Policy matters. The Long Run Effects of Aggregate Demand and Mark Up Shocks on the Italian Unemployment Rate

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Abstract

This paper estimates a vector autoregression system including labor productivity, real wage and unemployment rate to identify the dynamic effects of technology, demand and mark up shocks on the Italian labor market. Identification is achieved by imposing recursive restrictions on the matrix of long run multipliers. Our results show that both mark up and aggregate demand shocks permanently reduce the unemployment rate. Finally, technology shocks do not affect the unemployment rate in a significant way.

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1 Introduction

Several studies on European labor market, though using different theoretical framework and empirical techniques, have tried to give account of the high persistence in the unemployment rate, which in its extreme form is modeled, as a variable affected by *full-hysteresis*[1] (Ball, 1999, Bean 1994, Layard et al, 1991). This term has been used to mean that past experience of high (low) unemployment permanently raises (reduces) the equilibrium unemployment. In statistical terms, full-hysteresis implies that all the shocks to the unemployment rate have permanent effect and hence that unemployment problem can also be mitigated by expansionary aggregate demand policy.

The high persistence of unemployment is related to those factors that have a permanent or long lasting effects on the natural rate, for example skill biased technology shocks or national wage rigidity. History of unemployment itself may generate sluggishness in unemployment: for example, skills gained during employment may erode during a period of unemployment reducing the probability to be employed[2]. An explanation for hysteresis in European unemployment is proposed by Blanchard and Summers (1986). It relates to the asymmetry in the wage setting process between insiders, who are employed, and outsiders, who are unemployed: in particular, wages are set in order to insure the jobs to the insiders. In this context, shocks, which lead to reduced employment, change the number of insiders and thereby change subsequent equilibrium wage rate giving rise to hysteresis.

Resting on these channels, the shock accounting and propagation literature adopts an aggregate perspective to analyze the labor market dynamics and the hysteresis in unemployment. This approach is known as Structural Vector Autoregression (SVAR) Approach. A partial list of papers that study labor markets using SVAR includes Balmaseda et al. (2000), Castillo et al. (1998), Gamber and Joutz (1993), Dolado and Jimeno (1995, 1997), Dolado and Lopez-Salido (1996).

In our paper, we present a slightly modified version of the AD-AS model proposed by Castillo et al. (1988) and Balmaseda et al. (2000). The model considers a wage setting rule and includes technology, aggregate demand and mark up shocks. As in the insider-outsider model proposed by Blanchard and

[1] In the full-hysteresis case, the unemployment rate is an I(1) process. In the partial-hysteresis case, the series is a stationary I(0) process and it can be characterized by different degree of persistence. In this latter case, shocks can have long lasting effects (high persistent), but not permanent effects.

[2] The channels for hysteresis are reviewed by Blanchard and Katz (1996).

Summers (1986), the wage setting rule, we use, states that nominal wages are chosen one period in advance and they are set to equate expected employment to a weighted combination of lagged labor supply and employment. Wage-setters take care of the insiders via lagged employment and the outsider via lagged labor supply. Moreover, the model is augmented by a "discouragement effect" on the labor force participation: labor force reduces as unemployment increases. The wage setting behavior described above and the discouragement effect both contribute to explain sluggishness in unemployment. Full-hysteresis is a particular solution of the model, when only lagged employment (insiders) is considered in the wage bargaining process. In the full-hysteresis solution, all the three structural shocks may have permanent effects on the unemployment rate.

In order to discuss the empirical relevance of the model, we estimate a VAR system including labor productivity, real wage and unemployment to identify the dynamic effects of the structural shocks on the Italian labor market. Identification is achieved by imposing recursive restictions on the matrix of long run multipliers along the lines in Clarida and Gali (1994)[3].

A battery of unit root and stationary tests suggest that the Italian unemployment rate is not mean-reverting over time, in other words it is characterized by full-hysteresis. The SVAR analysis shows that both (negative) mark up and (positive) demand shocks permanently reduce unemployment, while technological progress reduces unemployment although not significantly. Finally, there is no evidence of technological bias. This outcome involves important policy implications: aggregate demand and competition policies (reducing the monopoly power), can permanently affect Italian unemployment. To conclude, this paper adds new evidence about the strong long run relationship between macroeconomic policies and unemployment recently emphasized by other authors (e.g. Ball, 1999, for the OECD, Castillo et. all (1998) and Dolado and Lopez-Salido (1996) for Spain, Fortin (1996) and Posen (1998) for Canada and Japan respectively, Ridseth (1997) for Norway). The paper is organized as follows. Section 2 presents the theoretical model and the solutions related to the full-hysteresis case. Section 3 describes the VAR representation for productivity, real wage and unemployment rate and the long run identifying assumptions that allows us to recover the structural shocks (technology, demand and mark up shocks). Section 4 discusses the data set used and shows the results. Section 5 concludes.

[3] Clarida and Gali (1994) develops the identification scheme proposed by Blanchard and Quah (1989).

2 Theoretical Framework

2.1 The Basic Model

In order to analyze the Italian labor market fluctuations, we present a slightly modified version of the models proposed by Castillo et. al. (1998) and Balmaseda et al. (2000)[4]. We focus on the role played by technology, demand and mark up shocks in explaining the dynamic behavior of labor productivity, real wages and the unemployment rate.

Let us consider the following three structural equations

$$
\begin{aligned}
y_t &= d_t - p_t && (1)\\
y_t &= n_t + \theta_t && (2)\\
p_t &= w_t - \theta_t + \mu_t && (3)
\end{aligned}
$$

where y_t is the log of output, d_t is the log of nominal expenditure, p_t is the log of prices, n_t is the log of employment, w_t is the log of wage θ_t and μ_t represent respectively a productivity and a mark up shift factors. Equation (1) is the aggregate demand function, equation (2) is the production function under a CRS technology, finally equation (3) describes a simple price setting rule: a mark up on unit labor cost. Labor supply and wage setting rule are given by the following equations

$$
\begin{aligned}
l_t &= \alpha(w_t - p_t) - bu_t && (4)\\
w_t &= w^* + \gamma_1\varepsilon_d + \gamma_2\varepsilon_\mu && (5)\\
w^* &: n_t^e = (1-\lambda)n_{t-1} + \lambda l_{t-1} && (6)
\end{aligned}
$$

where l_t is the log of labor force, n_t^e is the expected employment, $u_t = l_t - n_t$ is the unemployment rate, ε_d and ε_μ are shocks to demand and mark up respectively. Equation (4) is the labor supply function, it depends on the real wage, $w_t - p_t$, and the unemployment rate, u_t. The parameter α represents the elasticity of the labor supply, while b captures the effects of the unemployment on the labor supply decisions. For $b > 0$, the *discouragement effect* dominates [5], the labor force tends to reduce as unemployment increases. Equations (5)-(6) describe a wage setting rule, where wages have both a backward looking

[4] A similar model is also used by Dolado and Lopez-Salido (1996).

[5] $b > 0$ implies long term unemployed get demoralized and exit from the labor force: *discouragement effect.* $b > 0$ implies that if head of household loses the job others household members participate more: *participation effect.*

component and a forward looking one. As in the insider-outsider model proposed by Blanchard and Summers (1986), nominal wages are chosen one period in advance and they are set to equate n_t^e to a weighted combination of lagged labor supply and employment[6]. λ is the key parameter characterizing the unemployment persistence. In particular, $\lambda = 0$ implies *full-hysteresis*, while $0 < \lambda < 1$ *partial-hysteresis* in the unemployment rate. In equation (5), wage fluctuations depend both on w^* and on mark up and demand shocks.

To close the model, we specify the evolution of the shift factors: m, θ and μ . For simplicity, we assume that these stochastic processes are pure random walks[7], that is

$$\Delta d = \varepsilon_d \qquad (7)$$

$$\Delta \theta = \varepsilon_s \qquad (8)$$

$$\Delta \mu = \varepsilon_\mu \qquad (9)$$

hence $\varepsilon_d, \varepsilon_s, \varepsilon_\mu$ are *i.i.d* uncorrelated aggregate demand, technology and mark up shocks[8].

2.2 Full Hysteresis

As clearly discussed in Castillo (1998) and Balmaseda et al. (2000), when the wage setters only care the insiders in the wage bargaining, the parameter λ in equation (6) is equal to zero (full-hysteresis) and the unemployment can be characterized by a unit root process[9]. As we will see in section 4.2, the Italian unemployment rate can be empirically characterized by a stochastic process with a unit root. For this reason, we only derive the solution of the theoretical model under the full hysteresis case. Imposing $\lambda = 0$ and solving out equations (1) to (9) in terms of shocks we obtain the following

[6] In this framework, the wage setters care both the insiders, that is the employed workers (n_{t-1}), and the outsider, that is the unemployed via l_t.

[7] As also noted by Balmaseda et al. (2000), the random walk hypothesis is only to simplify the algebra. The only necessary assumption is that these stochastic processes are I(1).

[8] In the empirical investigation we remove this random walk simplifying assumption only assuming that the shift factors in (7), (8) and (9) are I(1) processes and allow a richer dynamics.

[9] In particular, the persistence of unemployment is an increasing function of both the discouragement effect (b) on the labor force and the influence of lagged employment on the wage determination process (λ).

representation

$$\begin{aligned}\Delta y_t &= (1-\gamma_1)\varepsilon_d - (1+\gamma_2)\varepsilon_\mu + \varepsilon_s & (10)\\ \Delta n_t &= (1-\gamma_1)\varepsilon_d - (1+\gamma_2)\varepsilon_\mu & (11)\\ \Delta w_t &= \gamma_1\varepsilon_d + \gamma_2\varepsilon_\mu & (12)\\ \Delta p_t &= \gamma_1\varepsilon_d - \varepsilon_s + (1+\gamma_2)\varepsilon_\mu & (13)\end{aligned}$$

Linear combinations of the above variables yield to

$$\begin{aligned}\Delta(y_t - n_t) &= \varepsilon_s & (14)\\ \Delta(w_t - p_t) &= \varepsilon_s - \varepsilon_\mu & (15)\end{aligned}$$

Hence, labor productivity changes are only driven by technology shocks (equation 14), while real wage changes are driven both by technology and mark up shocks (equation 15). Finally, unemployment rate changes are driven by technology, mark up and demand shocks as follows:

$$\Delta u_t = (1+b)^{-1}\left[-(1-\gamma_1)\,\varepsilon_d + (1+\gamma_2-\alpha)\,\varepsilon_\mu + \alpha\varepsilon_s\right] \qquad (16)$$

Positive technology shocks increase labor productivity, real wages and unemployment rate (unless the elasticity of labor supply, α, is zero). This latter fact describes the so-called technological bias explanation of unemployment, in other words skill biased technological progress increases the unemployment rate because the demand of new workers (skilled) does not compensate the number of unskilled workers unemployed because of the innovation process. Negative mark up shocks, a reduction in the mark up, increases real wage and decreases the unemployment rate. Finally, positive aggregate demand shocks reduces unemployment if indexation in the wage setting rule is not complete, that is $\gamma_1 < 1$. In general, all these shocks may have permanent effects on the unemployment rate.

3 The Empirical Model

We apply VAR analysis in order to recover the dynamic effects of technology, demand and mark up shocks on the variables which characterize the labor market. The identification is achieved by imposing long run restrictions as suggested by equations (14)-(16). Finally, variance decomposition analysis is applied to assess the relative importance of these shocks on the variables included in the model.

3.1 VAR Representation

Let $X_t = [\Delta(y_t - n_t), \Delta(w_t - p_t), \Delta u_t]'$ be a covariance stationary stochastic vector process. X_t admits the following Wold representation[10]:

$$X_t = A(L)v_t \tag{17}$$

For which the following conditions hold: (i) $A(L) = I + A_1 L + A_2 L^2 + ...$, (ii) $v_t \sim (0, \Sigma_v)$, (iii) $\det \Sigma_v \neq 0$ and (iv) $A(0) = I$. Representation (17) is the VAR reduced form. Now let us assume that X_t has the following structural moving average representation

$$X_t = B(L)\varepsilon_t \tag{18}$$

where $\varepsilon_t \sim (0, \Sigma_\varepsilon)$. The innovations v_t of the reduced form are assumed to be linear combination of the structural disturbances ε_t, i.e. $v_t = S\varepsilon_t$ for some (3x3) full rank matrix S. Hence the following relation holds:

$$S\Sigma_\varepsilon S' = \Sigma_v$$

Since Σ_v can be estimated from the reduced form, the identification problem relates to the conditions under which the structural parameters in $S\Sigma_\varepsilon S'$ can be recovered from Σ_v. The structural model, the coefficients of $B(L)$, will be identified introducing enough restrictions to determine S uniquely. The orthonormality of the variance-covariance matrix $\Sigma_\varepsilon = I$ provides six non linear restrictions on S. To just-identify the model we need three additional restrictions.

3.2 Identification

From equations (14) to (16) we choose the following *long run identifying restrictions*: demand shocks, ε_d, have no permanent effects on labor productivity $(y - n)$ and real wage $(w - p)$; mark up shocks, ε_μ, have no permanent effects on labor productivity. In fact, a CRS production function implies that only technology shocks affects productivity in the long run, while the long-run component of real wage is only driven by productivity and mark up shocks.

These restrictions imply that the matrix of the long run multipliers $B(1)$ is lower triangular as follows:

[10] The deterministic components of the variables have been omitted for simplicity.

$$\begin{pmatrix} \Delta(y_t - n_t) \\ \Delta(w_t - p_t) \\ \Delta u_t \end{pmatrix} = \begin{pmatrix} b_{11}(1) & 0 & 0 \\ b_{21}(1) & b_{22}(1) & 0 \\ b_{31}(1) & b_{32}(1) & b_{33}(1) \end{pmatrix} \begin{pmatrix} \varepsilon_s \\ \varepsilon_\mu \\ \varepsilon_d \end{pmatrix} \quad (19)$$

As in Clarida and Gali (1994) S is obtained as $S = A(1)^{-1}C$, where $CC' = A(1)\Sigma_v A(1)'$.

3.3 Variance Decomposition

Consider the structural representation (18). Let $j = 1, 2, 3$ be the number of shocks, $i = 1, 2, 3$ the number of variables, $t = 1, ..., T$ the number of quarters and $var(\varepsilon_{itj}) = 1$. We can express the variance of X_{it} as follows

$$V_{it} = var(X_{it}) = \sum_{j=1}^{3} \sum_{t=1}^{T} b_{ijt}^2 \quad (20)$$

Our interest mainly focuses on the proportion of the variance of each variable explained by technology, mark up and demand shocks which we define as

$$V_{it}^{\varepsilon_s} = \frac{\sum_{t=1}^{T} b_{i1t}^2}{\sum_{j=1}^{3} \sum_{t=1}^{T} b_{ijt}^2}, V_{it}^{\varepsilon_\mu} = \frac{\sum_{t=1}^{T} b_{i2t}^2}{\sum_{j=1}^{3} \sum_{t=1}^{T} b_{ijt}^2}, V_{it}^{\varepsilon_d} = \frac{\sum_{t=1}^{T} b_{i3t}^2}{\sum_{j=1}^{3} \sum_{t=1}^{T} b_{ijt}^2} \quad (21)$$

where the numerator in (21) represents the variance of the i-th variable explained by shocks ε_s, ε_μ, ε_d and, the denominator the total variance of the i-th variable. In subsection 4.3 we report results for the ratios (21) for $T = 1, 4, 16, 60$.

4 Results

4.1 Data

The data are from OECD *Business Sector Data Base*. We use Italian quarterly data running from 1960:1 to 1999:4 on the following series:

d: GDP - gross domestic product (market prices);
n: total employment (number of workers);
p: GDP deflator (market prices);
w: compensation for employees;
u: unemployment rate

As suggested previously, we perform the empirical analysis using the following variables:

$y - n$: labor productivity (real GDP per workers) in logs

$w - p$: real wage in logs

u: unemployment rate

4.2 Integration Analysis

The theoretical model presented in section 2 has been closed under the assumption that the unemployment rate is characterized by full-hysteresis. This assumption captures the stylized fact that in the past two decades the behavior of Italian unemployment has changed with respect to the post-war period showing higher persistency, in particular after 1974 (Figure 1). Figure 1 shows the evolution of the Italian unemployment rate since 1960. The unemployment rate increases from a value of 5%, stable during all the 60's, to about 12% in the 1999 and it looks like a non-stationary series. In this section, we study the non-stationary nature of the Italian unemployment rate to check for the presence of full-hysteresis.

As stated previously, full-hysteresis in unemployment describes a situation in which all shocks, both transitory (e.g aggregate demand shocks) and permanent shocks (e.g technology shocks), may have permanent effects on the series. Within the framework of a linear dynamic model, full-hysteresis requires a unit root in unemployment series. Hence, the persistence of a series in the unit root sense can be modeled as the sum of an autoregressive process of a higher order with a constant mean value parameter and verified by using tests on the order of integration of the series.[11].

Here, we discriminate between an I(1) process with drift and trend stationary series, by using a battery of unit root and stationary tests. As stated by the solutions in section 2.2, not only the unemployment rate is a variable characterized by high persistence, but also real wage and labor productivity

[11]Many studies have followed the unit root approach, e.g. Layard et al. (1991). A second approach pointed that the degree of persistence may be caused by abrupt changes in the mean rate of unemployment (e.g Phelps, 1994) and that between these shifts unemployment may be stationary (does not contain a unit root). Recently, Bianchi and Zoega (1994) calculate the sum of the coefficients in the autoregressive process as a measure of persistence with time invariant mean and compare it to the same measure of persistence obtained when the mean shifts are taking into account. This study tries to asses the significance of mean shifts of unemployment for the OECD countries. The outcome suggests that the Italian unemployment rate is an I(1) process instead of a stationary I(0) process with a shifting mean.

are I(1) processes. Hence, we test the presence of unit root in all the series used in this paper.

Table 1 reports the results of the following integration tests: the Augmented Dickey Fuller test (ADF), the Phillips and Perron test (PP) and the stationary KPSS test[12]. The number of lags used in the specification of these tests are also reported. While ADF and PP test are unit root test, that is the null hypothesis is I(1) process, the KPSS is a stationary test, that is the null is I(0) process.

More precisely, when the *levels of* the variables are considered, $[u, (w-p), (y-n),]$ the null hypothesis for the ADF and PP tests is a unit root with drift (I(1) process with drift), while the alternative is linear trend stationary series. Instead, the null hypothesis of the KPSS test is linear trend stationary series versus the unit root with drift case. When the first difference of the variables is considered, $[\Delta u, \Delta(w-p), \Delta(y-n),]$the null hypothesis of the ADF and PP test is unit root (I(1) process), while the alternative is stationary series. For the KPSS test the null is stationary series while the alternative is unit root.

For all the variables in levels, the null hypothesis of unit root with drift cannot be rejected and in the case of the stationary test (KPSS) the null of stationarity is rejected. These results allow us to conclude that all the series contain at least one unit root. Performing the unit root tests on the first difference of the variables it is possible reject the null of unit root (ADF and PP test) or not reject the null of stationary series (KPSS). This outcome suggests that the first differences of the series are I(0) process. To conclude, logged unemployment rate u, logged real wage $(w-p)$, and logged $(y-n)$ are I(1) process with drift and they are consistent with the theoretical model solved for the full-hysteresis case.[13]

[12]On these tests see Fuller (1996), Phillips and Perron (1988) and Kwiatkowski et al.(1992).

[13]The presence of unemployment hysteresis in the OECD countries is also analyzed in Roed, (1996). This paper applies a battery of tests posing both stationary and unit root as null hypothesis. The results are ambiguous for the Italian series: different tests give different answers. As we have seen in Table 1, by applying the same type of tests, we achieve a unique conclusion.

4.3 Impulse Response and Variance Decomposition Analysis

Figure 2 displays the impulse response functions with 90% confidence band[14] relative to a *positive* technology shock. Productivity immediately increases in consequence of the shock: in the first quarter it remains steadily around the impact level then begins to increase after the 5-th quarter reaching the new long run level after about 20-quarters. As stated in the theoretical model (CRS hypothesis), technology shock permanently affects labor productivity in a significant way. The variance decomposition (Table 2) suggests that technology shock is the main source of variation in labor productivity explaining about 90% of its variance in the short-medium run and 100% in the long-run. Real wages show an impulse response similar to that of productivity: they immediately react to the shock and after about 20-quarters reach the new long run path. However, differently from productivity, the response of real wages is not significant at 90% at each quarter. A technology shock has little weight in real wages variance (Table 2): about 2% of the total variance in the first quarter, about 25-30% in the medium and long run. Unemployment drops after the shock. Such a reduction although permanent, the new unemployment equilibrium level is below the initial one, is not significant. Technology shocks do not play a major role in the unemployment variation since they are responsible only for 6% in the first quarter, about 11-18% in the medium run and only 21% in the long run (Table 2).

Figure 3 displays the impulse response functions with 90% confidence band relative to a *negative* mark up shock (a reduction in the mark up). A mark-up shock immediately reduces labor productivity. After the initial negative effect productivity remains for some quarter at its minimum level then begins to climb back to the initial level. The effect of the shock vanishes after about 30-quarters. The effect of the shock is very modest and not significant at 90% at every quarter. Mark up shocks explain just a small fraction of the overall productivity variance: 7% in the first quarter, 10% after 4-quarters and zero for longer horizons. Real wages immediately increase in consequence of the mark-up shock raising steadily for the first 20-quarters. After about 30-quarters real wages reach their new long run level. The mark-up shock permanently affects real wages in a significant way. It represents the main source variation of wages. The explained variance is about 97% in the first

[14]Impulse responses are derived by a VAR with four lags in all the variables. The lag lenght was selected to ensure residuals white noise normal. Confidence band are derived by using the bootstrapping method with 1000 repetitions.

quarter, 74% after one year and about 68% in the long run. Unemployment shows a positive impact effect: after the second quarter unemployment reduces below its initial value reaching the new long run level after about 20-quarters. Although significant, the effect of the shock is modest in the short run: mark-up shocks are responsible only for 1% in the first quarter and 7% after 4-quarters. In the long run, a mark up shock has a greater importance: after 60-quarters it explains 21% of the total variation of the unemployment rate.

Figure 4 displays the impulse response functions with 90% confidence band relative to a *positive* demand shock. Productivity immediately reduces but after 5-quarters is again at its initial value. Moreover, the effect is not significant. Demand shock have no influence on the productivity variance. Real wage is acyclical: the effect is close to zero at each quarter. Demand shock are not responsible for real wage variation since the portion of explained variance is almost zero at each horizon. Unemployment immediately drops and after 10-quarters reaches the new long run level. Demand shocks permanently affects the unemployment rate and their effects are statistically significant. Moreover, they are the main source of unemployment fluctuations: they explain 91% of the total unemployment variance after 1-year, 81% after 4-years, 57% in the long run.

These outcomes are in line with the main implications of the theoretical model. In particular, (i) positive technology shocks increase labor productivity and real wage, while they do not affect significantly the unemployment rate. This latter outcome is in contrast both with the technological bias hypothesis - we do not find evidence that technological improvements increases unemployment - and with the common view of favorable employment effects of the technological innovation. This also suggests an indication about the size of the elasticity of the labor supply, α. The absence of a statistically significant effect of technology shocks on the unemployment rate is consistent with a labor supply relatively inelastic with respect to real wage changes. In terms of our model, this implies α close to zero. (ii) Negative mark up shocks (a mark up reduction) increase real wage and decrease unemployment. (iii) Positive aggregate demand shocks reduce unemployment. This outcome mainly depends on the sluggish adjustment of wages ($\gamma_1 < 1$) and prices. This interpretation is also consistent with the acyclical behavior of real wage$-$aggregate demand shocks do not affect real wages in a significant way$-$suggesting the importance of sticky-wage and sticky-price theories of the business cycle[15].

4.4 Policy Implications

Empirical evidence involves important policy implications. First, expansionary demand policies can permanently reduce the unemployment rate. This outcome is in line with other recent empirical evidence. Balmaseda et al. (2000) find that unemployment fluctuations in the OECD countries are dominated by demand shocks in the short run and by technology shocks in the long run, while in Italy and Spain demand shocks are also important in the medium and log run. Other works provide evidence that aggregate demand affects long run movements in unemployment. A partial list includes: Ball (1999) for the OECD, Castillo et. all (1998) and Dolado and Lopez-Salido (1996) for Spain, Fortin (1996) and Posen (1998) for Canada and Japan respectively, Ridseth (1997) for Norway. This empirical evidence is important in the light of the recent debate on the potential cure for high unemployment in Europe involving two opposite views: structural reforms[16] versus economic policies which act through monetary policy and/or other determinants of aggregate demand. Our evidence suggests that such positions should not be contrasting but rather concomitant. Indeed within a theoretical framework where labor market is rigid and structural reforms can play a role, policies are very powerful. The reason why monetary and fiscal policies are important instruments for unemployment reduction is exactly the same which justifies structural reforms: the rigidity. Indeed hysteresis in the unemployment rate make economic policies effective both in the short and in the long run. For this reason, we should consider aggregate demand policies both as useful instruments for managing unemployment and as concomitant rather than contrasting with structural labor market reforms. A further aspect is worth noting. By symmetry of the shocks contractionary demand policies have permanent and sharp negative effects on unemployment. On the one hand this can be an explanation itself for high unemployment rate. Indeed we could point out contractionary monetary policy which take place in Italy during the '80 as a possible cause for the high Italian unemployment rate. On the other hand the extreme effectiveness must increase the attention

[15]For a survey on the nominal rigidities, see Kempf (1992). See OECD (1994) on the real wage flexibility in Europe.

[16]Structural reforms include for example wage bargaining decentralization, reduction of hiring and firing costs and of the barriers to labor mobility (see e.g. OECD, 1994, and Bean, 1994).

to undertake restrictive policies because of this potential strong permanent contractionary effect.

Second, policies which lower the mark up reduce permanently the unemployment rate. We refer to such kind of policies as competition policies, since they operate, essentially through regulation, in order to increase the degree of competition. The mechanism through which policies affect unemployment is simple. First a mark up reduction lower prices increasing aggregate demand and real wage. Second aggregate demand leads to an increase in the employment for given level of technology. The result, captured by our empirical evidence, is a sharp reduction in unemployment at a higher real wage level. Competition policies can be implemented in two different ways. On the one hand allowing international competition to force firms to adapt to the new conditions, for example a reduction of the tariffs. On the other hand by using industrial organization policies in order to keep market concentration at an optimal level.

5 Conclusions

In this paper we measure the dynamic responses of labor productivity, real wage and unemployment rate to technology, aggregate demand and mark up shocks in Italian economy for the period 1960-1999. These structural shocks are identified imposing recursive restrictions on the matrix of long run multipliers in a VAR system including the variables of interest. These long run identifying assumptions are derived by an AD-AS model in which wage setters only care for the insiders (employed workers). This wage setting behavior generates full-hysteresis in unemployment. We perform integration analysis confirming the presence of a unit root in the Italian unemployment rate. This outcome implies full-hysteresis and as a consequence of this, both demand and supply shocks permanently affect the unemployment rate. Our main findings can be summarized as follows: (i) positive technology shocks increase labor productivity and real wage; (ii) negative mark up shocks (a mark up reduction) increase real wage and decrease unemployment; (iii) positive aggregate demand shocks reduce unemployment. With respect to unemployment, there is no evidence of both technological bias - we do not find evidence that technological improvements increase unemployment - and favorable effects in terms of employment gains of the technological progress. Instead, positive aggregate demand and negative mark up shocks permanently reduce unemployment. This outcome suggests that in economies which suffer from strong unemployment state dependence, both aggressive disinflationary policies or passive macroeconomic policies during recession periods have a high cost since they lead to permanently higher unemployment. Finally, also competition polices (reducing the monopoly power) permanently reduce unemployment.

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Table 1
Integration Analysis

Series	test(*)	Statistics	5%cv	10%cv	Conclusion
u	ADF(4)	-2.49	< -3.45	< 3.15	I(1)+drift
u	PP(4)	-14.58	< -21.5	< -18.1	I(1)+drift
u	KPSS(4)	0.26	> 0.146	> 0.119	I(1)+drift
Δu	ADF(3)	-6.55	< -2.9	< -2.59	I(0)
Δu	PP(3)	-189.77	< -14	< -11.2	I(0)
Δu	KPSS(3)	0.11	> 0.46	> 0.34	I(0)
$(w-p)$	ADF(1)	-1.92	< -3.45	< -3.15	I(1)+drift
$(w-p)$	PP(1)	-1.73	< -21.5	< -18.1	I(1)+drift
$(w-p)$	KPSS(1)	1.88	> 0.146	> 0.119	I(1)+drift
$\Delta(w-p)$	ADF(0)	-7.95	< -2.9	< -2.59	I(0)
$\Delta(w-p)$	PP(0)	-91.14	< -14	< -11.2	I(0)
$\Delta(w-p)$	KPSS(0)	4.54	> 0.46	> 0.34	I(0)
$y-n$	ADF(4)	-2.22	< -3.45	< -3.15	I(1)+drift
$y-n$	PP(4)	-5.07	< -21.5	< -18.1	I(1)+drift
$y-n$	KPSS(4)	0.66	> 0.146	> 0.119	I(1)+drift
$\Delta(y-n)$	ADF(3)	-6.24	< -2.9	< -2.59	I(0)
$\Delta(y-n)$	PP(3)	-98.83	< -14	< -11.2	I(0)
$\Delta(y-n)$	KPSS(3)	0.96	> 0.46	> 0.34	I(0)

Notes:ADF: Augmented Dickey Fuller test (Fuller, 1996); PP: Phillips - Perron test (Phillips P.C.B and P. Perron, 1988), KPSS: KPSS stationary test (Kwiatkowsky D., P. Phillips, P.Schmidt, Y.Shin, 1992); (*): indicates the number of lags. The lag width was chosen by the Wald test.

Table 2

Variance Decomposition

	Lags	V^{ε_s}	V^{ε_μ}	V^{ε_d}
Unemployment	1	0.0692	0.0171	0.9137
	4	0.1126	0.0721	0.8153
	16	0.1897	0.1913	0.6190
	24	0.2044	0.2076	0.5880
	60	0.2118	0.2165	0.5717
Real Wage	1	0.0289	0.9711	0.0001
	4	0.2543	0.7456	0
	16	0.3031	0.6969	0
	24	0.3130	0.6870	0.0004
	60	0.3177	0.6823	0
Productivity	1	0.9018	0.0712	0.0270
	4	0.8925	0.1040	0.0035
	16	0.9976	0.0024	0
	24	0.9997	0.0003	0
	60	1	0	0

Figure 1 The Italian unemployment rate 1960:1-1999:4

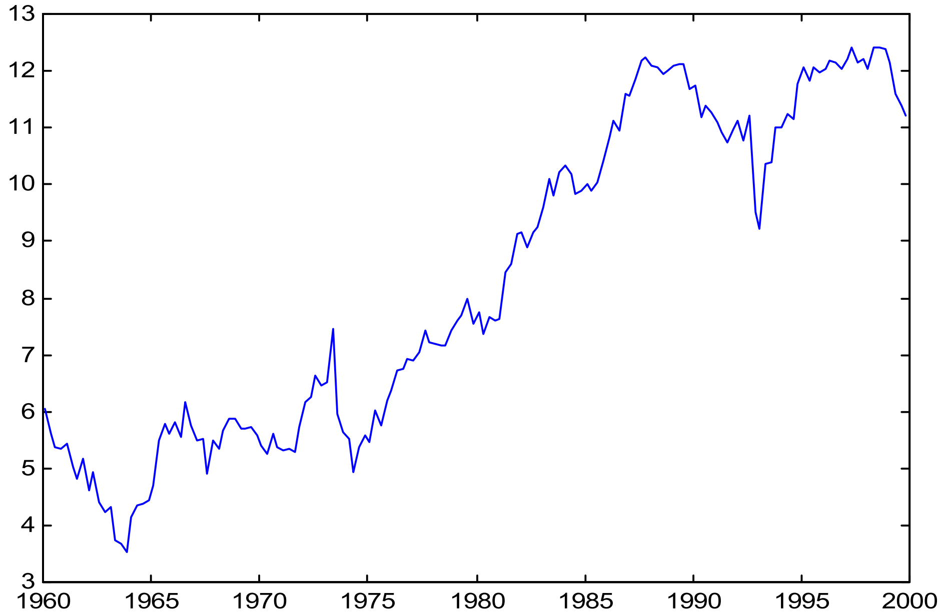

Figure 2 The effects of a positive technology shock

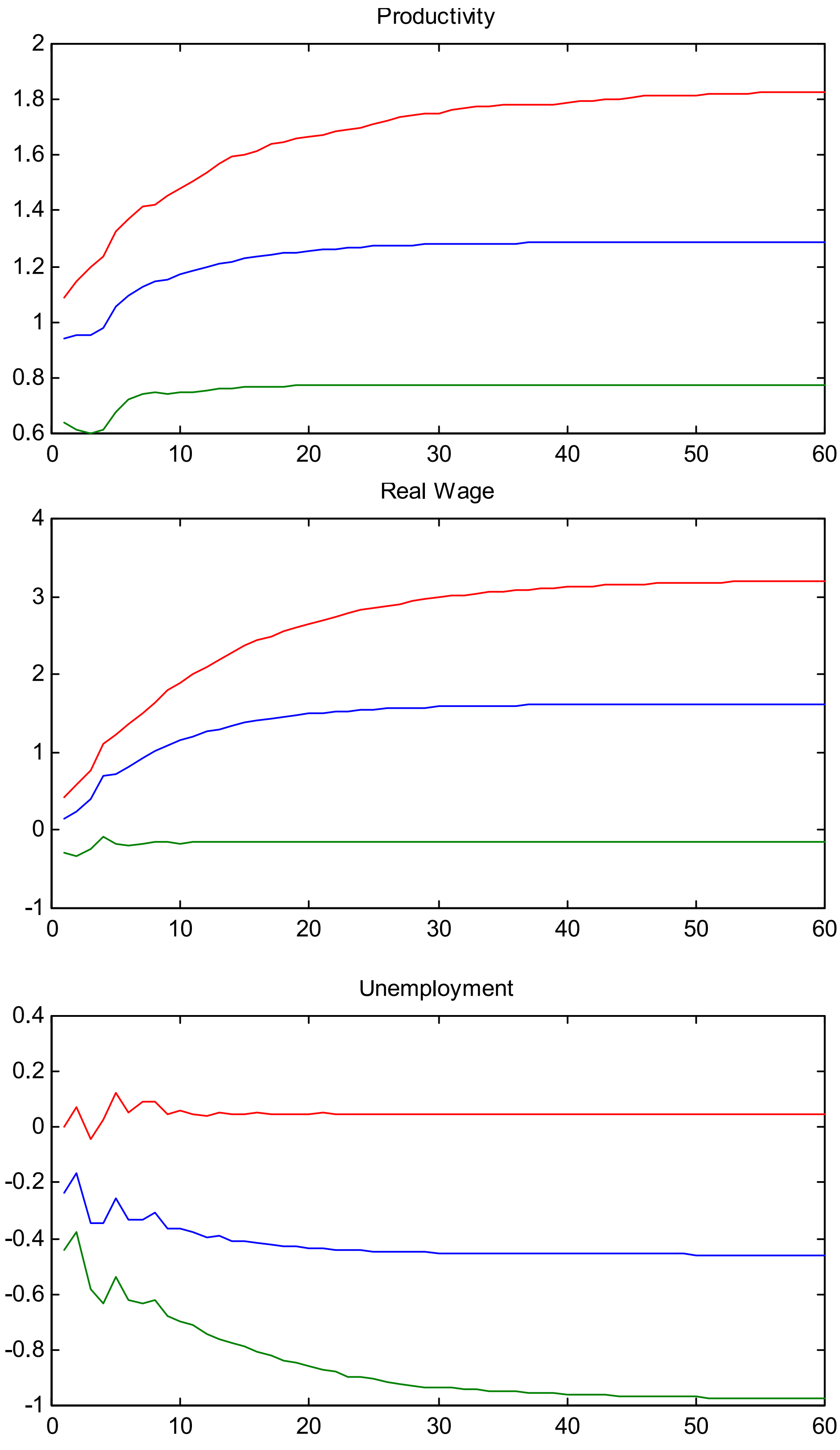

Figure 3 The effects of a negative mark up shock

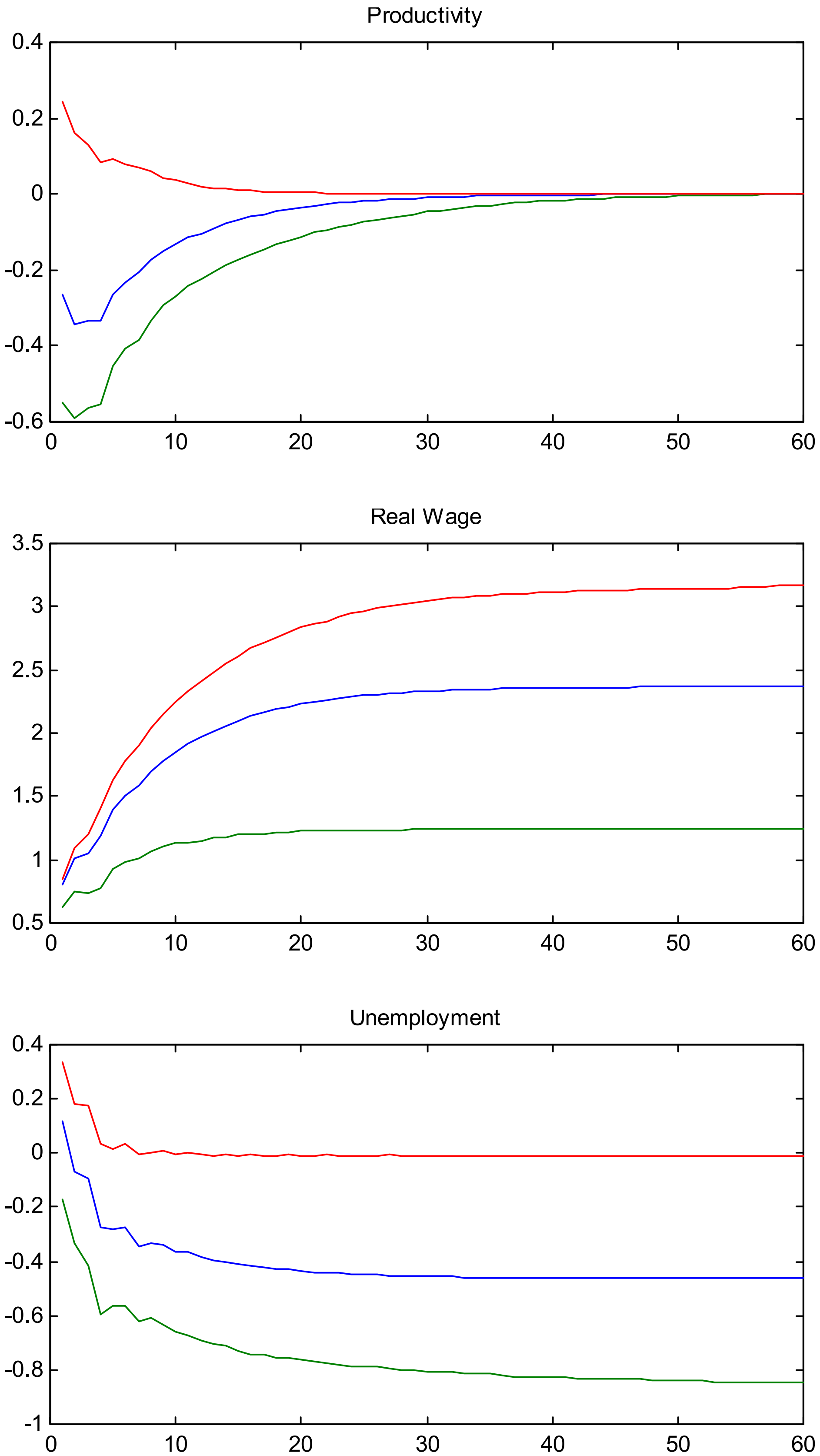

Figure 4 The effects of a positive aggregate demand shock