

DEREGULATION AND “LAFFER EFFECT”:  
THE ITALIAN CASE OF EMPLOYMENT POLICIES AND SOCIAL SECURITY  
CONTRIBUTIONS’ CUTS IN THE PERIOD 1997-2001

SILVIA FEDELI, FRANCESCO FORTE, ERNESTO ZANGARI

JEL Codes: E24, E27, E62, H27

Keywords Social security contributions, Laffer effect, Labour market deregulation, Employment policies.

Silvia Fedeli, Francesco Forte, Ernesto Zangari

## Deregulation and “Laffer effect”: The Italian case of employment policies and social security contributions’ cuts in the period 1997-2001 ♦

- April 2007 -

### Abstract

An employment policy package (EP), reducing the social security tax burden and increasing flexibility in the labour market, was introduced in Italy by the centre-left Government with the aim of creating new employment. We empirically test its macroeconomic effects for the period 1997-2001. We show that EP had positive effects not only on employment, but also on the revenues from social security contributions.

Using standard time series techniques, we estimate a model of labour market with Italian data from 1980 to 1996, i.e., a model implicitly based on the old social security tax regime. On this basis we forecast the hypothetical level of employment in the absence of EP from 1997 to 2001. The results are compared with the actual data on employment and the difference is taken as a proxy of the employment generated by the EP. On this basis, we determine the difference between the actual revenues from social security contributions at reduced rates and the hypothetical revenues from social security contributions in the absence of EP, at the old contributory rate. This difference results to be positive and increasing through time showing a peculiar Laffer effect.

**Keywords:** Social security contributions, Laffer effect, Labour market deregulation, Employment policies.

**JEL Codes:** E24, E27, E62, H27

Universita' di Roma "la Sapienza",  
Dipartimento di Economia Pubblica,  
Via del Castro Laurenziano 9,  
00161 Roma,  
Italy.  
Tel.: +39 06 49766399  
Fax: +39 06 49766399  
E-mail: [silvia.fedeli@uniroma1.it](mailto:silvia.fedeli@uniroma1.it)  
[francesco.forte@uniroma1.it](mailto:francesco.forte@uniroma1.it)  
[ernestozangari@hotmail.com](mailto:ernestozangari@hotmail.com)

---

♦ We wish to acknowledge the participants to the Conference of the European Public Choice Society in Berlin and to the Meeting of the Italian Society of Public Economics in Pavia, where a previous version of this paper was presented.

## 1. Introduction

In the first half of the '90s, the unemployment rates increased rather sharply, in Italy as well as in most European countries. Because of the priority attached to this problem, a number of policy advices at both European and national governments' levels supported those employment reforms reducing the tax burden on employers in order to create new jobs possibly without reducing wage levels (European Commission (1994)). There is a wide literature on the interaction between employment and labour taxation recognising that employment tax cut and deregulation of labour market do increase employment.<sup>1</sup> No unanimous consent on the effects of these policies on the unemployment rate has been reached. For example, Daveri and Tabellini (2000) report evidence for European economies that increases of payroll taxation increase unemployment. On the other hand, Bertola and Garibaldi (2002) seem to support the thesis (Pissarides, 1998) that payroll taxation is likely independent of unemployment rate in the long run.<sup>2</sup> Leaving apart the debate on the effects on the unemployment rate,<sup>3</sup> from a supply side economics point of view, the recognised expansion of employment, due to employment tax cut and less stringent regulations of labour market, in turn, should determine a Laffer effect, with Government revenues from labour taxation overtaking those levels obtainable without these measures. As far as we know, for the Italian labour market, this Laffer effect, if any, has never been empirically measured. This paper is concerned with the Italian *employment policy package of the period 1997-2001* (henceforth EP) introduced by the Italian centre-left Government (13<sup>th</sup> legislature, 1996-2001). This package, characterised by *simultaneous* (partial) reduction of *payroll and social security* (henceforth SC) tax burden as well as (partial) deregulation of labour supply, was mainly motivated by employment growth, even at the price of SC revenues' losses. We test whether EP determined any Laffer effect on the Italian SC revenues.

Since the beginning of the '90s, production, exports and employment in Italy were adversely affected by low flexibility of labour contracts and high relative wage costs aggravated by heavy SC

---

<sup>1</sup> For example Holmlund and Kolm (1995) and Lockwood and Manning (1993) discuss the effects of different tax systems on labour costs. Pissarides (1998) analyses the difference among different (partial equilibrium) models of employment taxation and finds that, in some models, changes in structures of taxation that are revenue-neutral can have higher impact on employment than a general tax cut that reduces overall tax revenue.

<sup>2</sup> Nevertheless, they recognise that employment taxation has important effects on two dimension of the labour market such as the shadow economy and the extensive margin of labour supply. Heavy and increasing taxation, social security and administrative tax burden imposed on legal activities likely determine the upward trend of the shadow economy. In turn, the latter can reduce both the official and overall employment and increase the shadow component of employment. Stringent labour market regulations can have similar impact when rising the cost of official employment relative to that of irregular employment (see also Boeri and Garibaldi (2002)).

<sup>3</sup> Garibaldi and Wasmer (2001) show that when the size of labor force is endogenous, alongside the employment and the unemployment rate, rising payroll taxation affects participation decisions, even if neutral on the unemployment rate. Bertola et al. (2002) empirically find that the fall in the Italian employment rate is sensibly correlated with the rise in payroll taxes.

rates. In this context, many firms were induced to substitute capital for labour in production, some others to outsource their labour needs.<sup>4</sup> In this scenario, aiming at reversing the unemployment trend and at stimulating economic growth, the centre-left Italian Governments in power since May 1996, devised EP by broadening the room of adoption for the so called “atypical” labour contracts, most of which enticed by reduced SC rates. In 2001 the Legislature expired.<sup>5</sup> Therefore, the period 1997-2001 appears to us as convenient “laboratory-like” testing to assess whether the EP definite package had any Laffer effect. We show that EP remarkably increased both employment and SC revenues even in a period of weak GDP growth.

In section 2, we analyse the dynamic of the employment in order to take into account the heterogeneity of the labour contracts of the various kinds of workers. The Italian official statistics provide this information by disentangling either subordinate and semi-subordinate from independent-autonomous workers or typical from atypical labour with a sub classification of the atypical (see below). In section 3, we estimate the trend of the Italian employment with a standard small scale macroeconometric model of the labour market applied to Italian data from 1980 to 1996. The model is implicitly based on the old social security tax regime. On this basis, we forecast the level of employment for the period 1997-2001. The *ceteris paribus* forecasts are taken as the levels of hypothetical employment in the absence of EP.<sup>6</sup> These figures are compared with the actual employment given by the official data, so as to infer the effect of EP on the level of employment. It turns out that the difference is positive by important values. Among the features of the EP of the 13<sup>rd</sup> Legislature, the most appealing for firms was the reduction of SC rates allowed to a number of labour contracts. In section 4, we assess the *hypothetical revenues* of the SC in the absence of EP by multiplying the simulated employment for the period 1997-2001 and the hypothetical per capita social security contributions revenues under the assumption that the per capita social security contributions are those of 1996 increased by the rate of inflation plus the forecasted *real* wages rate of growth. We take as hypothetical SC burden, in the absence of EP, that of 1996 net of the health-care share of the SC rate, which from 1998 has been nominally transferred to the area of taxation. It turns out that a *Laffer effect* on the Government revenues did actually occur and was increasing over the considered period.

---

<sup>4</sup> 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.

<sup>5</sup> In the subsequent Legislature the new (centre-right) Government introduced a new package of labour policies, having most of its effects in 2002, when also an income tax reform took place. For these reasons, the analysis of the effects of the centre-right Government's policies, beginning in 2002, cannot be undertaken here.

<sup>6</sup> Notice that the model incorporates the rate of GDP growth and productivity of the period 1980-1996.

## 2. Some stylized facts

Figure 1 shows the dynamic of the employment in “labour standard units” (LSU)<sup>7</sup> from 1980 to 2003 and its disaggregation into “subordinate and semi-subordinate workers” and “independent-autonomous workers”. Figure 2 shows the unemployment rate of the same period. In 1980 the unemployment rate was about 3.4%. Subsequently, it persistently increased, reaching about 8.2%, in the triennium 1987-1989, because of the increase in the labour force and in spite of an important increase of the employment of the same period. The latter increase (measured in LSU), in the same period, was about 1.1 million units, from 22062000 of 1980 to 23123000 in 1989 (+4.8%) . During the biennium 1990-1991 the unemployment rate decreased to about 7.1%. The peak of employment in LSU was reached in 1991 with 23516000 units, i.e, about 1.5 million units more than in 1980 (+6.6%). Since 1992, for the first time, a remarkable decline started, reaching 22528000 LSU in 1995, a decrease of 4.2% with respect to 1991 (fig. A1 in appendix 1) in spite of wage moderation and flexibility oriented reforms following the recession of early ‘90s. This occurred, presumably because of the high costs of labour combined with the restrictive monetary and fiscal policies required to enter the European Monetary Union. The unemployment rate consequently increased, peaking at 11.8% in 1998 (see Fig. 2).<sup>8</sup>

In this context, 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,<sup>9</sup> the so called “Pacchetto Treu” (law n.196, 24/6/1997) introduced important innovations on labour contracts,<sup>10</sup> such as the job-on-loan, the new discipline for apprenticeship contracts, the reduction of social security contributions for part-time job. Subsequently, important measures defined new regulations for work overtime and for SC incentives for part-time job. Hiring subsidies, in the form of tax credits, were allowed to firms hiring workers over 25 years of age not regularly employed in the previous 2 years.<sup>11</sup>

---

<sup>7</sup> The Labour Standard Unit (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.

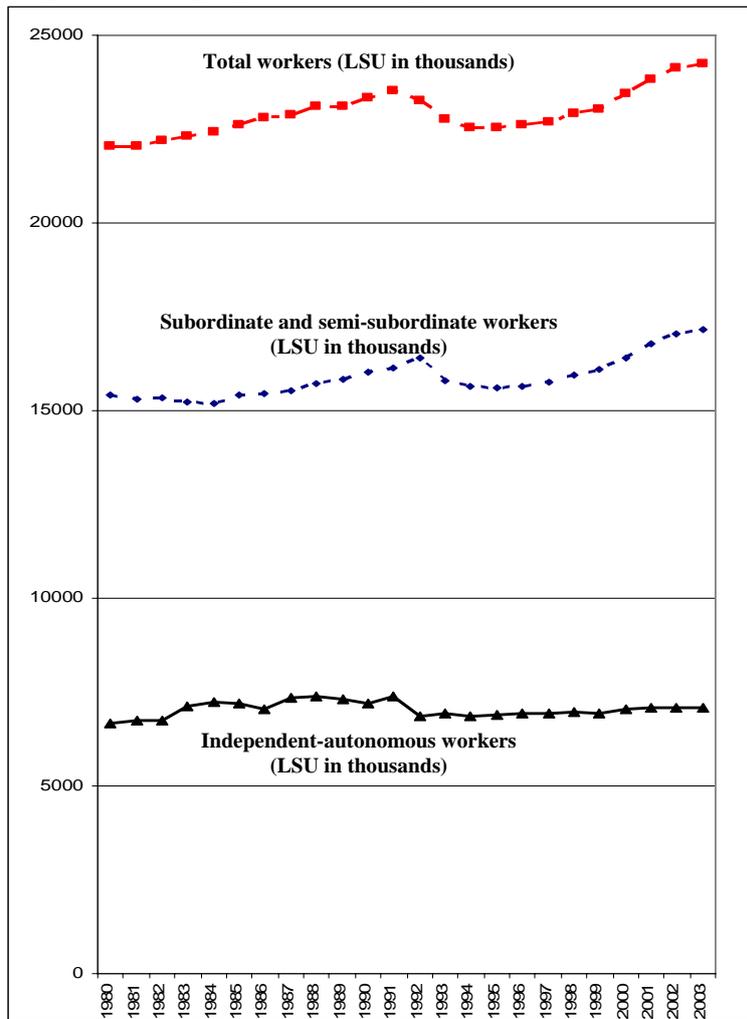
<sup>8</sup> Notice that from 1992 to 1994 the “job destruction” in LSU averaged 360 thousands jobs per year. From 1999 to 2001 new LSU in labour market averaged to about 310 thousands per year.

<sup>9</sup> For example, the law 662/1996 (introducing “*Patti Territoriali*” and “*Contratti di Programma*”) aimed at promoting economic growth and development.

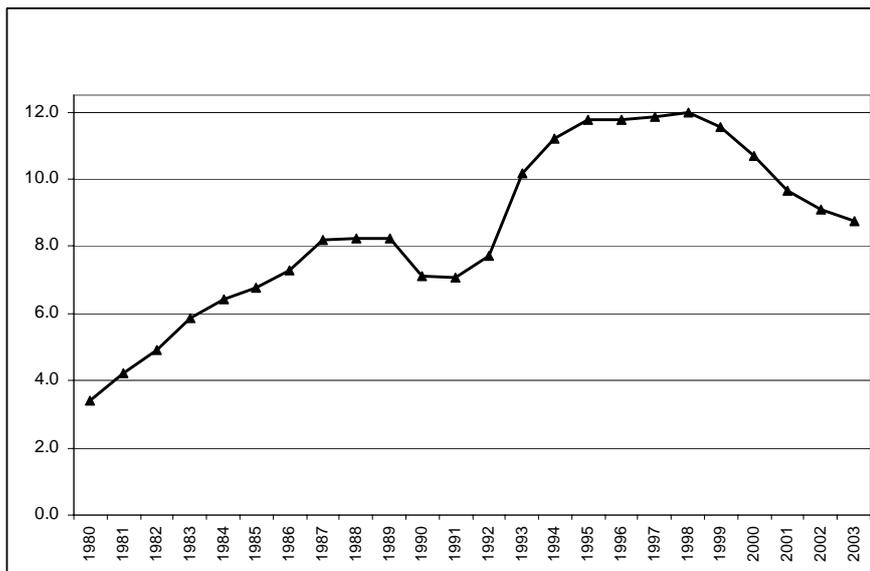
<sup>10</sup> Among others, notice also the end of the government’s monopoly of the employment agency.

<sup>11</sup> The reduced fiscal burden might have determined employment growth partially due to legalization of previously ‘black’ employment relationships.

**Figure 1. Employment in Italy (LSU in thousands)**



**Figure 2. Unemployment Rate in Italy 1980-2004 (Source: ISTAT)**



The positive effects on labour market of this EP package result from figure 1. In the five years from 1997 (the first year of the EP) to 2001, the aggregate LSU increased of 1152000 units. The EP mainly focused on the introduction of subordinated and quasi subordinated contracts, whose workers (in LSU) increased of 993000 units from 15776000 in 1997 to 16769000 in 2001. Considering the components of employment in figure 1, the positive effects on labour market of these policies due to a remarkable growth of subordinate and semi-subordinate workers at the end of 1990s are in the area of “special” and flexible legal relationships between employees and employers (also called atypical, e.g. part-time, job-on-loan, contracts of coordinated or semi subordinated continuous labour services also called *Co.Co.Co.*). Notice that the instrument, initially aimed at offering flexible labour supply in a period of unfavourable (international) trends, become quite popular among Italian firms, which exploited it not only as a short run buffer, but also as a gateway toward more permanent employment (Bertola and Garibaldi, 2002). This determined a decreasing trend of unemployment since 1998. Figure 2 shows, in the EP years, a quick downward trend of the unemployment rate, which, however, slackened in 2001.

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

		<i>Decomposition of the employment's growth rate</i>					<i>Decomposition of employment</i>	
		<i>Oct.94- Oct.97</i>	<i>Oct.97- Oct.99</i>	<i>Oct.99- Oct.00</i>	<i>Oct.00- Oct.01</i>	<i>Oct.94- Oct.01</i>	<i>Level Oct.94 (a)</i>	<i>Level Oct.01 (a)</i>
Total Employment Growth		1.0	2.9	2.8	1.2	8.1	100.0	100.0
<b>Contributions to Growth of:</b>								
<b>Self- Employed and semi subordinated</b>		<b>0.4</b>	<b>0.1</b>	<b>1.0</b>	<b>-0.2</b>	<b>1.4</b>	<b>28.8</b>	<b>27.9</b>
	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
<b>Subordinate- Employed</b>		<b>0.6</b>	<b>2.8</b>	<b>1.8</b>	<b>1.4</b>	<b>6.7</b>	<b>71.2</b>	<b>72.1</b>
	Full Time Permanent	-0.7	0.6	0.7	1.8	2.5	63.6	61.1
	“Atypical”	1.3	2.2	1.1	-0.4	4.2	7.6	11.1
<b>Details on subordinate “Atypical”:</b>								
	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: Ministero del Lavoro, Rapporto di Monitoraggio delle Politiche Occupazionali e del Lavoro

Table 1 shows the employment trend in Italy from 1994 to 2001. In the five years of EP (1997-2001) it did grow of about 6.9%. Of this rate of increase, 0.9% has to be imputed to semi subordinated workers (which in the statistic of table 1 are together, but, as from figure 1, the number of independent workers, in the considered period did not substantially change), while another 6% has to be imputed to

the subordinated workers.<sup>12</sup> Among the subordinated workers, a 3.1% has to be imputed to the ordinary full time workers with permanent job, while another 2.9% has to be imputed to the atypical workers. To sum up, of the 6.9% growth employed workers in the period from October 1997 to October 2001, a share of 2.9% has to be imputed to the atypical workers.

As already indicated, lower SC rates were associated to several “atypical” labour contracts. Table 2 gives, for the period 1990-2001, the total amounts of social security contributions paid by workers and firms and the total of gross wages and salaries for (the aggregate of) all types of labour contracts. From these figures we have derived, in the same table, the implicit average rates of SC rates for subordinate workers of the private sector during the period 1990-2001. Notice that the implicit SC rates on firms undergo an abrupt reduction of 6.5% in 1998, due to a formal change in the taxation on wages. Indeed, 6.26% SC rate for the National Health-care Service and the health care insurance<sup>13</sup> was abolished, but simultaneously a new regional tax on value added of income-type named IRAP was introduced.<sup>14</sup> The IRAP tax rate is 4.25% and its taxable basis includes labour costs gross of SC.<sup>15</sup> Table 2 shows that, in spite of the reduction of the implicit SC rate of about 14.5% from 48.8% to 41.7% of gross wages, the SC revenue in 2001 was 6.6% more than in 1996. The question, then, is whether, as for the SC revenues, the increase of employment, caused by this and some other atypical contracts (more) appealing under the EP, was sufficient to offset the negative effects of the lower taxable basis and of the lower rate per average additional employed, in comparison with the hypothetical employment without the EP.

---

<sup>12</sup> Actually the number of persons enrolled in the special fund of coordinated continuative labour did grow from 1276740 in 1997 to 2113480 in 2001. They were 974087 LSU in 1996, 1530829 in 1998, 1745.885 in 1999, 1897348 in 2000. (Altieri and Otieri, 2003)

Altieri and Otieri (2003) also show that the biggest increase in atypical works has been that of the semi subordinated labour contract, which did increase by a 65.4 % favoured by a low SC rate. The permanent part time which did increase at a 44.7 %, enticed by a reduction of the SC rates to the level of full time ordinary contracts. The temporary part time contract, which includes the “job on loan” and the seasonal workers with ordinary SC rates, increased of about 37.9%. Temporary full time contracts, which include the contracts of apprenticeship and formation of young workers, enticed by reduced SC rates, increased of about 34.1%.

<sup>13</sup> This insurance covered the loss of wages of the workers due to their absence for work caused by their illness.

<sup>14</sup> That is, Imposta Regionale sulle Attività Produttive (i.e. Regional Tax on Productive Activities).

<sup>15</sup> This tax was due to the labour costs on interest and rents paid and on profits of any organized private or public entity producing goods and services. Labour cost consists of the wages due to the workers gross of social security contributions paid by the firms. The taxable basis of IRAP as compared to that of SC contribution is about 4.25%. Thus a rate of 4.25% of IRAP corresponds to a rate of 6.26%. But the SC rates are deductible from the taxable basis of the personal income tax and of the profit tax of the companies of 33%, whereas the labour component of IRAP cannot be deducted. This benefit implied a tax saving of 2.08 % of the official 6.26% SC rate. Thus, the 6.26% SC rate abolished, on average, was actually greater than the 4.25% IRAP rate .

**Table 2. Social Contributions, Gross Wages and Salaries, Implicit Rates (as given by Social contributions Revenues/gross wages and salaries) for Employees, Market Sector,<sup>A</sup> 1990-2001 (millions of euro)<sup>B</sup>**

Year	SC paid by the firm			SC Paid by Subordinate Workers	Gross Wages and Salaries	Implicit Actual Rate Subordinate Workers (Total)	Implicit Actual Rate (firm)	Implicit Actual Rate (worker)	Gross Wages and Salaries (per thousand LSU)	SC Per Capita (millions of euro per Thousand LSU)
	Actual	Imputed	Total							
1990	62680	6480	69160	12251	159963	46.8	39.2	7.7	12.9	6.1
1991	68045	6712	74758	14227	176163	46.7	38.6	8.1	14.2	6.6
1992	71888	7161	79049	14805	185407	46.8	38.8	8.0	15.0	7.0
1993	73297	7654	80950	15783	189859	46.9	38.6	8.3	15.8	7.4
1994	75017	6539	81556	16446	194942	46.9	38.5	8.4	16.3	7.7
1995	79838	6661	86498	17174	202773	47.8	39.4	8.5	17.0	8.1
1996	84999	6928	91927	18973	212910	48.8	39.9	8.9	17.8	8.7
1997	89662	6969	96631	20350	222041	49.5	40.4	9.2	18.3	9.1
1998	80164	7260	87424	19950	233570	42.9	34.3	8.5	18.9	8.1
1999	82135	7669	89804	20348	244292	42.0	33.6	8.3	19.5	8.2
2000	86539	7931	94469	21190	256977	41.9	33.7	8.2	20.0	8.4
2001	90183	8242	98424	22368	269751	41.7	33.4	8.3	20.5	8.6

<sup>A</sup> The market sector does not include general government sector (central government + local governments + social security institutions, ISTAT, Glossario)

<sup>B</sup> The SC paid by the firms consists of an actual share (i.e., actually paid to the social security institutions) and of imputed share, i.e., the imputed contribution paid by the Ministry of labour for the workers at reduced SC rates whose pension rights remained as those related to the ordinary rates and miscellaneous welfare expenditures directly incurred by entrepreneurs in favour of their workers.

It seems clear that, mainly by means of atypical contracts, EP was paramount in increasing employment in the 1997-2001. One could contend that, without EP, an increase of employment would have occurred in any case, merely because of the improvement of the international economic conditions after 1996 reacting on the “economic variables affecting employment”. In order to verify this contention we develop a model of the labour market without EP and apply it to forecast employment in the considered years. Results show that the *ceteris paribus* increase in employment would have been smaller (see below).

### **3 Basic assumptions and procedure to value the effects of EP on employment in the private sector**

We build up a standard macroeconomic model capturing the behaviour of employment from 1980 to 1996. The model shall be used to forecast the employment in the private sector,<sup>16</sup> in the absence of

<sup>16</sup> In our macro economic model, dealing with the employment of the *private sector*, we leave out, on purpose, the sub sector of self-employed or autonomous workers. We concentrate on the effects of EP on employment and social security revenues of the private sector relating to subordinate or semi subordinate workers, who quantitatively show the most remarkable increase between 1997 and 2001. The total employment increase is 1.8% with respect to the previous quinquennium, autonomous workers also increase although at a lower pace and the public sector employment remained at almost the same levels of 1996.

EP, for the period 1997-2001. We follow the *macroeconomic* methodologies applied to the labour market by Jacobson et al. (1997), Marcellino and Mizon (2000 and 2001), Bruggemann (2006).<sup>17</sup>

The three years from 1995 to 1997 were still affected by the economic cycle characterized by a slow recovery after the jobs destruction of the beginning of the 1990s. As in standard optimizing structural models, we are implicitly incorporating the change of expectations due to the new laws, by a stable information set. The launch and subsequent application of EP had the effect of a shock affecting optimal employment and capital and therefore firms' optimal contingent plans of investment and employment. This seems to have induced the firms to move towards the new equilibrium paths.<sup>18</sup> The full package became effective during 1997, but effects were also present at the end of 1996 and in the first part of 1997. As explained above we take 1997 as the beginning year.

As in Jacobson et al. (1997) and Bruggemann (2006), our model for the 1980-1996 period shall consider the following variables:<sup>19</sup>

- (the log of) employees in the market sector, as expressed in LSU (Standard Labour Unit), ( $e_t$ );
- (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:

$$\text{UNEMPLOYMENT RATE} = \frac{\text{UNEMPLOYED PEOPLE}}{\text{LABOUR FORCE}};$$

- (the log of) real labour cost per capita at constant prices ( $w_t$ ),<sup>20</sup> where

---

<sup>17</sup> A number of paper using *microeconomic* techniques have studied different types of labour policies in different countries. Mostly these policies, labelled as “active”, consist of public expenditure interventions instead of tax cuts. A survey of the micro and macro empirical researches on the effects of active labour market policies is in Calmfors et al. (2001). They report empirical evidence for Sweden that these policies had either small positive effects on employment or that sometime during the '90s even negative effects. A less pessimistic view can be found in Zetterberg (2001) and Scarpetta (1996). Forslund and Krueger (1994) using a panel of 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. Other interesting different aspects related to the effects of active employment policies have been studied. For example, Saint-Paul (1998, 2000) and Fredriksson (1999) propose a political economy analysis of labour market policies and institutions.

Our results relate to the effects of EP from a *macroeconomic* point of view.

<sup>18</sup> Although the changed reactivity of the relevant macroeconomic variables was chiefly evident in 1998, some signs of firms' changed behaviour, as for employment in relation to growth, had already emerged in 1995 (cf. Appendix A and also see below). Taking into account these signs, our research based on data up to 1996, may incorporate a bias of “excessively optimistic” forecast of employment in the absence of EP. We have purposely adopted this approach to be able to avoid the opposite bias of an “excessively optimistic” consideration of the impact of the EP.

<sup>19</sup> The main source of our data is ISTAT, National Accounts 1970-2002 available at [www.istat.it](http://www.istat.it) and ISTAT, Labor Force Survey, Annual Publication (series 1978-2002 available upon request). We have excluded from the data set the period 1970-1979 because of a documented instability of the empirical models of the Italian labour market inclusive of this period (see, for example, Marcellino and Mizon, 2000 and 2001).

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

We test the above set of variables for cointegration, because, for forecasting purposes, we need a stable system, which requires a decision on whether to use the vector autoregressive (VAR)<sup>21</sup> model in levels or in differences. Before testing for cointegration, it is necessary to ascertain the properties of the individual series. To test the level of integration of these variables - (plots of the variables and of their first differences are in figure A1 in appendix 1) - we have performed standard unit root tests. Table 3 reports the results of the ADF tests.

**Table 3. Univariate Analysis, ADF Unit Root Tests**

Variable	Deterministic Components	Lags	ADF
<i>Employment</i>	Intercept, Trend	1	-1.89
<i>D(Employment)</i>	Intercept	0	-6.12*
<i>Labour Cost</i>	Intercept, Trend	2	-2.06
<i>D(Labour Cost)</i>	Intercept	0	-8.77*
<i>Productivity</i>	Intercept, Trend	2	-2.23
<i>D(Productivity)</i>	Intercept	0	-8.55*
<i>Unemployment Rate</i>	Intercept, Trend	0	-1.96
<i>D(Unemployment Rate)</i>	Intercept	1	-9.34*

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

The levels of the variables do not look stationary, whereas their first differences follow a stationary process.<sup>22</sup> Therefore the considered variables might form a cointegrating set (we refer to Johansen procedure for testing cointegrating relations).

Table 4 presents the relevant information for the choice of the lag length in the VAR.<sup>23</sup> On this basis, we adopt a model with two lags, including a blip dummy taking value 1 in the last quarter of 1992 to capture the change in the definition of the unemployment rate.

<sup>20</sup> This definition of wages that we shall use shows (figure 3 below) some peculiarity depending on the introduction of IRAP and its impact on the labour costs. As mentioned, notice that IRAP on the labour cost is non deductible as a cost from the gross revenue of taxpayers unlike the health SC that has replaced. Therefore, the equivalence of burden with them that we have assumed, merely referring on its rate, is correct only from its revenue point of view, not from the point of view of the aggregate revenue of the Government. From this point of view it represents an extra burden providing a greater revenue.

<sup>21</sup> This kind of models appears to be powerful to describe data and provide reliable multi-step benchmark for forecasting (Stock and Watson, 2001).

<sup>22</sup> From the figure A1 in appendix 1, notice that, although stationary, the growth rates of the variables present several outliers and, as for the unemployment rates, a possible changing variance overtime. These features of the data can be important in the modelling process.

<sup>23</sup> In order to establish the appropriate lag order for the endogenous variables we evaluate lags ranging from 1 to 8 with a LR test and several information criteria. 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 from the last. This

**Table 4. Lag Order Selection Criteria of the VAR**

Lag	LogL	LR	FPE	AIC	SC	HQ
0	496.8632	NA	9.84E-13	-16.29544	-16.01619	-16.18621
1	801.0741	547.5797	6.64E-17	-25.90247	-25.06473*	-25.57478*
2	818.4809	29.01139	6.40E-17*	-25.94936*	-24.55313	-25.40322
3	822.8640	6.720653	9.63E-17	-25.56213	-23.60741	-24.79753
4	831.7805	12.48314	1.27E-16	-25.32602	-22.81280	-24.34296
5	844.1810	15.70725	1.53E-16	-25.20603	-22.13433	-24.00452
6	869.2293	28.38816*	1.26E-16	-25.50764	-21.87745	-24.08767
7	880.1988	10.96942	1.72E-16	-25.33996	-21.15127	-23.70153
8	893.9973	11.95877	2.30E-16	-25.26658	-20.51940	-23.40969
* 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						

The next step consists in exploring whether one or more long run attractors (cointegrating relationships) do exist for the system.<sup>24</sup> The determination of the cointegrating rank is carried out with Johansen trace test (1995). The results of the tests are in Table 5.<sup>25</sup>

**Table 5. Johansen Cointegration Test**

Eigenvalue	Trace	Trace*	H0: r	Frac95	P-value	P-value*
0.3001	63.6823	59.1548	0	47.21	0.0498	0.1159
0.2500	40.1300	31.7449	1	29.68	0.0917	0.4083
0.1923	21.1451	17.6717	2	15.41	0.1757	0.3740
0.1013	7.0484	6.1277	3	3.76	0.3495	0.4549

With the asymptotic critical value the test rejects the null (p-value=0.0498). When the trace statistic is corrected to consider the fact that the empirical distributions can differ from the asymptotic ones, the null is not rejected at standard significance levels (p-value=0.1159). Notice, however, that there is some evidence in the literature that the small sample correction to the trace test does not work

---

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 hypotheses 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 estimators such as SC (Schwartz Criteria) and HQ (Hannan-Quinn Criterion) that provide a consistent estimate of the VAR order (see Lutkepohl, 1991, p.130). It is worth noting that in small samples 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 select two lags. For a full treatment of the lag selection in VAR model see Lutkepohl (1991, Chapter 4).

<sup>24</sup> If the variables are not stationary and if among them there are not long run relationships then the correct strategy would be differencing them before performing the multivariate analysis. If, instead, the cointegration tests signal the existence of long run relationships between the levels of the variables, then differencing does not appear to be the best strategy. It would imply the loss of likely important information.

<sup>25</sup> Note that in table 5, the trace\* is the test statistic with a small sample adjustment, r is the number of cointegrating relationships, Frac95 is the 95% critical value and finally p-value and p-value\* are basically the decision rules of the test on the basis of the asymptotic or small sample distributions, respectively.

very well (see Nielsen 2004). Therefore, we interpret these results as signalling the existence of one long run relationship between the variables.<sup>26</sup>

Since the estimated (unrestricted) model does not present problems<sup>27</sup> (see appendix 2, table A1 for the estimates), it can be suitable for dynamic forecasting as follows.<sup>28</sup> Given a VAR model

$$X_t = \Phi D_t + \Pi_1 X_{t-1} + \dots + \Pi_k X_{t-k} + \varepsilon_t \quad t = 1, 2, \dots$$

where,  $X_t' = [y_t - e_t, e_t, ur_t, w_t]'$ , with  $(y_t - e_t)$ =(log) productivity,  $e_t$ =(log) employment in LSU (Labor Standard Unit),  $ur_t$ =(log) unemployment rate and  $w_t$ =(log) real wage). The forecasts  $h$  periods ahead in the future are obtained recursively starting from  $h=1$  as the linear projections conditional on the information set at the end of 1996 and assuming that  $\varepsilon_t$  is an IID white-noise process:

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

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

$$X_{T+h|T} - X_{T+h|T} = \varepsilon_{T+h} + \Phi_1 \varepsilon_{T+h-1} + \dots + \Phi_{h-1} \varepsilon_{T+1}$$

with  $\Phi_s = \sum_{j=1}^s \Phi_{s-j} \Pi_j$  ( $s=1, 2, \dots$ ),  $\Phi_0 = I_K$  e  $\Pi_j = 0$  for  $j > p$ . Thus the forecast errors have zero mean and, hence, the forecasts are unbiased.<sup>29</sup>

<sup>26</sup> In order to decide the number of cointegrating relationships, we also look at the roots of the companion form of the VAR imposing one cointegrating relationship. The largest root of the companion form different from 1 is equal to 0.72 and might be safely considered less than one from a statistical point of view. Therefore we can estimate the VAR in levels.

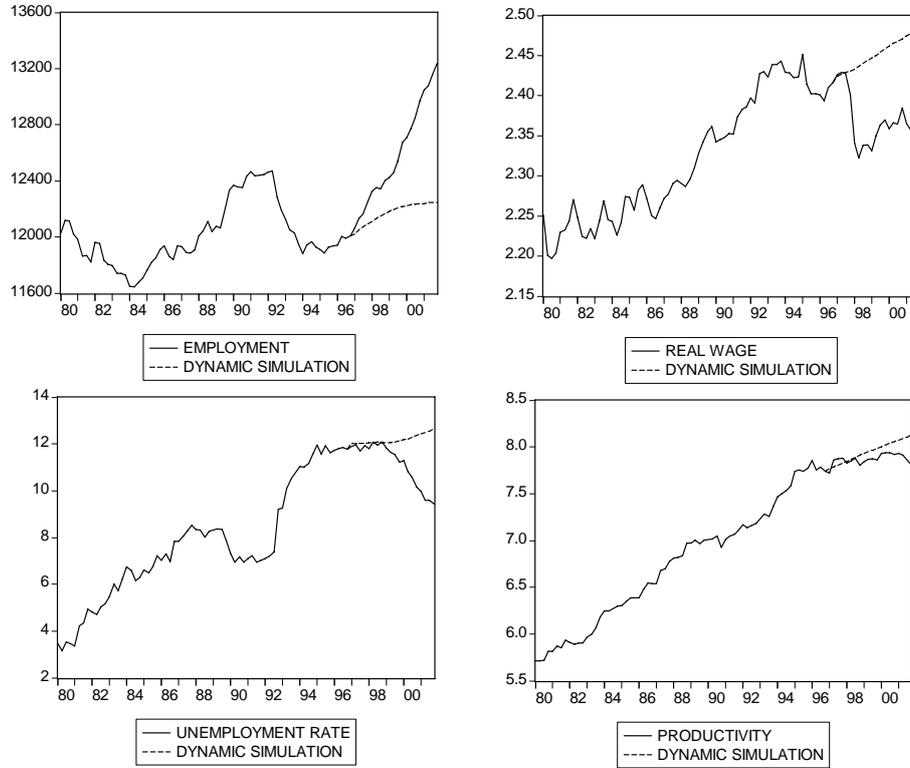
<sup>27</sup> The null hypotheses of no residual autocorrelation up to lag four and eight are not rejected (Chi-Sqr(32)=35.54 (0.30.52), Chi-Sqr(96)=87.98 (0.70.78) respectively). The LM tests of no serial correlation at lags one, four and eight do not reject the null (LM(16)=5.61 (0.99), LM(16)=13.85(0.61), LM(16)=9.70(0.88) respectively). The normality is not rejected both at univariate and multivariate level and the same is true for the (joint) null of homoschedasticity of the residuals (see the appendix 2 for details).

<sup>28</sup> In order to check whether the model's simulations are built on a sound basis, we checked how well the model predicts the time up to the EP-reform in 1997. With this purpose we shortened down the period up to 1993 and forecasted the pattern for 1994, 1995 and 1996. The out-of-sample forecasts show that the estimated model is able to predict the employment dynamics since 1994, but since 1998 the forecasted employment is quite below the actual level. The exercise shows that our simulated development is a valid measure of the contra factual development. The results of the exercise are available from authors on request.

<sup>29</sup> The joint forecast error covariance matrix for all forecasts up to horizon  $h$  is:

Figure 3 shows the forecasting results for the four endogenous variables in the EP period 1997-2001.<sup>30</sup> Table 6 reports the results of the simulation for employment on a yearly basis.

**Figure 3. Dynamic Simulation of the Italian Labour Market 1997-2001**



**Table 6. Actual and hypothetical employment (thousands of LSU) of the market sector**

Year	Actual	Hypothetical	Difference	C.I. (+/- 1 S.D)	
1997	12155	12060	95	11965	12155
1998	12356	12139	217	11983	12298
1999	12522	12192	331	12007	12380
2000	12823	12227	596	12035	12423
2001	13129	12248	882	12053	12446

$$Cov \begin{pmatrix} X_{T+1} - X_{T+h|T} \\ \vdots \\ X_{T+h} - X_{T+h|T} \end{pmatrix} = \begin{bmatrix} I & 0 & \dots & 0 \\ \Phi_1 & I & & 0 \\ \vdots & & \ddots & \vdots \\ \Phi_{h-1} & \Phi_{h-2} & \dots & I \end{bmatrix} (\Sigma_\varepsilon \otimes I_h) \begin{bmatrix} I & 0 & \dots & 0 \\ \Phi_1 & I & & 0 \\ \vdots & & \ddots & \vdots \\ \Phi_{h-1} & \Phi_{h-2} & \dots & I \end{bmatrix}$$

Assuming normally distributed innovations, these results can be used for setting up forecast intervals as:

$$[X_{v,T+h|T} - c_{1-\gamma/2} \sigma_k(h), \quad X_{v,T+h|T} + c_{1-\gamma/2} \sigma_k(h)]$$

where  $c_{1-\gamma/2}$  is the  $\left(1 - \frac{\gamma}{2}\right)100$  percentage point of the standard normal distribution,  $X_{v,T+h|T}$  denotes the  $v$ -th component of  $X_{T+h|T}$  and  $\sigma_k(h)$  is the standard deviation of the  $h$ -step forecast error for the  $v$ -th component of  $X_t$  (for details, see Lütkepohl, 1991).

<sup>30</sup> The dynamic simulation has been performed with Eviews.

The results of the simulation in table 6 shows that the model estimated until 1996, with unchanged employment and tax policies, is not able to describe the *actual employment trend* of the period 1997-2001 under the EP period. The difference between the actual employment and the hypothetical employment without the new policies begins to emerge in 1997<sup>31</sup> and displays its relevance at an increasing pace in the subsequent years. Although, the estimated hypothetical employment (see Table 6) is subject to wide confidence intervals, notice that only in 1997 the hypothetical value of the employment in the upper bound of the interval is equal to the actual employment. This result may be due to the fact that the EP in 1997 was not yet entirely in operation, while in the subsequent years even this extreme hypothetical value is lower than the real one. From 1998 the actual employment is *neatly* above the upper bound of the forecasting bands, meaning that the differences between actual and hypothetical employment are significant from the statistical point of view after an initial (gradual) adjustment. Notice, further, that the actual productivity in the simulation period is lower than the forecasted one, with the mentioned exception of the first year.<sup>32</sup> Overall, therefore, the hypothetical values appear as a test of the positive effects of the EP on employment.

#### **4. The Laffer effect of the new EP package**

Given the success of the new EP policy in terms of increased employment, we now assess its effects on the government SC revenues from 1997 to 2001. We shall compare the actual revenues with hypothetical Government revenues in the absence of EP.

In order to work out the social contributions suitable for the simulation, we multiply the hypothetical (*ceteris paribus*) employment of each year by a hypothetical (*ceteris paribus*) measure of the per capita social contributions. The latter measure is not straightforward because of the introduction of the new income-type value added tax on firms and professionals replacing the abolished components of the SC rate financing the health-care system since 1998. Therefore we take the 1996 legal average SC rates (that was 48.98%)<sup>33</sup> and subtract the 6.26 percentage points (of the

---

<sup>31</sup> See section 1.

<sup>32</sup> Referring to the employment increase in the second half of the 1990s, Bertola and Garibaldi (2003) write "...Italy has been able to generate many jobs, despite still rather restrictive fiscal policy....and despite a sharp cyclical slowdown. This is welcome, since its employment rate (even after its strong recent increases) stands at only 55.8% of working-age population, far below the EU target of 70% by 2010. Of course, productivity growth (sustaining wage growth) is needed to make high employment appealing, and this has been lacking in recent years". We add that productivity growth might also make employment increase long lasting.

<sup>33</sup> 48.98% is the average legal rate for industrial sector (source Bank of Italy) before the introduction of IRAP.

abolished SC rate for health care), thus, obtaining a hypothetical level of 42.72%.<sup>34</sup> On this basis, since in 1996, with a rate of 48.98%, the average social security contributions per thousand workers were 8.7 millions of euros, we infer that, with a rate of 42.72%, they would have been 7.59 millions of euro. The average SC per thousand workers equal to 7.59 millions of euro in 1996, for the period 1998-2001,<sup>35</sup> is then assumed to grow with the rate of inflation plus the rate of growth of real wage as forecasted by our simulation with respect to 1996.

We derive our results for the Laffer effect of the EP for the revenues of the social security contributions using the point forecasts. In order to take into account of the uncertainty in the employment and labour cost projection, we perform the computations by considering a confidence interval for the point forecasts equal to +/- 1 standard deviations. The results of this exercise are reported in table 7, where it is shown the percentage increase of the SC revenues for the point employment forecasts and for the upper and lower bounds of the projection both in level and in terms of GDP.

---

<sup>34</sup> As noted , this burden, because non deductible as cost, on average was actually, greater, than that of the rates of SC for the National health-care service abolished.

<sup>35</sup> Recall that in the year 1997, IRAP was not introduced. Therefore the hypothetical per capita SC in 1997 is obtained by taking 8.7 millions of euro per thousand of workers of SC obtained in the absence of IRAP in 1996 and making it grows at the rate of inflation plus the forecasted rate of growth of real wages in 1997 with respect to 1996.

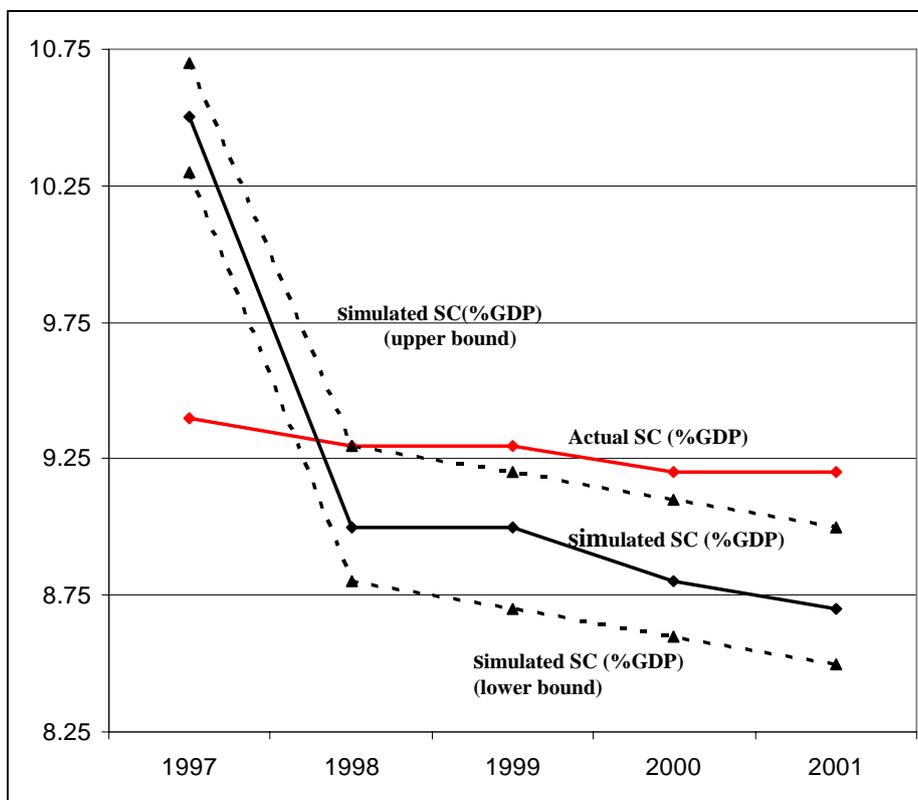
**Table7. Laffer effects of the 1997-2001 EP in absolute value and as percentage of GDP**

Year	Implicit SC Rate for Subordinate Workers )	Actual SC revenues (A)	Hypothetical SC revenues (point estimates) (B)	Hypothetical SC revenues for the lower bound of the simulation (C)	Hypothetical SC revenues for the upper bound of the simulation (D)	H-Laffer effect: difference between actual and hypothetical SC revenues (A-B) Point estimates	H-Laffer effect: difference between actual and hypothetical SC revenues (A-C) Lower bound	H-Laffer effect: difference between actual and hypothetical SC revenues (A-D) Upper bound	Actual SC revenues (% GDP) (A')	Hypothetical SC revenues (point estimates) (%GDP) (B')	Hypothetical SC revenues for the lower bound of the simulation (%GDP) (C')	Hypothetical SC revenues for the upper bound of the simulation (%GDP) (D')	H Laffer effect: difference between actual and hypothetical revenues (%GDP) (A'-B')	Laffer effect: difference between actual and hypothetical revenues (%gdp) (A'-C') Lower bound	Laffer effect: difference between actual and hypothetical revenues (%gdp) (A'-D') Upper bound
1997	43.24*	96099.4*	107628	105779	109501	-11529	-9680	-13402	9.4*	10.5	10.3	10.7	-1.123	-0.943	-1.306
1998	42.9	100114	96898	94568	99272	3216	5546	842	9.3	9.0	8.8	9.3	0.3	0.517	0.079
1999	42	102483	99497	96807	102247	2986	5677	236	9.3	9.0	8.7	9.2	0.27	0.513	0.021
2000	41.9	107729	102794	99909	105745	4935	7820	1984	9.2	8.8	8.6	9.1	0.423	0.67	0.17
2001	41.7	112551	106286	103268	109374	6265	9283	3177	9.2	8.7	8.5	9.0	0.514	0.762	0.261

\* The implicit rate and the actual SC revenues of 1997 are corrected to consider the introduction of IRAP

The results given in table 7 are reported in figures 4 and 5, which show the trend over time of the actual SC revenues, the hypothetical revenues in absence of EP and the difference between them. Notice here the behaviour of both actual and simulated revenues between 1997 and 1998. They show a reduction in real terms also dependent on the economic cycle: in 1998 the unemployment reached its peak and Italy experienced a remarkable fiscal effort (reaching the 6% primary budget surplus) in order to gain the EMU membership. Moreover, recall the already mentioned reduction of the SC rate not dependent on EP, but due to the introduction of IRAP, which revenues enter a different area of taxation.

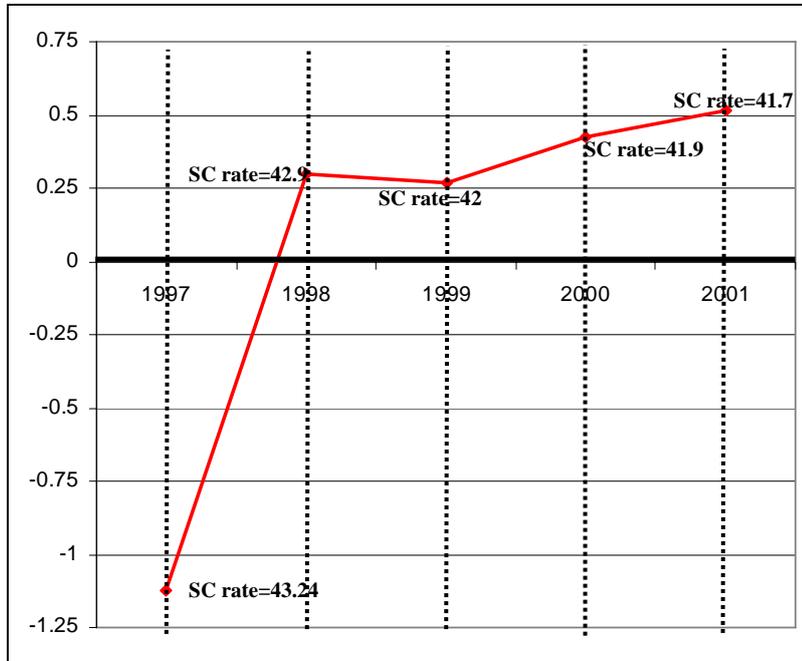
**Figure 4. The trend over time of the difference between the actual and the hypothetical SC revenues in absence of EP**



While the time trend of the actual and hypothetical SC revenues is overall decreasing for both figures, their difference (figure 5) becomes positive in 1998, showing a slight reduction in 1999, when the trend becomes persistently increasing up to 2001. This may be considered as a peculiar Laffer effect of the EP only due to both a more flexible labour policy and a reduced SC burden affecting an important share of the new employment (it has been explored in Fedeli and Forte, 2006). Notice that this effect seems similar to the effect on the revenue of a firm due to a reduction of prices applied only to a share of the product (e.g., a kind of price discrimination that opens new opportunities for the consumer' choices). It should be noted, however, that the employment was also characterised by a

quite large shadow and “irregular” components likely to “emerge” after the EP. Less stringent labour market regulation and lower SC burden might have also had the effect of increasing the cost of unofficial employment relative to the official one, with the positive result in terms of government SC revenues as shown in figure 5.

**Figure 5. Difference between Actual and simulated SC revenues (share of GDP)**



This over time trend can be explained in the light of the role of taxpayers’ expectation, which in the standard Laffer analyses are implicitly assumed almost passive as if any government policy change was permanent (see Buchanan and Lee, 1982a and 1982b; Buchanan and Brennan 1985). Nevertheless, if taxpayers model the government behaviour on the basis of the standard revenue maximizer government model, they might not react to the tax cut as if it was permanent and the government additional SC revenues might get lost. Yet, if the government recognises the additional revenues potentially available from SC rate reduction and it wants to exploit this potential, the government has to convince taxpayers that the SC rate reductions are permanent. Therefore, the government has to bind to the announced policy either with a commitment on SC rate cut or with a fiscal limit of any kind. In other words taxpayers (workers and employers), after the remarkable tax cut between 1997 and 1998, observed between 1998 and 1999 a lower cut and remained possibly skeptical of the willingness of the government to continue in future years the announced EP. Since 1999, however, the government convinced taxpayers that commitment was actually into force, with the result of figure 5 of a persistent remarkable increase of the SC revenues.

## 6. Conclusions

The Employment Policy was introduced in Italy, by means of partial deregulation of labour market and partial reduction of SC rates with the aim of increasing employment and fostering economic growth, even at the cost of a loss of social security contributions revenues. We have shown a short run increasing level of employment generated by the EP. Moreover, although the GDP rate of growth remained below the previous Italian average and below the European average, EP had also positive effects on SC revenues. This *Laffer effect* was increasing over the considered period.

A main reason of these results is that the EP provided a room for flexibility of labour supply. The new opportunities 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 hire the new worker, *were paramount together with the reduced SC rates* in determining this extended Laffer effect. The two factors cannot be disentangled. Thus, what we have empirically tested is that the combination of tax reduction and (partial) deregulation of the labour supply, *together*, can generate a quite relevant increase of revenue with increasing (likely cyclical) effects through time. Notice that if the increase in the new atypical forms of labour contract was accompanied by a reduction in the subordinate workers contracts, one might not have had the Laffer effect. In our case Laffer effects are important likely because the partial flexibility of the labour contracts increased the marginal supply of labour without reducing the supra marginal as compared with the hypothetical situation without EP. This may be an interesting lesson in optimal taxation theory.

## References

- Altieri G., and C. Otieri (2003), Terzo Rapporto sul Lavoro Tipico in Italia: verso una stabilizzazione del precariato?, IRES (CGIL), Roma.
- Banca d'Italia, *Relazione Annuale*, Anni 1990-2001.
- Bean, C., Layard, P.R.G. and S.J. Nickell, (1986), The Rise in Unemployment: A Multicountry Study, *Economica* 53, 1-22.
- Bertola, G., F.D. Blau and L.M. Kahn (2002) Labor Market Institutions and Demographic Employment Patterns, CEPR DP3448, NBER w9043.
- Bertola G. and P. Garibaldi, (2003), The Structure and History of Italian Unemployment, CESifo Working Paper No.907.
- Bruggemann, R. (2006), Sources of German unemployment: a structural vector error correction analysis, mimeo, Berlin University, forthcoming *Empirical Economics*.
- Boeri, T. and P. Garibaldi, (2002), Shadow Employment and Unemployment in a Depressed Labor Market, <http://web.econ.unito.it/garibaldi/>.

Buchanan J. M. and D. R. Lee, (1982a) Tax Rates and Tax Revenue in Political Equilibrium Economic Inquiry re-edited in J. M. BUCHANAN, *Collected Works, Volume 13.*, (2000) *Politics as Public Choice*, Indianapolis, Liberty Fund p.466-4.

Buchanan J. M. and D. R. Lee, (1982b) Politics, Time and the Laffer Curve, *Journal of Political Economy*, 1982.

Buchanan J. M. and G. Brennan (1985), The Reason of rules. *Constitutional Political Economy*.

Calmfors, L., A.Forslund, and M. Hemstrom, (2001), Does Active Labor Market Policy work? Lessons from the Swedish Experience, *Swedish Economic Policy Review* 8, 125-132.

Carstensen, K. and G.Hansen, (2000), Cointegration and Common Trends on the West German Labor Market, *Empirical Economics* 25, 475-493

European Commission (1994), Growth, Competitiveness, Employment: The challenges and ways forward into the 21<sup>st</sup> Century. White Paper, Office for Official Publications of the European Community. Luxembourg.

Fedeli, S. and F.Forte (2006), Labour deregulation and the hidden Laffer curve: Empirical evidence from Italy (1997-2001), *Mimeo*.

Fredriksson, P. (1999), The Political Economy of the Public Employment Programs, *Journal of Public Economics* 72, 487-504.

Forlund, A. and A. Krueger (1994), An Evaluation of the Swedish Active Labor Market Policy: New and Received Wisdom, *NBER Working Paper No.4802*.

Daveri, F. and G. Tabellini, (2000), Unemployment, growth and taxation in industrial countries, *Economic Policy* 30, p. 47-104.

Holmlund, T. and A.S.Kolm, (1995), Progressive Taxation, Wage Setting and Unemployment: Theory and Swedish Experience, *Swedish Economic Policy Review* 2, p.423-460.

Garibaldi, P. and E. Wasmer (2001), Labor Market Flows and Equilibrium Search Unemployment, *IZA Discussion Paper* 406.

Jacobson, T., A. Vredin, and A.Warne, (1997), Common trends and hysteresis in Scandinavian Unemployment, *European Economic Review* 41, 1781-1816.

Johansen, S. (1995) *Likelihood-Based Inference in Cointegrated Vector Autoregressive Models*, Oxford University Press.

Lockwood, B. and A. Manning, (1993), Wage Setting and the Tax System, *Journal of Public Economics* 52, p. 1-29.

Lütkepohl, H. (1991) *Introduction to Multiple Time Series Analysis*, Springer Verlag, Berlin.

Marcellino, M. and G.E.Mizon, (2000), Modelling shifts in the wage-price and unemployment-inflation relationships in Italy, Poland and the UK, *Economic Modelling* 17, 387-413.

Marcellino, M. and G.H.Mizon (2001), Small System Modelling of Wages, Inflation, Unemployment and Output per Capita in Italy 1970-1994, *Journal of Applied Econometrics*, Vol. 16, No. 3, p. 359-370.

Ministero del Lavoro, *Rapporto di Monitoraggio sulle Politiche Occupazionali e del Lavoro, Anni 2000-2002*.

Ministero del Tesoro, *Relazione sulla Situazione Economica del Paese, Anni 1990-2001*.

Nielsen, B. (2004), On the distribution of the likelihood ratio test statistics for cointegration rank, *Econometric Review*.

Pissarides, C. (1998), The impact of employment tax cuts on unemployment and wages, *European Economic Review* 42, p.155-183.

Saint-Paul, G. (1998), A Framework for Analyzing the Political Support for the Active Labor Market Policy, *Journal of Public Economics* 67, 151-165

Saint-Paul, G. (2000), *The Political Economy of Labor Market Institutions*, Oxford University Press.

Scarpetta, S. (1996), Assessing The Role of Labor Market Policies and Institutional Setting on Unemployment: A Cross Country Study, *OECD Economic Studies* No.26.

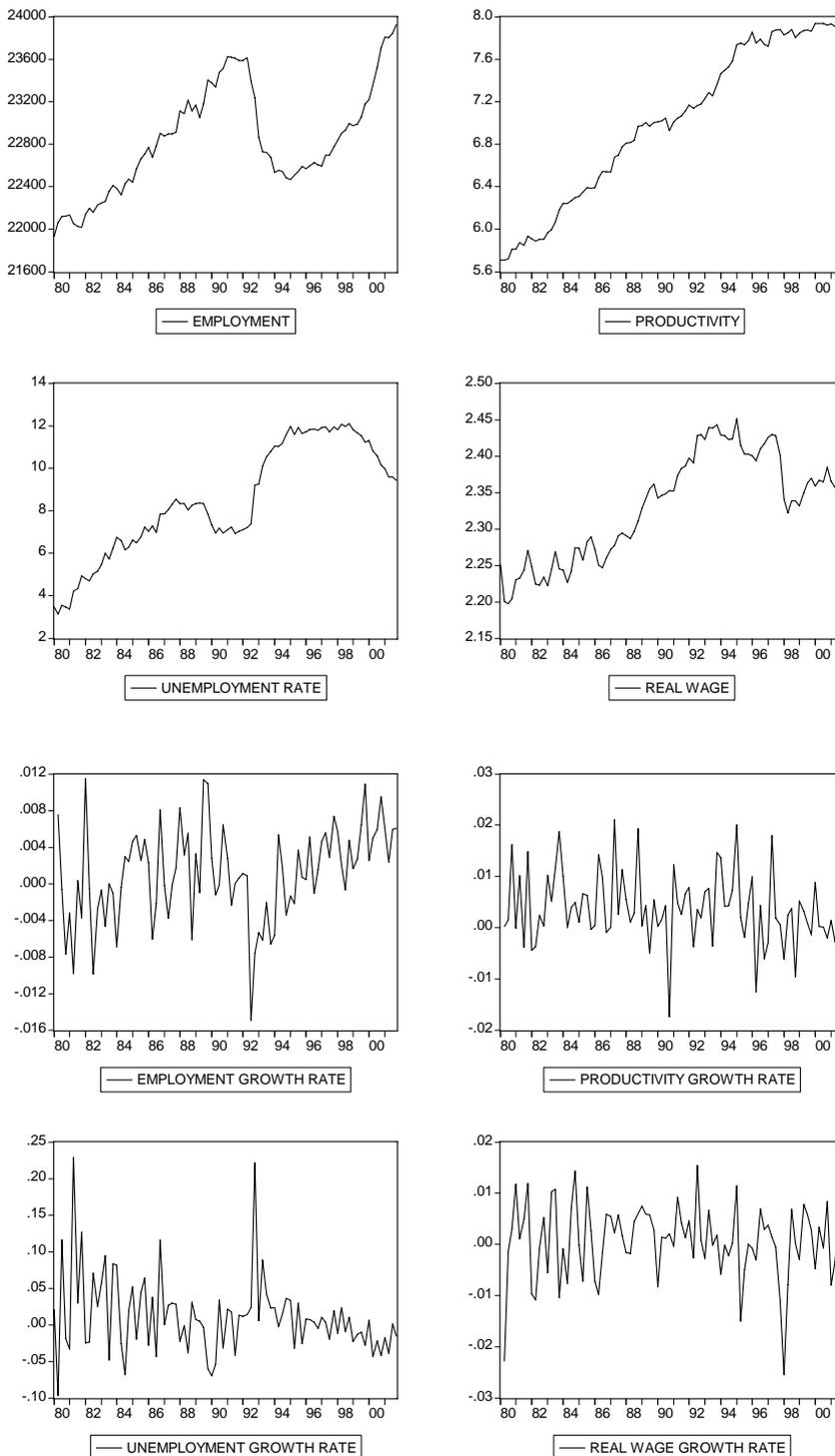
Stock, J.H. and W.W. Watson, (2001), Vector Autoregressions, *Journal of Economic Perspectives*, American Economic Association, vol. 15(4), 101-115.

Zetterberg, J. (2001), Comments on Lars Calmfors, Anders Forslund and Maria Hemstrom: Does Active Labor Market Policy work? Lessons from the Swedish Experience, *Swedish Economic Policy Review* 8, pp.125-132.

## APPENDIX 1: The data

The dataset consists of quarterly observations of the variables defined in the main text from the Italian labour market ranging from 1980 to 2001 (source: ISTAT National Accounts). Notice the “job destruction” following the 1992 recession and the strong growth from 1997 of the employment. The unemployment rate shows a large outlier in the last quarter of 1992 due to a definitional change that we capture with a blip dummy variable in our statistical model.

**Fig. A1. Quarterly Observations of Italian Labour Market Variables 1980-2001**



**APPENDIX 2: The Estimates and the Diagnostics of the final VAR(2) model <sup>36</sup>**

Table A1 presents the VAR estimates.

<b>Table A1. Vector Autoregression Estimates</b>				
Sample(adjusted): 1980:3 1996:4				
Standard errors in ( ) & t-statistics in [ ]				
	Labour Cost	Employment	Productivity	Unemployment Rate
Labour Cost(-1)	0.868537 (0.12696) [ 6.84078]	0.086127 (0.09755) [ 0.88295]	0.172388 (0.14462) [ 1.19197]	1.021047 (0.97071) [ 1.05185]
Labour Cost(-2)	-0.101936 (0.11569) [-0.88112]	-0.176892 (0.08888) [-1.99020]	-0.045158 (0.13178) [-0.34268]	-0.095212 (0.88450) [-0.10765]
Employment(-1)	-0.397111 (0.20462) [-1.94071]	1.324815 (0.15721) [ 8.42717]	-0.266978 (0.23308) [-1.14542]	-3.285731 (1.56444) [-2.10026]
Employment(-2)	0.467873 (0.21258) [ 2.20090]	-0.384590 (0.16332) [-2.35477]	0.360307 (0.24215) [ 1.48794]	1.900087 (1.62530) [ 1.16907]
Productivity(-1)	-0.125542 (0.13071) [-0.96046]	0.187183 (0.10042) [ 1.86394]	0.615782 (0.14889) [ 4.13577]	-0.659697 (0.99935) [-0.66012]
Productivity(-2)	0.213880 (0.12643) [ 1.69166]	-0.135286 (0.09714) [-1.39275]	0.223344 (0.14402) [ 1.55081]	0.805308 (0.96664) [ 0.83310]
Unemployment Rate(-1)	-0.003244 (0.01621) [-0.20012]	0.003157 (0.01245) [ 0.25348]	-0.009882 (0.01846) [-0.53525]	0.601119 (0.12392) [ 4.85074]
Unemployment Rate(-2)	-0.002481 (0.01628) [-0.15243]	-0.006579 (0.01251) [-0.52601]	0.040313 (0.01854) [ 2.17394]	0.241321 (0.12446) [ 1.93888]
C	-0.622932 (0.68616) [-0.90785]	0.544726 (0.52717) [ 1.03331]	-0.731187 (0.78160) [-0.93550]	12.29820 (5.24605) [ 2.34428]
D92_4	-0.005939 (0.00720) [-0.82439]	-0.001922 (0.00553) [-0.34720]	-0.006969 (0.00821) [-0.84918]	0.155923 (0.05508) [ 2.83080]

The main diagnostic tests of our VAR(2) model are then presented. As for autocorrelation, we report both the multivariate Box-Pierce/Ljung-Box Q-statistics (also the adjusted Q-statistics with a small sample correction) (see Lutkepohl ,1991, 4.4.21 & 4.4.23 for details) and the LM statistics (see Johansen, 1995, p.22). As for the normality tests, we report the Jarque-Bera statistics and its multivariate extension which compares the third and fourth moments of the residuals to those from the normal distribution (see Eviews 4 User's Guide, p.524 for details).

Both the autocorrelation and normality tests do not signal any misspecification and we conclude that the model well explains the labour market dynamics in the sample and it can be used for dynamic projection.

<sup>36</sup> The estimation of the model has been performed with Eview 4.1.

**Table A2. Autocorrelation Portmanteau Tests (a)**

H0: no residual autocorrelations up to lag h

Lags	Q-Stat	Adj Q-Stat
4	35.537 (0.3052)	37.240 (0.2405)
8	87.984 (0.7078)	95.203 (0.5038)
12	153.592 (0.6277)	173.136 (0.2260)
16	197.109 (0.9021)	228.916 (0.3967)
20	239.701 (0.9825)	288.138 (0.4866)
24	287.097 (0.9952)	360.102 (0.3714)

(a) p-values are reported within parenthesis

**Table A3. Autocorrelation LM Tests (a)**

H0: no serial correlation at lag order h

Lags	LM-Stat
1	5.6145 (0.9918)
2	14.773 (0.5413)
3	7.0933 (0.9714)
4	13.846 (0.6101)
5	14.772 (0.5414)
6	17.085 (0.3801)
7	10.243 (0.8536)
8	9.7070 (0.8815)
9	19.784 (0.2301)
10	13.786 (0.6146)
11	23.173 (0.1092)
12	13.771 (0.6158)

(a) p-values are reported within parenthesis

**Table A4. VAR Residuals Normality Tests (a)**

Ho: Residuals are normal

Component	Jarque-Bera
DL_COSTO	3.780 (0.1511)
DL_E	1.112 (0.5732)
DL_PROD	2.193 (0.3340)
DL_UR	0.681 (0.7111)
Joint	7.768 (0.4565)

(a) p-values are reported within parenthesis