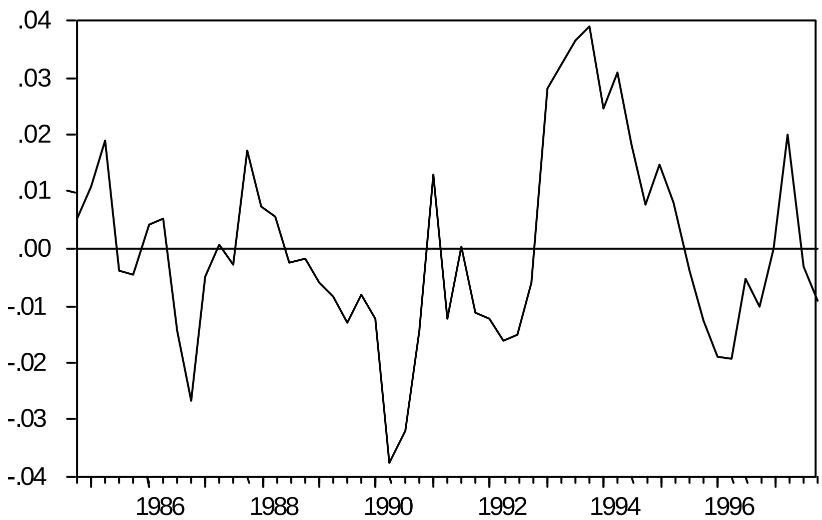
the basis of these tests we conclude that only the labor cost and the productivity would react to the long run disequilibrium with loading coefficients equal to –0.29 (-4.18) and +0.23 (4.63), respectively (t-statistics in parenthesis). After the restrictions on the loading coefficient our estimated long run wage function is the following (t-values in parenthesis):

$$w_t = (y_t - e_t) - \underset{(13.15)}{0.14} * (ur_t)$$

We note a very significant elasticity[27] of the per capita labour cost with respect to the unemployment rate (a classic measure of search intensity) that signals a non competitive feature of the Italian labour market.[28]

The figure 3 shows the estimated restricted cointegrated relationship that appears stationary.

Figure 3 – The cointegrated relation for real wage



Notice that leaving the cointegrating vector unrestricted, we could not reject the null of the weak exogeneity of unemployment (LR(1)=0.29 (0.59)) and employment (LR(1)=3.26 (0.07)) and the joint hyphothesis (LR(2)=3.31 (0.19)).

[27] This coefficient is often defined as long run elasticity of real wage with respect to unemployment. As a comparison, for the German labour market, the (statistically significant) estimates of this parameter are significantly higher. The estimate of Bruggemann (1991) for Germany (unified) is –2.733, Carstensen and Hansen's (2000) estimate is –1.824 for the West Germany, whereas the Bean, Layard and Nickell's estimate is –3.31 (1896).

[28] Notice that this result contradicts the estimate of Marcellino and Mizon (1997, 2000) where this parameter is not significantly different from zero. Marcellino and Mizon (1997, 2000), however, assume a different theoretical model (where, for example, inflation is considered and the employment series is excluded) and their sample estimate ranges from 1980 to 1994.

Our results for the Italian labour market support an interpretation in terms of hysteresis[29]. In particular, since we could restrict to zero the adjustment coefficients in the equations of both the unemployment rate and the employment, this implies that the two processes generating the two time series would have influenced the dynamic of the system without being influenced by it. In turn, this implies that the accumulated shocks in both the unemployment and employment equations are two of the stochastic trends that possibly drove the Italian labour market up to 1997.[30] In other words, the shocks to the Italian labour market in the considered period may have had permanent effects on unemployment and employment.

Our final restricted VECM model does not present problems[31] and it can be suitable for dynamic forecasting. Notice, however, that the best VECM estimates are obtained by imposing some relevant restriction on data. For this reason, we have also checked the performances of less restricted versions of the above model (see the appendix 3 and 4). Figure 4 presents the results of the simulation for the four endogenous variables in the AEP period 1998-2001 (see the appendix 5 for a discussion of the forecasting formulas and statistics). Table 6 reports the results of the simulation for employment expressed in LSU on a yearly basis.

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[29] These are situations where one time disturbances permanently affects the path of the economy (Romer, 1996, p.473). Apparently, hysteresis characterised the 1980s European labour market dynamic. Blanchard and Summers (1986) explanation relies basically upon the insider-outsider dynamic. That is, a negative shock to labour demand, subsequently becoming unexpectedly low, causes the firms to hire relatively few workers, and so the number of insiders falls. When the remaining insiders decide on the wage for the following period, they can afford to set a higher wage, since there are fewer of them for the firm to employ. Thus the one time shock to labour demand has a long lasting effect on employment (Romer, 1996, p.471). As for unemployment, there are two sources of hysteresis other than the insider-outsider considerations: the deterioration of the skills and "hysteresis through labour-force attachment". Workers who are unemployed for extended period may adjust their standard of living to the lower level provided by income-maintenance programs (Romer, 1996, 473).

[30] A standard result of cointegration analysis is that the number of common trends (the cumulated shocks that determine the I(1) nature of the system of variables) is obtained subtracting from the number of endogenous variables the number of cointegrating relationships. In our case, with one cointegrating relation, we have three common trends driving the system. Two of them are the cumulated shocks of the unemployment and employment equations. The last one is a linear combination of the shocks in the wage and productivity equations.

[31] The null hypothesis that residuals are serially uncorrelated against the alternatives that they follow a VAR(1) and a VAR at lag 4 are not rejected (LM(16) = 21.40 (0.16), LM(16) = 17.11 (0.38) respectively). The LM tests for 1st order ARCH are the following: labor cost (LM(1)=0.22 (0.64)), employment (LM(1)=0.30 (0.58), unemployment (LM(1)=0.96 (0.33)), productivity (LM(1)=0.49 (0.48)). LM tests for 1st-4th order ARCH are the following: labor cost (LM(4)=3.58 (0.46)), employment (LM(4)=7.93 (0.09), unemployment (LM(4)=4.31 (0.36)), productivity (LM(4)=0.63 (0.96)). The null hypothesis of skewness 0, kurtosis 3 and the joint one are not rejected by the following Wald statistics and significance levels (W(4)=5.28 (0.26), W(4)=4.65 (0.32) and W(8)=9.94 (0.27)). Also the parameter constancy tests do not signal any problem. More precisely the Chow 1-step ahead test rejects only few time the null that the short run coefficients starting from a given t are constant with respect to time t+1. The Ploberger-Krämer-Kontrus fluctuation test does not reject the null hypothesis that short run coefficients in each equations are constant for all t in {1993:2,...,1997:4}. Three roots of the estimated polynomial equation $\left| I_4 - \sum_{j=1}^{k} \Pi_j z^j \right| = 0$ are equal to 1 (as it must be given our choice of one cointegrating relation) and the fourth bigger is equal to 0.71.

The simulation clearly shows that a model estimated until 1997 is not able to replicate the actual employment trend in the period 1998-2001. This can be considered (although with some caution given by the wide confidence intervals reported in the last two columns of table 6, but see appendix 6 for a further robustness test of our results) as an indirect proof of the positive cyclical effects of the AEP.[32] [33]

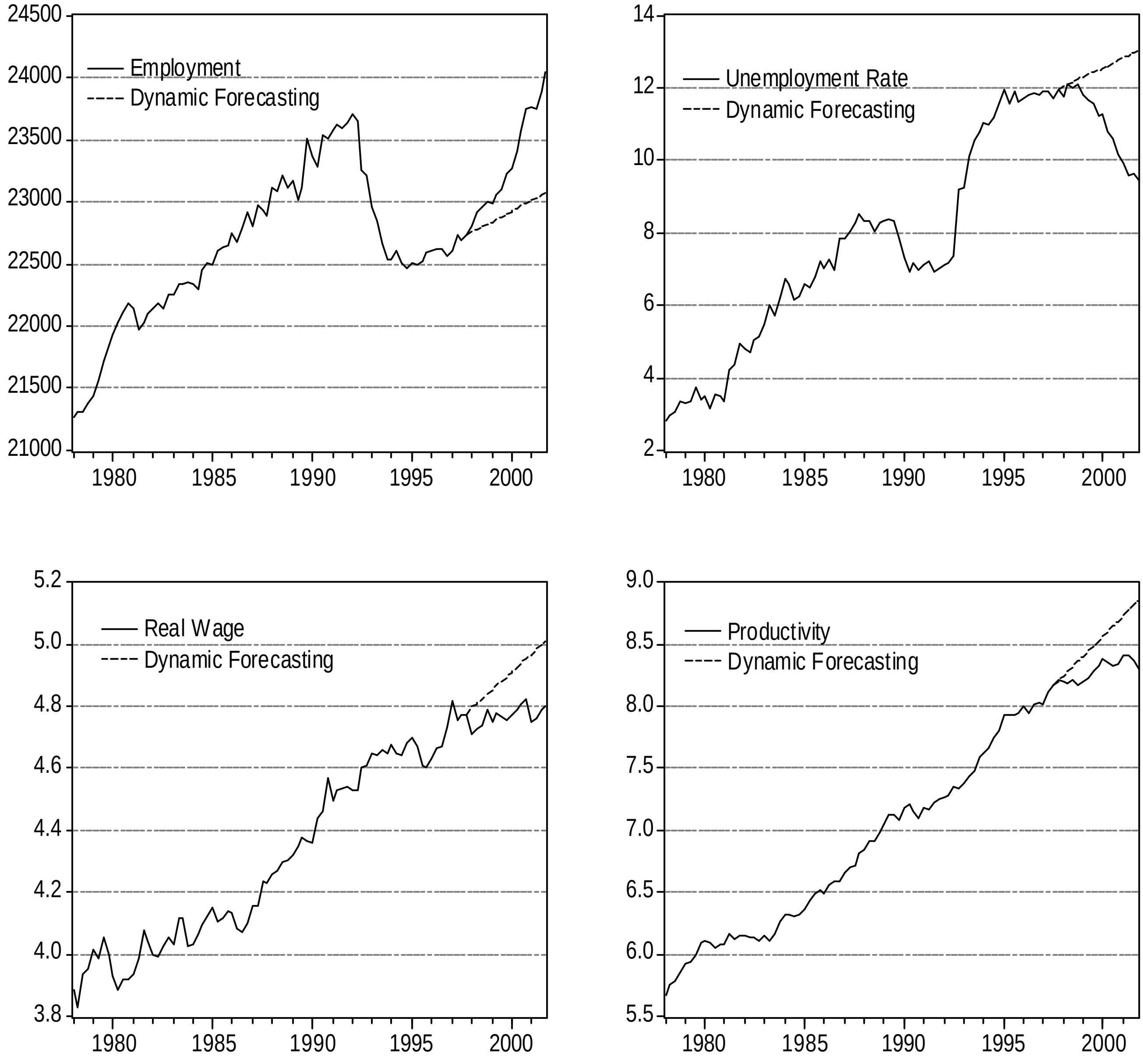
Table 6 Actual and forecasted employment (thousands of LSU)

Year	Actual	Forecasted	Differences	C.I. (95%)	
1998	22916	22810	106	22504	23120
1999	23049	22914	135	22373	23467
2000	23452	23016	436	22290	23764
2001	23844	23118	726	22238	24031

[32] The absence of dynamic in the forecasted series might signal a likely problem. Notice, however, that the model is actually forecasting the unconditional expectations, thus, the forecasted series are, at least, indicating the likely trend.

[33] Other interesting aspects related to the effects of AEP have been studied with different approaches. See, for example, Saint-Paul (1998, 1999, 2000) and Fredriksson (1999) for a political economy analysis of labour market policies and institutions. In particular, Saint-Paul highlights a likely political distortion bias toward rigid labour market institutions as deriving from the fact that a group of employed unskilled workers can operate through their political counterparts to redistribute income to them from high skilled workers. In particular, a part of low-skilled, workers will gain from rigid labour market institutions and "rigid policies" in terms of higher wages. In order for this mechanism to be effective, there must be decreasing return to labour and this can be rationalized considering as a fix factor the high skilled workers. In this case, higher wages will determine the mentioned redistribution but, of course, they will harm other workers (the losers among the low skilled workers and the long term unemployed) and so it will be an inefficient way to resolve the redistributive conflict.
With a similar approach, Fredriksson, using a matching model of labour market, determines endogenously the equilibrium level of a particular kind of AEP.

Figure 4. Dynamic Simulation of the Italian Labour Market [34] 1998-2001



[34] Table 6 below reports the 95%. confidence intervals (C.I.) as measures of uncertainty of the point forecasts. Here, notice that the C.I. are wider for employment (and unemployment) because the series is I(1) and exogenous with respect to the disequilibria characterising the long term equation of wages. Notice also that, when forecasting on the basis of cointegration techniques, there is an increasing uncertainty when moving away from the time the information set is referred to (Lutkephol, 1991, par.11.3, Clements e Hendry, 1998, chapter 4, Banerjee et al., 1993, par.8.5.4, Hamilton, 1994, p.440).

4. The Laffer effect of the new AEP package on the revenues of the Social Security Institutions

We now calculate the revenues from social security contributions from 1998 to 2001 in the absence of AEP. Table 6 reports the values expressed in LSU for forecasted employment, actual employment and the differences between them. In Table 7 we decompose such values into the two components of subordinate workers and of self-employed workers, on the basis of the yearly actual shares of subordinates and self-employed workers on total employment.

Table 7 – Decomposition of simulated employment in subordinate and self-employment

Year	Actual Subordinate Employment	Actual Self-Employment	Simulated Subordinate Employment	Simulated Self-Employment	Disaggregated Effect of AEP on employment	
					Subordinates	Self-Employees
1998	15939	6977	15865	6945	74	32
1999	16105	6944	16012	6904	93	40
2000	16412	7039	16108	6909	304	130
2001	16769	7075	16258	6860	511	216

In order to asses the revenues from social security contributions for the period 1998-2001 in the absence of AEP, we must find reliable proxies of the per capita social security contribution rates (for both subordinate and self-employed workers) to be multiplied by the corresponding employment figures of table 7. The computation of the mentioned proxies is not straightforward (see Box 2 below). The legal rates of the contributory system changed in 1998 also because of the introduction of a new income-type value added tax on firms and professionals, IRAP, which, among others, substituted that part of the social security tax financing the health-care system. Therefore, the straightforward reference to the legal tax rate of 1997 (or to an average of, say, the previous 5 years) for the period 1998-2001 would lead to an over-assessment of the contributory revenues in absence of AEP. For it, we exclude from the per capita social security contribution rate (for both the subordinate and self employed workers) that part replaced by the (equivalent) IRAP. The rates thus obtained applied to the estimated employment figures should give us the revenues from social security contributions without AEP in the period 1998-2001.

BOX 2

<u>*Subordinate worker:*</u> The average effective legal contributory tax rate (net of "reductions of social security contributions for less developed areas") in 1997, was 50.08% of wages and salaries. This tax rate is consistent with the actual 1997 average revenue of social security contributions for subordinate workers which was 9.6 millions of euro per thousand of workers. To avoid an overstatement of the hypothetical burden on the subordinate workers due to the absorption of a share of the social security rates in equivalent IRAP rates we cut the average social security tax rate to an hypothetical level of 43.82%. Since in 1997 with a rate of 50.08 % the average social security contribution per thousand workers was 9,6 millions of euros, with a rate of 43.82%, it would have been 8,4 millions of euro. This figure shall be multiplied by the simulated data of the series of subordinate workers, for the given period, in order to obtain an estimate of the revenues from social security contributions in the absence of new AEP in the period 1998-2001.

<u>*Self-employed*</u>: We consider the legal statutory system of the "craftsmen and traders". In order to simplify the normalization (without a significant influence on the results), we shall only consider the contributions expressed as percentages of the tax base and not some minor lump sum contributions. We consider as basis the actual social security contributions of self-employed per thousand workers (2,5 millions of euros) corresponding to the average rate of 1997 equal to 21.8%. But, in order to consider the introduction of IRAP we reduce the rate so that the social contributions for self-employed is assumed to be 1,74 millions of euros per thousand workers. We then multiply this figure for the yearly data of our simulated series of self-employed, obtaining the revenues from social security contributions from self-employees in absence of new AEP for the years 1998-2001.

The final results are given in Table 8. The differences between simulated and effective revenues of social security contributions both for subordinate and for self employed workers, give the Laffer effect of the AEP on the revenues from social security contributions. The data show a relevant additional flow of revenues and, although with cautions, they suggest that the trend is increasing over time.

Table 8. Laffer effect of AEP on the revenues from social security contributions in the period 1998-2001 (in parenthesis all the figures as percentages of GDP)

Year	*Gross Domestic Product*	*Actual Social Security Contributions Subordinate (A)*	*Actual Social Security Contributions Self-Employees (B)*	*Simulated Social Security Contributions Without ALP Subordinate (C)*	*Simulated Social Security Contributions Without AEP Self-Employees (D)*	*A-C*	*B-D*	*Laffer Effect of AEP on the Social contribution Revenues*
1997	1026285	152164 (14.8%)	17351 (1.7%)	-	-	-	-	-
1998	1073019	137206 (12.8%)	13502 (1.3%)	133268 (12.4%)	12084 (1.1%)	3938	1418	5356 (0.5%)
1999	1108497	140600 (12.7%)	15234 (1.4%)	134492 (12.1%)	12011 (1.1%)	6108	3223	9384 (0.8%)
2000	1164767	147556 (12.7%)	16760 (1.4%)	135302 (11.6%)	12021 (1.0%)	12254	4739	16993 (1.5%)
2001	1216694	154351 (12.7%)	17326 (1.4%)	136569 (11.2%)	11936 (1.0%)	17782	5390	23172 (1.9%)

Note: all the data are expressed in millions of euro

Source: ISTAT, Conti dei Settori Istituzionali (July 2003)

5. Conclusions

Given that most of the atypical contracts are classified as subordinate, in order to further explore the Laffer effect of the AEP, we work out the elasticity of the new revenues from the social security contributions of the subordinate workers (as an addition to the simulated revenues in the absence of AEP) to the tax (implicit rate) cut. We shall consider the following formula:

$$Z = \frac{\dfrac{Laffer\ Effect(t)}{simulated\ revenues\ for\ subordinate\ workers(t)}}{\dfrac{actual\ implicit\ rate(t) - hypothetical\ implicit\ rate(1997)}{hypothetical\ implicit\ rate(1997)}} \qquad t = 1998, \ldots\ldots, 2001$$

where the numerator of *Z* is given by the ratio of the difference between the effective revenue and the simulated revenue for subordinate workers in the absence of AEP and the simulated revenue for subordinate workers; the denominator is given by the share of tax cut over a hypothetical 1997 rate. The latter rate is computed by modifying the actual 1997 implicit rate (that is equal to 50.3%) for the "IRAP effect" with the same procedure (and the same proportion[35]) used when the simulated revenues from social security contributions in absence of AEP were computed (see Box 2). Given that procedure, the hypothetic implicit rate is equal to 44.01% (that is 50.3*(43.82/50.08), where 50.3% is the actual 1997 implicit rate, whereas 43.82% and 50.08% are the average legal rate net of the allowances, respectively, after and before controlling for the social contributions that were eliminated from 1998 with the introduction of IRAP. Notice that the same exercise for self-employed workers is not possible because the tax base (and, thus, the implicit rate) is not available. Table 9 presents the elasticity on the basis of the above procedure.

We can see that the measure of the elasticity given from *Z* is quite relevant and, after 1999, increasing through time (see Appendix 6 for a check of robustness of the results). It is important to note that the rates of social security contributions are much lower for the new contractual forms introduced by the AEP (such as *Co.Co.Co.*, i.e., quasi-subordinated labour) than for the standard type of subordinate workers. The average rate of social security contribution, thus, decreases as the percentage of the increased number workers subject to the reduced rate. In the first year of AEP, i.e.1998, the elasticity is magnified by the fact that the workers subject to the reduced rate regime are a fraction of the total smaller than that of the subsequent years. But after a reduction in 1999, the elasticity increases in spite of the fact that the average rate reduction becomes greater due to the increased atypical workers. Thus, one may say that the Laffer effect becomes more relevant the more time elapses. Obviously, one may argue that a main reason of this elasticity is that the AEP (as given

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[35] In that case the ratio between hypothetic and actual average rates was 43.82/50.08.

by new types of contracts and contributory cuts) has introduced important components of flexibility in the labor supply. The possibility for the firms, in the most diverse areas of production of goods and services, of hiring workers at conditions different from those given by the collective labour contracts and without the subsequent obligation to permanently hiring the new worker, has determined an important effect on the employment figures. Yet if the cost of social security contributions was not so different (lower) for the new workers, the success of the formula would have been smaller. The two effects on the elasticity of the revenue cannot be disentangled. Thus, what we have empirically tested is that the combination of tax cuts and partial deregulation of the labour market, *together*, may generate a quite relevant increase of revenue with increasing elasticity through time.

Table 9. Elasticity of the increased revenues from social security contribution to the rate of reduction of the implicit contributory rate

Year	Implicit Rates Effective Social Contributions (firm+worker)	Percentage Changes of the actual implicit rates with respect to 1997 B	Laffer Effect	Simulated Revenues from Social Contributions without AEP	Laffer Effect as a percentage of the simulated revenues from social contributions without AEP A	Yearly Elasticity A/B
1997	44.01*					
1998	43.7	-0.7	**3938**	133268	2.95	**-4.3**
1999	43.0	-2.2	**6161**	134492	4.58	**-2.1**
2000	43.0	-2.3	**12254**	135302	9.06	**-3.9**
2001	42.8	-2.8	**17782**	136569	13.02	**-4.7**

* implicit rate computed modifying for the IRAP's effect (see Box 2)

Notice that if the increase in the new form of labour contract was accompanied by a reduction in the subordinate workers or in the self employed workers, one could have argued that there had been a simple shift from one type of more expensive labour supply to the less expensive type or that there has been a shift from less efficient contractual formulas to more efficient formulas with similar tax rates. But, as seen, this was not the case. Thus, it seems plausible to conclude that AEP have, not only, substantially increased the employment, but they have also shown a relevant Laffer effect on the revenues from social security contributions. Moreover *via* the elasticity formula we have also been able to empirically test a peculiarity of the Laffer effect that, at a theoretical level has been point out by James Buchanan, that is its substantial tendency to increase through time.[36]

[36] The peculiarity of the 1998 elasticity jump can be explained in terms of an (optimistic) over-reaction of the labour market to the new policies or in terms of non-linearity deriving, for example, from the different institutional and timing features of the policies accumulate through time.

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APPENDIX 1: Lag choice in the VAR

Before cointegration analysis, it necessary to establish the appropriate lag order for the endogenous variables. Lags ranging from 1 to 8 are, thus, evaluated with a LR test and with the help of several information criteria as reported in Table 5 of the paper.

In the lags' selection, several criteria are possible. Assuming an upper limit we, first, use the LR test. It allows us to test the possibility of eliminating one lag per time, starting form the last. This procedure is commonly used, in spite of some important drawbacks: for example every null is tested conditioning on the fact that the previous are true. This implies that the significance level of the single test (that is, the I type error of the test for eliminating a lag) is different from the I type error of the full procedure. The latter increases substantially with the number of hypothesis sequentially tested. On this basis, a battery of selection criteria to reduce the probability of error might be preferred. For forecasting purposes, it may be reasonable to base the choice on measures such as the MSE (Mean Square Error) that is, the AIC (Akaike Information Criteria) and the FPE (Final Prediction Error). In order to find the "right" VAR order, it is, instead, preferable the use of an estimator such as SC (Schwarts Criteria) and HQ (Hannan-Quinn Criterion) that provide a consistent estimate of the VAR order (let p be the right VAR order and p^ the estimate, a selection criteria is consistent if $p\lim_{T\to\infty}(p\wedge) = p$ (Lutkepohl, 1991, p.130)). It is worth noting that in small sample AIC and FPE may select the right order more often than SC and HQ, on this basis, given our forecasting purpose, we mainly rely on the AIC and FPE criteria. Both selected three lags. For a full treatment of the lag selection in VAR model see Lutkepohl (1991, Chapter 4).

APPENDIX 2: Diagnostics of the VAR(3) model with dummy (1992.3, 1992.4)

We report the main diagnostic statistics of the VAR(3) model with the two dummies introduced to correct for some important outliers in the residuals series of the unemployment rate (1992.4) and employment (1992.3))

The null hypothesis that residuals are serially uncorrelated against the alternatives that they follow a VAR(1) and a VAR(4) are not rejected: LM(16) = 12.32 (0.72) and LM(16) = 10.6279 (0.83), the significance levels of the tests are in parentheses.

The LM tests for 1st order ARCH are the following: labor cost (LM(1)=0.53 (0.47)), employment (LM(1)=1.36 (0.24), unemployment (LM(1)=2.45 (0.12)), productivity (LM(1)=1.85 (0.17)).

LM tests for the 1st to 4th order ARCH are the following: labor cost (LM(4)=2.80 (0.59)), employment (LM(4)=11.55 (0.02), unemployment (LM(4)=5.10 (0.28)), productivity (LM(4)=1.95 (0.76)).

The null hypothesis of skewness 0, kurtosis 3 and the joint one are not rejected by the following Wald test statistics (and significance levels): W(4)=2.13 (0.71), W(4)=4.58 (0.33) and W(8)=6.72 (0.57).

Therefore, only the null of no ARCH effect in the employment equation is not rejected at the 1% significance level but simulation evidence (see Juselius (2002)) shows that moderate ARCH effects do not influence significantly the VAR estimates.

Furher information about the properties of the models are obtained from the roots of the estimated polynomial equation $\left| I_4 - \sum_{j=1}^{k} \Pi_j z^j \right| = 0$ (not reported, but available from authors on request), saying that the VAR is not explosive since these roots are less than 1 and some of them is close to 1, thus supporting our initial unit root approach.

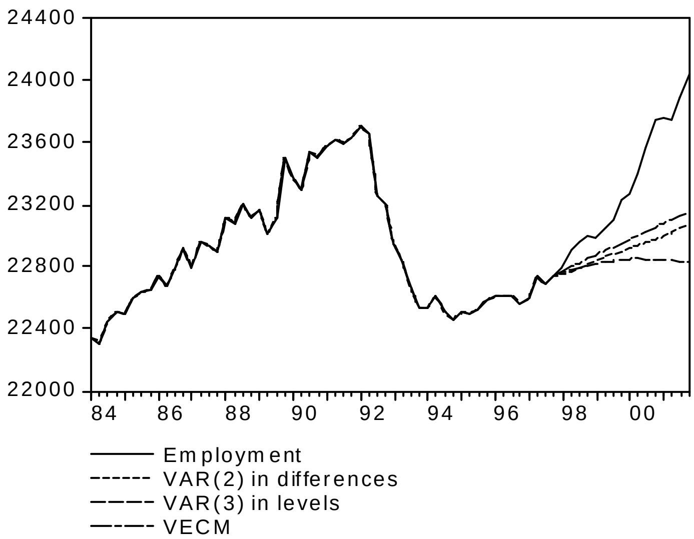
APPENDIX 3: Alternative forecasting simulation models

Since all the diagnostic tests do not signal any misspecifications (see footnote 27) our identified VECM is suitable for forecasting (possibly after some further reductions aimed at eliminating the insignificant coefficients and at increasing the efficiency of the estimates). [37] [38]

Given the restricted nature of our VECM model, we now study the properties of less restricted models that can be considered as the general forms of our estimated VECM in order to gain some insights about the "best" one. We first compare our results from VECM model with a differences model (a VAR(2) in first differences) and with a model in level (a VAR(3)).

Figure 1 presents the results of this comparison. It is clear that as far as forecasting is concerned the use of the VECM model rather than the VAR(2) makes a little difference. The choice should thus be between one of these two models and the VAR(3) in levels.[39] For it we performed a simulation exercise that considers the peculiar behaviour of the employment series from the third quarter of the 1992 on.

Figure A1 Comparisons of the different models



We estimated the three models recursively (adding two quarters per time) starting from the beginning of 1992, on this basis we projected the dynamic of the system in the subsequent three years. We expected a certain

[37] The VECM that we have used to forecast employment presents many coefficients whose significance is dubious. Generally it occurs mainly for two reasons. The first is that these coefficients are really insignificant, that is they are equal to zero in the DGP (Data Generating Process). The second is that, notwithstanding the fact that these coefficients are not equal to zero in the DGP, the data set is not sufficiently informative to make them statistically significant. So there is a problem of efficient use of limited information. The reduction of a VECM to *a subset VECM* can be pursued in several ways. If there is no a priori knowledge of the possible restrictions on the coefficients that must be estimated, one should rely on statistical criteria. "Using hypothesis tests in such a situation may create problems because the different possible models may not be nested.(....) Therefore, in subset VAR modelling it is not uncommon to base the model choice on model selection criteria..." (Lutkepohl, 1991, p.179)

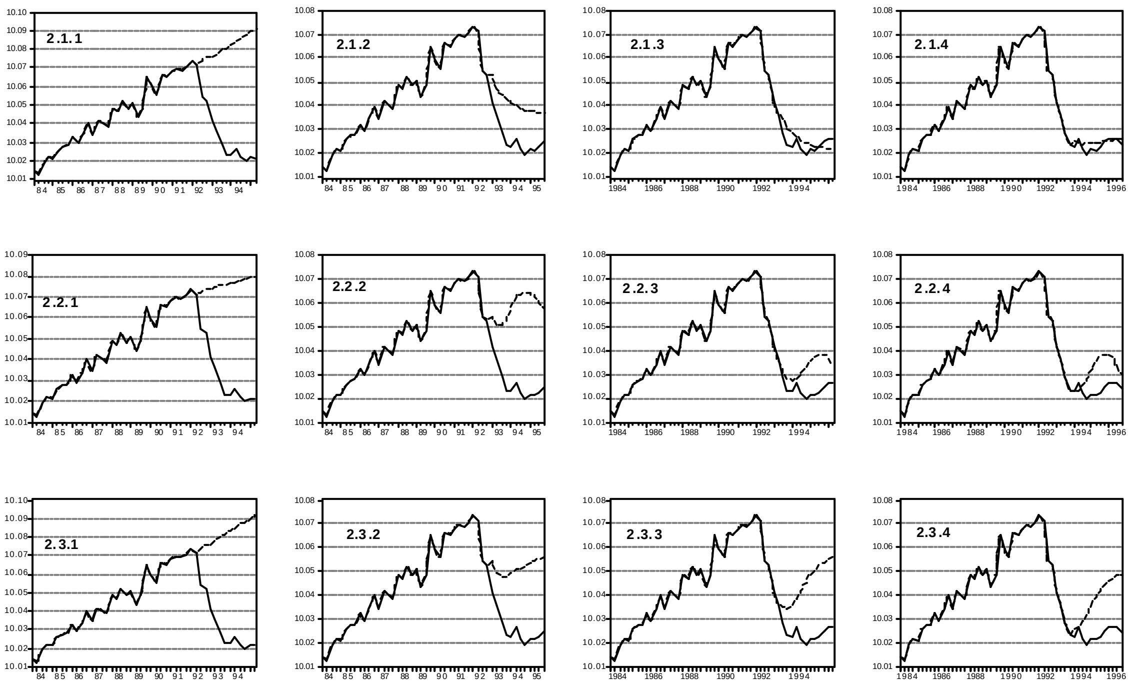
[38] We tried several reduction of our simulation models in order to increase the precision but without substantial improvements with respect to our final simulation scenario (full results are available from the authors upon request).

[39] Notice that, however, the VECM is the one that gives the minor advantage to the hypothesis of the existence of a Laffer effect for the revenues from social security contributions.

initial mismatch between projected and actual series, given the negative “jump” of the employment but, if our models (or some of them) are someway useful for forecasting, they should show their ability of “catching” the right employment trend of the period as far as new information flows are introduced as condition of the new simulations. The quicker this ability the higher the confidence that we can rely on the results of our simulations from a particular model. Figure 2 presents the results of the exercise.

The comparison between the three models indicates that the VAR(2) model is the one more able to catch that peculiar employment dynamics as for the sequence of negative shocks that hit (directly or indirectly) the employment series from the 1992 (see especially the figures 2.1.2 and 2.1.3). Nevertheless, if there exist stationary relationships among the variables considered, as in our case, the model in differences is misspecified. Therefore, to further test the robustness of the forecasts obtained with the restricted VECM in the absence of AEP, we also forecast employment, and revenues from social security contributions on the basis of the above VAR (2). The results of the simulation on a yearly basis are reported below in tables A1,A2 and A3.

Figure A2 Recursive Simulation Properties of Different Models



Legend: 1st Row: VAR(2) in differences; 2nd Row: VAR(3) in levels; 3rd Row: VECM.
Every column shows the result of a three years dynamic simulation with a model estimated adding two quarter per time starting from the model in the first columns that is estimated with the sample 1984:1 1992:2 so the fourth column contains the results of a model estimated on the sample 1984:1 1993:4 and projected until the end of 1996

Table A1. Actual and Simulated Employment (thousands of LSU)

Year	Actual	Simulated	Difference	C.I. (95%)	
1998	22916	22782	134	22481	23086
1999	23049	22865	184	22337	23406
2000	23452	22954	497	22256	23674
2001	23844	23042	802	22211	23904

Table A2 – Decomposition of the simulated employment in subordinate and self-employment

Year	*Actual Subordinate Employment*	*Actual Self-Employment*	*Simulated Subordinate Employment*	*Simulated Self-Employment*	*Employment Adding Effect of AEP*	
					Subordinates	*Self-Employees*
1998	15.939	6.977	15845	6936	93	41
1999	16.105	6.944	15977	6888	128	55
2000	16.412	7.039	16064	6890	348	149
2001	16.769	7.075	16205	6837	564	238

Table A3. Laffer effect of AEP on the revenues from social security contributions in the period 1998-2001

Year	***Actual Social Security Contributions Subordinate (A)***	***Actual Social Security Contributions Self-Employees (B)***	***Simulated Social Security Contributions Without AEP Subordinate (C)***	***Simulated Social Security Contributions Without AEP Self-Employees (D)***	***A-C***	***B-D***	***Laffer Effect of AEP on the social security contribution Revenues***
1998	137206	13502	133102	12069	4104	1433	5537
1999	140653	15234	134206	11986	6447	3248	9695
2000	147556	16760	134938	11989	12618	4771	17389
2001	154351	17326	136120	11897	18231	5429	23661

Note: all the data are expressed in millions of euro

Notice that the results do not changes significantly with respect to those reported in the paper (respectively, in table 6, 7 and 8). For example, the VECM Laffer effect for 1998 is estimated to be 5356 millions of euro with a difference with respect to the VAR(2) in differences of -181 millions of euros whereas for 1999 the difference is -311 millions of euros. We take these results as further evidence of the reliability of our benchmark forecasts.

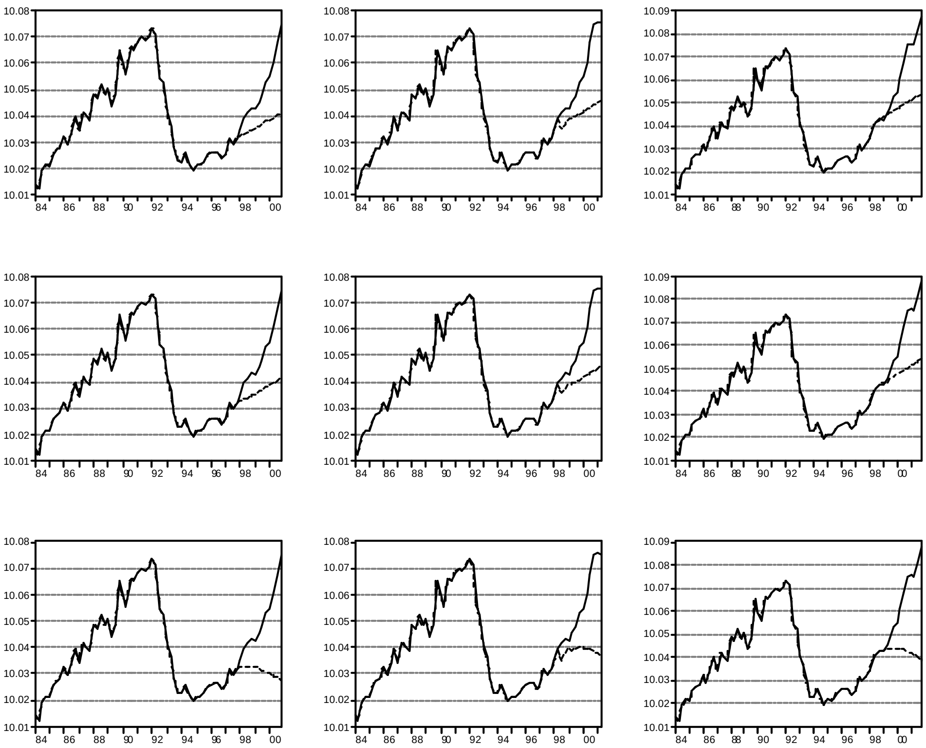
Appendix 4 : Simulation Evidence of the Non-Constancy of the models estimated up to 1997

One implicit pre-condition of our use of the models estimated up to 1997 is that they are really not able to capture the dynamics of the considered variables in the period 1998-2001, once one takes into account the uncertainty always present in every forecast (especially when there are I(1) variables). Different statistical methods exist to ascertain whether a model is able to account for the dynamic in a certain period. We can, for example, estimate a model for the full sample (1984:1 2001:4) and verify if there are some misspecification and instability signs.

None of our three models when estimated on the full sample presented relevant problems (with the exception of the rejection of some normality tests for the employment residuals in the model in differences and the impossibility of restricting the still signalled cointegrating relation as a wage function or a labour demand function). How much these last problems could signal as much instability as we need to justify the use that we did of the models (that is forecasting employment with an unchanged regime) is in doubt. In order to gain some insights on the non constancy of the empirical model in the period 1998 onward, we perform another simulation exercise starting from the beginning of 1998. Our reasoning is the following: if there is no instability from 1998, then the models (or some of them) once feed with some new observations (and with more realistic initial conditions) should be able to catch the actual dynamic. If the models will fail this proof, it shall be taken as an indirect and informal evidence that justify the use we did of the models

Figure A3 presents the results of this simulation study. Notice that none of the models is able to catch the strong cyclical increase of employment also when they have been “taught” about it. On the basis of this further evidence we can consider our forecasted employment series as fully meaningful for our purposes.

Figure A3: Recursive Simulation Properties of Different Models as Proof of Instability in the period 1998-2001



Legend: 1st Row: Differences Model; 2nd Row: VECM; 3rd Row: Model in Levels. Every column shows the result of a three years dynamic simulation with a model estimated adding two quarter per time starting from the model in the first column that is estimated with the sample 1984:1 1997:4 so the third column contains the results of a model estimated on the sample 1984:1 1998:4 and projected up to the end of 2001

APPENDIX 5: Forecasting formulas

Given a VAR model, where, in our case we define $X_t' = [y_t - e_t,\ e_t,\ l_t - e_t,\ w_t]'$ ($(y_t - e_t)$ is the (log) productivity, e_t is the (log) employment in SLU (Standard labor Unit), ur_t is the (log) unemployment rate and w_t is the (log) real wage):

$$X_t = \Phi D_t + \Pi_1 X_{t-1} + ... + \Pi_k X_{t-k} + e_t \qquad t = 1,2................ \tag{A1}$$

the forecasting *h* periods ahead in the future is obtained recursively starting from h=1 with the conditioned (with respect to the time T information set) expectation assuming that e_t *is* an IID *white-noise* process:

$$X_{T+h|T} = \Phi D_{T+h} + \Pi_1 X_{T+h-1|T} + ... + \Pi_k X_{T+h-k|T} \tag{A2}$$

where $X_{T+j|T} = X_{T+j}$ se $j \leq 0$ and the forecasting error is:

$$X_{T+h|T} - X_{T+h1|T} = e_{T+h} + \Phi_1 e_{T+h-1} + ... + \Phi_{h-1} e_{T+1} \tag{A3}$$

where $\Phi_s = \sum_{j=1}^{s} \Phi_{s-j}\Pi_j$ (s=1,2....), $\Phi_0 = I_K$ e $\Pi_j = 0$ for j>p.

Given the previous assumptions the forecast is unbiased.

The MSE matrix (*Mean Square Error*) of the forecasting h periods ahead is equal to:

$$\sum_x (h) = E\{(X_{T+h} - X_{T+h|T})(X_{T+h} - X_{T+h|T})'\} = \sum_{j=0}^{h-1} (\Phi_j \sum_e \Phi_j)' \qquad (A4)$$

This matrix, for stationary processes, converges to the variances-covariances matrix of X_t:

$$E(X_t - E(X_t))(X_t - E(X_t))' = \sum_{j=0}^{\infty} (\Phi_j \sum_e \Phi_j') \qquad (A5)$$

"...In contrast, for integrated processes the MSEs are generally unbounded as the horizon *h* goes to infinity. Thus the forecast uncertainty increases without bounds for forecasts of the distant future. This does not rule out, however, that forecasts of some components or linear combinations of $I(1)$ variables have bounded MSEs. In particular, cointegrating relations have bounded MSEs even for horizons approaching infinity because they are forecasts for stationary variables..." (Lutkepohl, 2003, p.120). The previous discussion takes as given both the DGP and its parameters. In the reality, however, we have not this information and we must estimate the parameters of the assumed GDP. The bottom line is that one should take into account the corresponding uncertainty in evaluating the forecast precision. "...the estimation uncertainty may be ignored in large samples. The same holds for setting up asymptotic forecast intervals. In small samples, it may still be preferable to include a correction term…" (see Lutkepohl, 2003 p.122 for details on VAR and VECM forecasting see also Lutkepohl, 1991, p. 27-34, 85-92, 375-380)

APPENDIX 6: Robustness check

In the framework of a VAR model with unit roots the uncertainty problem is exacerbated by the imposition of the unit root hypothesis (see Appendix 5). In order to take into account, at least, some of the uncertainty and check whether our main qualitative results in terms of elasticity of the social security contribution revenues with respect to implicit tax rate changes survive, we perform the elasticity computations by adding to and subtracting from the employment forecasts the square roots of the relevant diagonal element of the MSE matrices (*Mean Square Error*) $\Sigma_x(h)$ (see appendix 5, Eq.A4). The results of this exercise are reported in the following table A4.

Table A4. Robustness check of elasticity			
Year	***Point Forecast***	***- 1 s.d***	***+1 s.d***
1998	-4.3%	-5.2%	-3.3%
1999	-2.1%	-2.6%	-1.6%
2000	-3.9%	-4.8%	-3.3%
2001	-4.7%	-5.6%	-4.1%

From table A4 note that both the sign and the increasing behaviour over time (starting from1999) of the elasticity that we find with the points forecasts is robust to the introduction of the two-sided uncertainty.