Technological and non-technological shocks in the labor market

Enrico Saltari and Giuseppe Travaglini

1 Introduction

From the beginning of the 1990s to the first half of the new century European countries have recorded the worst economic performance from the end of the Second World War accompanied, paradoxically, by increased employment. This disappointing evolution has been the subject of increasing scrutiny over recent years. The main issue is the deterioration in the last decade of the EU15's performance relative to that in the USA and the policies to be adopted in order to remedy to this situation.

We focus on four specific issues.

1. How does the EU15 compare to the USA in terms of economy-wide productivity trends, and how big is the role of labour participation, capital accumulation and technological progress in the EU15 economy?

2. Is workforce participation or labor productivity responsible for EU15's decline during the last ten years? And how much of both labor participation and productivity affected the EU15 and Italy and USA performance during the same period?

3. In explaining recent EU15-US divergences in both productivity and trends to what extent is the EU15's relatively poor performance caused by its industrial structure (ICT versus non ICT sectors) and its difficulties in reorientating economy towards the higher productivity growth sectors such as ICT?

4. Is the decline in productivity growth structural in nature or is it cyclical?

Our analysis shows that the slowdown in labor productivity and not the labor participation explains the decline of the European economic growth in the last decade. A possible interpretation is that this decreasing productivity trend is the response of economy to a positive labor supply shock (labor market reforms, wage moderation, immigration). Alternatively, this recent evolution can be interpreted as the consequence of a decline in the growth rate of technological progress (TFP).

We argue that productivity pattern is structural, depending strongly on the technological progress dynamics.
We show that both technological and non technological shocks in labor market contributed to the actual decline of EU15 economy.

Our main conclusions are:

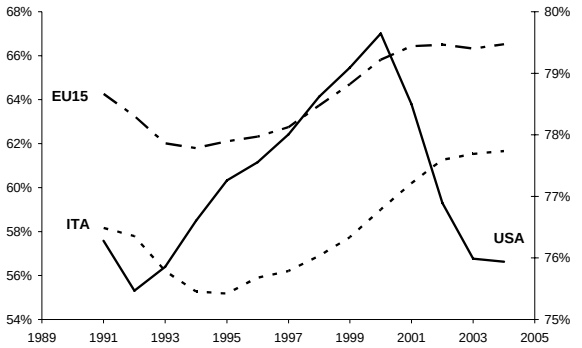
- The technological shock is able to explain the decrease of the growth rate of labor productivity but it cannot explain the increase in employment.
- In turn, the non technological shock can capture the dynamics of employment but cannot explain the slowdown of labor productivity.
- Thus, the analysis suggests that a combination of both shocks is necessary to give a complete picture of the employment and productivity dynamics in EU15 during the period 1995-2004.

2 Four stylized facts

We concentrate on the decade 1995-2004. Our analysis focuses on four conflicting stylized facts which characterizes the economic decline in Europe, and especially in Italy, during this period.

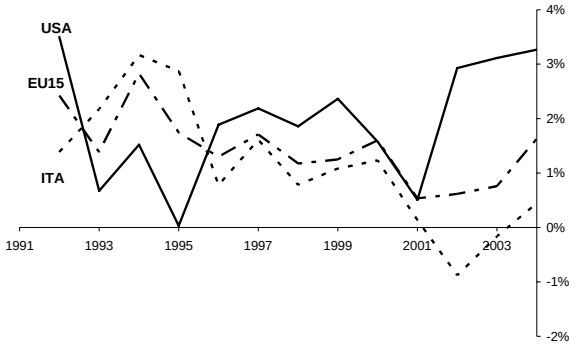
1. **The increase in employment.** The EU15 and Italy have experienced important reforms and changes in labor market over the course of the 1990s with an increase in the employment rate (measured in persons and total hours worked).

FIGURE 1
The employment rate – EU15 and Italy (left scale); USA (right scale)



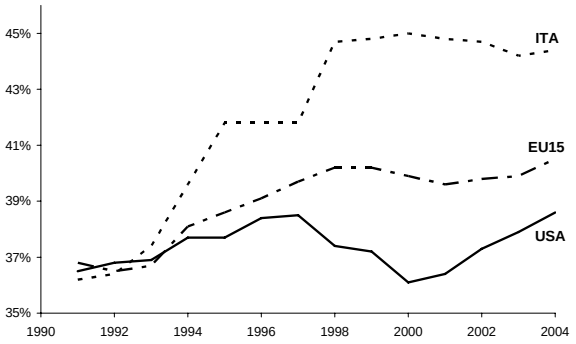
2. **The slowdown of productivity.** On the negative side, the EU15 and Italy labor productivity growth rate is declining from the mid-1990s by a 1 percentage point while the USA's is accelerating by a roughly similar amount.

FIGURE 2
The labor productivity



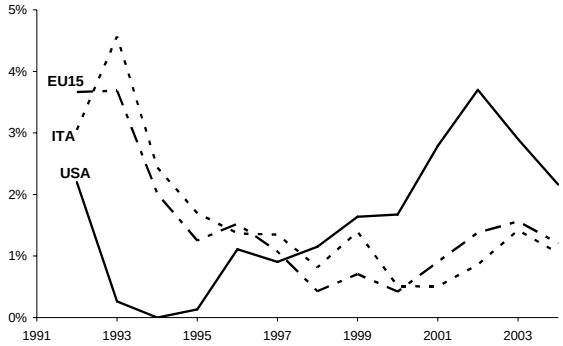
3. **The increase in profits**. This post 1995 deterioration in labor productivity is associated with an increase in the profit share. In Italy this is higher than the profit share in EU15 and in USA. In contrast to EU15 profit share, in USA it remained quite stable.

FIGURE 3
The profit share



4. **The slowdown of the capital intensity.** During the same period in EU15 and Italy the growth rate of the capital deepening (the rate of investment per worker) has decreased, signaling that firms invested in capital saving technology.

FIGURE 4
The capital intensity growth rate



Our main aim is to build a theoretical and empirical explanation of these seemingly conflicting facts. After briefly reviewing our interpretation, this short summary is organized in three parts. First, there is some simple growth accounting exercises, applied both to the whole economy and to the ICT – non ICT sectors. The second part describes and solves a version of the Blanchard (1997) model. Finally, the third part is dedicated to a SVAR analysis.

3 A simple graphic analysis

We argue that only a *combination* of the following two shocks can explain the above mentioned four stylized facts.

1. A shock to the labour demand curve arising from a slowdown of technological progress, or total factor productivity (TFP), dynamics.[1] In the model this is formalized as a change in the parameter A of the labor demand curve.

2. A shock to the labour supply curve deriving from the structural reforms in the labour market. In the model this is formalized as a change in the parameter θ of the labor supply curve.

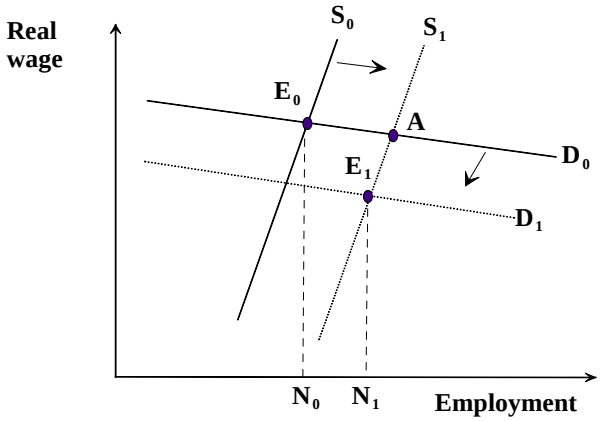
The figure 5 illustrates the interaction between these two shocks moving the long run equilibrium of the labor market from E_0 to E_1.[2]

[1] As usual this is calculated as the difference between (the growth of) labour productivity, $g_{y/n}$, and the contribution of capital accumulation, $\alpha g_{k/n}$, where α is the capital income share and $g_{k/n}$ is the growth of capital intensity. I.e.

$$g_A = g_{y/n} - \alpha g_{k/n}$$

[2] Note that the simple graph of the labor market can also be interpreted in terms of rates of growth of demand and supply of employment, suitably renaming the variables on the axis. In this case, the variable on the x-axis is the employment growth rate, $\frac{\dot{N}}{N}$. Similarly, on

FIGURE 5
The joint effect of a greater labor flexibility and a productivity slowdown



4 Growth accounting

The recent poor economic performance in Europe and in Italy is due to the declining performance of labor productivity which in turn is the result of a slowdown of TFP. To justify and clarify this claim, we look at the following data for USA, EU15 and Italy. Data are from Ameco database (Eurostat) and OECD.

Simple growth accounting analysis shows the following (see table 1).

- In EU15, and especially in Italy, the decade 1995-2004 witnessed a reversal of the traditional roles of employment and productivity in contributing to growth. For the first time since the 60s, the GDP growth in EU15 mainly stems from an increasing employment rather than productivity;
- In EU15 and in Italy this strong recovery of labour utilization was accompanied by a corresponding slowdown in labour productivity. In contrast, in USA labour productivity increased strongly.
- In the last ten years the EU15 and Italy economies recorded a slowing in capital deepening.[3] Note that in the same period USA economy (almost) doubled the growth rate of capital deepening, rising labour productivity and TFP as well.

the y-axis there is the growth rate of the marginal product of labor. With a Cobb-Douglas production function $AN^{1-\alpha}$, this is $A(1-\alpha)N^{-\alpha}$, and its growth rate is $\frac{\dot{A}}{A} - \alpha\frac{\dot{N}}{N}$. I. e. the demand for "labor" is downward sloping and shifts downward when TFP is slowing down. A similar reasoning applies to the supply curve, say $\frac{\dot{\theta}}{\theta} + \frac{\dot{N}}{N}$. It shifts rightward when flexibility increases.

[3] This weak investment pattern suggests that European firms preferred a capital-saving strategy, as a result of the wage moderation and reforms in labour market during 1990s. As we will see, in the short and medium run the main consequence of this policy has been to increase profit share, reducing the incentive of firms to invest in the ICT sector.

- From a EU15 perspective potentially the most concerning aspect is the negative evolution of the TFP. For the first time the TFP growth in USA is higher than in EU15. This significant slowdown affected negatively labour productivity and growth.

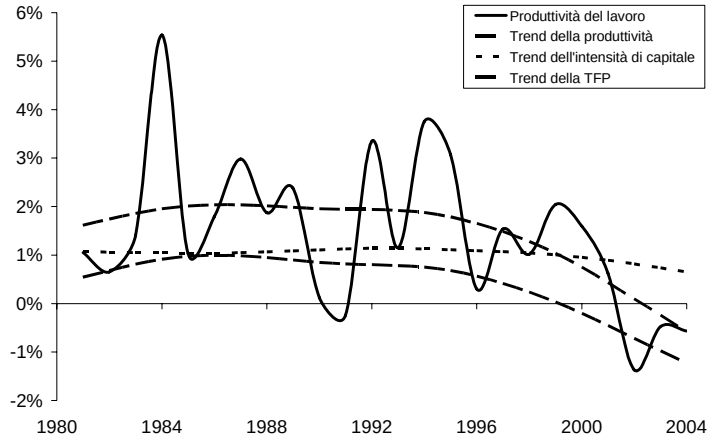
TABLE 1
Decomposition of the GDP growth rate

Growth rate (%)	1966 - 1970	1971 - 1980	1981 - 1990	1990 - 1994	1995 - 2004
USA					
GDP	3.4	3.2	3.3	2.3	3.3
Labour (Total hours)	1.5	1.6	1.7	0.9	1.0
Hours worked per worker	−0.9	−0.5	−0.1	−0.2	−0.1
Employment	2.4	2.1	1.8	1.0	1.2
Labour productivity (hourly)	1.9	1.6	1.5	1.5	2.3
TFP	1.2	1.1	0.6	0.7	1.2
Capital deepening	0.7	0.5	0.9	0.7	1.1
EU15					
GDP	4.6	2.9	2.4	1.7	2.2
Labour (Total hours)	−1.0	−0.9	0.1	−0.7	0.7
Hours worked per worker	−1.2	−0.7	−0.6	−0.5	−0.4
Employment	0.2	−0.2	0.7	−0.2	1.1
Labour productivity (hourly)	5.6	3.8	2.3	2.4	1.5
TFP	3.8	2.4	1.1	1.1	0.7
Capital deepening	1.8	2.4	1.2	1.3	0.8
ITALY					
GDP	6.0	3.5	2.2	1.0	1.7
Labour (Total hours)	0.1	0.1	0.3	−0.7	0.9
Hours worked per worker	0.1	−1.0	−0.3	−0.5	−0.3
Employment	0.0	1.0	0.6	−0.2	1.2
Labour productivity (hourly)	5.9	3.5	1.9	1.6	0.8
TFP	4.4	2.4	0.9	0.4	−0.1
Capital deepening	1.5	1.1	1.0	1.2	0.9

Hence, the poor performance of the European economy is a consequence of the productivity slowdown, not of labor participation.

The following graph shows the trends (using the H-P filter) of labor productivity, capital deepening and TFP (Solow residual) in Italy since the beginning of the 1980s. It is evident that the downward evolution of productivity and TFP trends are positively correlated, while capital deepening remains substantially constant. This implies that the slowdown of productivity is structural in nature, depending on the technological progress. Note that this feature characterizes the economy of the major continental countries like France, Germany, Spain and the average of EU15.

FIGURE 6
Labor productivity, capital intensity and TFP trends in Italy



4.1 Sectorial growth accounting

This section extends the previous analysis asking why the EU15 has a structural productivity problem. We take a closer look at sectorial/industry level productivity developments. We get two important results:

1. In EU15 and in Italy the non ICT sector is broadly similar in size (measured in percentage of value added), but greater than the one of the ICT sector. In turn, in USA the ICT sector has a higher share of the total value added and equal to the 55%.

TABLE 2
Contribution of ICT and non-ICT sectors to value added in 2002 (1995 prices)

	ICT	**Non ICT**
USA	55	45
EU15	41	59
Italy	36	63

2. Then, and more importantly, if we look at the evolution of the sectorial investment in these three areas we observe that the US economy changed dramatically its industrial structure during the last ten years, reducing the weight of the traditional sector and increasing the one of the ICT (see figure 7, 8, 9). This reorientation of its industrial structure in post 1995 allowed the great recovery of USA economy.

FIGURE 7
Value added share in the non-ICT sector

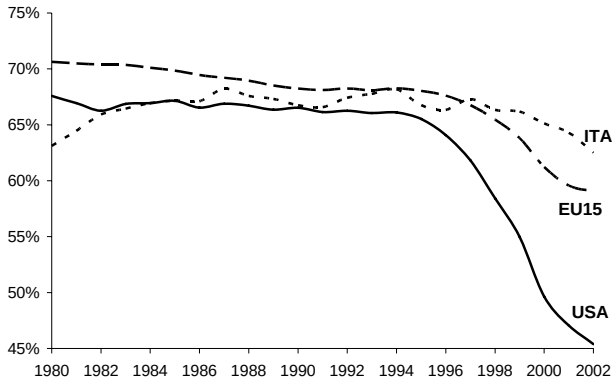


FIGURE 8
Non ICT investment share

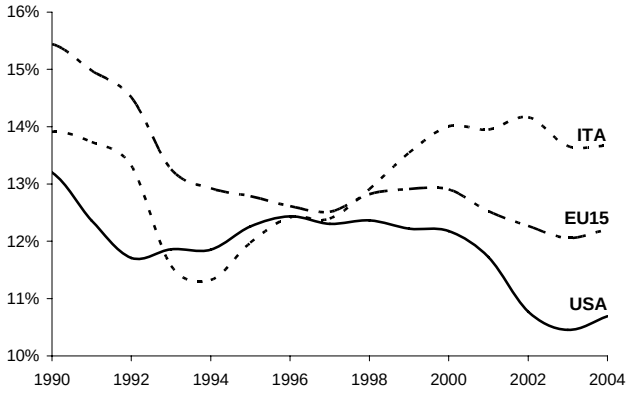
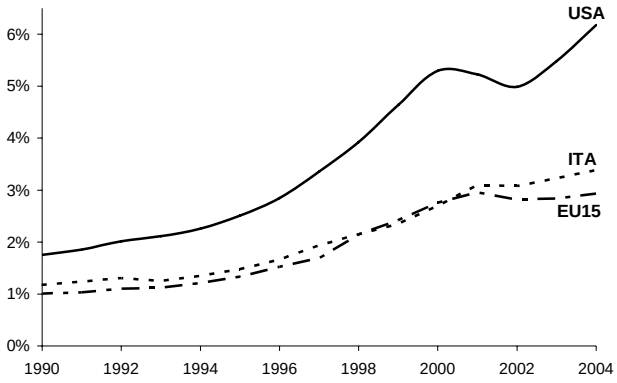


FIGURE 9
ICT sector - share of investment on GDP (real values).



We now perform a growth accounting exercise using the ICT-non ICT taxonomy. Data are from Stan database (OECD) and GGCD database (see tables 3 4).

- Sectorial growth accounting confirms the conclusions from the previous aggregate analysis: US economy achieved a significant turnaround in its labour productivity performance since the mid 1990s, whereas the EU15 and Italy productivity differential relative to US widened;
- The higher productivity performance of the US economy is mostly a reflection of the different productivity performance of these two sectors. In turn, this stems from the different TFP dynamics. In USA the TFP in the ICT sector grows from 1.5% of the period 1990-1994 to the 7.7% in the 1995-2002 period. Over the same period in the European economies, and especially in Italy, the growth of the TFP in the ICT sector is much weaker (4.3% in EU15 and to 2.3% in Italy).
- The aggregate productivity performance derives from the faster restructuring of industry towards the ICT sector in US relative to EU15 and Italy. In 2002, the ICT value added share in USA was 55%, in EU15 40% and 36% in Italy. In 1995 it was more or less equal to 66% in all the three areas.

4.2 Industrial structure and aggregate shock

We now ask if the poor performance of the Italian economy in the last decade depends only on its industrial structure or if it can also be a consequence of some aggregate technological shocks affecting the whole economy.

To address this issue, we make the following exercise:

1. we assume that Italy has the European industrial structure (in terms of value added share) but mantains its sectorial productivity growth rates (ICT and non ICT).

TABLE 3
Growth accountig in the ICT sector

	Annual growth rate	1980-90	1990-94	1995-02
USA	Labour productivity	1.7%	2.1%	8.6%
	Capital deepening contribution	0.7%	0.6%	0.9%
	Capital share	5%	6%	6%
	Capital intensity	15%	10%	14%
	TFP	1.0%	1.5%	7.7%
	Sector value added share	33%	34%	44%
EU15	Labour productivity	2.8%	2.4%	4.9%
	Capital deepening contribution	0.4%	0.4%	0.5%
	Capital share	3%	3%	4%
	Capital intensity	15%	10%	14%
	TFP	2.4%	2.1%	4.3%
	Sector value added share	30%	32%	36%
Italy	Labour productivity	0.0%	1.2%	2.8%
	Capital deepening contribution	0.3%	0.3%	0.4%
	capital share	3%	4%	4%
	capital intensity	14%	9%	13%
	TFP	−0.4%	0.9%	2.3%
	Sector value added share	33%	33%	34%

2. Alternatively, maintaining the Italian industrial structure, we use the European sectorial productivity growth rates to calculate the labor productivity of the Italian economy

The following two tables resume the results of this simulation.

Non ICT		ICT		Total Economy	
Prod. Struct. EU15	Prod.ty Italiy	Prod. struct. EU15	Prod.ty Italy	Prod.ty theoretical	Prod.ty effective
0.64	0.0%	0.36	2.8%	1.0%	1.1%

The first table shows that the change of the industrial structure does not substantially changes the Italian performance: the theoretical productivity is indeed equal to the effective one.

Non ICT		ICT		Intera Economia	
Strutt prod. Italy	Prod.tà EU15	Strutt prod. Italy	Prod.tà EU15	Prod.tà Calcolata	Prod.tà Effettiva
0.66	0.0%	0.34	4.9%	1.7%	1.1%

In turn, using the European sectorial productivity growth rates to calculate the performance of the Italian economy the result does change: 1.7% is the theoretical value of labor productivity, while only 1.1% is the effective one for the same period 1995-2002.

Thus, we can conclude that the poor *performance* of the Italian economy depends not only on its industrial structure, strongly orientated towards the traditional sectors (old economy), but also on aggregate shocks which have negatively affected the labor productivity of the entire economy.

TABLE 4
Growth accountig in the non ICT sector

	Annual growth rate	1980-90	1990-94	1995-02
USA	Labour productivity	1.2%	0.5%	−2.7%
	Capital deepening contribution	0.2%	0.3%	0.2%
	capital share	24%	24%	24%
	capital intensity	1%	1%	1%
	TFP	1.0%	0.2%	−2.9%
	Sector value added share	67%	66%	56%
EU15	Labour productivity	2.2%	2.2%	0.0%
	Capital deepening contribution:	0.7%	0.9%	0.4%
	capital share.	27%	28%	30%
	capital intensity.	3%	3%	1%
	TFP	1.5%	1.2%	−0.4%
	Sector value added share	70%	68%	64%
Italy	Labour productivity	3.1%	2.2%	0.0%
	Capital deepening contribution	0.8%	0.9%	0.5%
	capital share	28%	29%	35%
	capital intensity	3%	3%	2%
	TFP	2.3%	1.3%	−0.5%
	Sector value added share	67%	66%	66%

5 The model

The model is a version of Blanchard (1997). The main results of the model are:

- a change in the labor augmenting technical progress permanently modifies the steady state;
- only a combination of a (technology) shock to labor demand and a (non technological) shock to labor supply is able to account the negative correlation between employment and productivity in Europe and Italy in the last decade.

To get an analytical solution, we use a Cobb-Douglas production function, $y = An^{1-\alpha}$.

The Bellman equation for the single firm is

$$\rho v(n) = \max_{\dot{n}} \left[An^{1-\alpha} - wn - \frac{c}{2}\dot{n}^2 + \frac{d}{dt}v(n) \right]$$

where ρ is the user cost of capital. The FOC and the envelope condition imply:

$$\begin{aligned} c\dot{n} &= v_n \\ \rho v_n &= A(1-\alpha)n^{-\alpha} - w + v_{nn}(n)\dot{n} \end{aligned}$$

Putting $v_n = q$, the previous equations become:

$$\begin{aligned} c\dot{n} &= q \\ \rho q &= A(1-\alpha)n^{-\alpha} - w + \dot{q} \end{aligned}$$

Substituting in the Bellman equation:

$$v(n) = \frac{1}{\rho}\left\{An^{1-\alpha} - wn - \frac{q^2}{2c} + \left[\rho q - \left(A(1-\alpha)n^{-\alpha} - w\right)\right]\right\} \tag{1}$$

From the adjustment cost for net investment and the free entry condition we get:

$$v(n) = 1 + h\dot{K} \tag{2}$$

Finally, we have the labor market equations.

$$\text{Labor demand:} N = nK, \text{ Labor supply: } w = \theta N \tag{3}$$

The labor market equilibrium is:

$$w = \theta n K \tag{4}$$

A system of three differential equations characterizes the dynamics of the model:

$$\begin{cases} \dot{n} = \dfrac{1}{c}q \\ \dot{q} = \rho q - \left[A(1-\alpha)n^{-\alpha} - w\right] \\ \dot{K} = \frac{1}{h}(v-1) \end{cases} \tag{5a}$$

The steady state values of the variables are:

$$w^* = A(1-\alpha)n^{*-\alpha} \tag{6}$$

$$v^* = 1 \tag{7}$$

Using that $\dot{q} = q = 0$ in the second equation of the system (5a), we get:

$$n^* = \left(\frac{\rho}{aA}\right)^{\frac{1}{1-\alpha}} \tag{8}$$

and

$$w^* = A^{\frac{1}{1-\alpha}}(1-\alpha)\left(\frac{\rho}{\alpha}\right)^{\frac{-\alpha}{1-\alpha}} \tag{9}$$

The employment and capital steady state values are:

$$\begin{aligned} K^* &= \frac{1}{\theta}A^{\frac{2}{1-\alpha}}(1-\alpha)\left(\frac{\rho}{\alpha}\right)^{\frac{-(1+\alpha)}{1-\alpha}} \\ N^* &= \frac{1}{\theta}A^{\frac{1}{1-\alpha}}(1-\alpha)\left(\frac{\rho}{\alpha}\right)^{\frac{-\alpha}{1-\alpha}} \end{aligned}$$

Using the steady state solutions to linearize the differential equations, we get:

$$\begin{cases} \dot{n} = \dfrac{1}{c}\bar{q} \\ \dot{q} = \rho\bar{q} - \left[d - g\bar{n} - \theta\left(n^*K^* + n^*\bar{K} + K^*\bar{n}\right)\right] \\ \dot{K} = \frac{1}{h}\{\frac{1}{\rho}[l + d\bar{n} - \theta\left(n^{*2}\bar{K} + 2K^*n^*\bar{n} + \left(n^*K^*\right)^2\right) + \\ \left(\rho\bar{q} - \left[d - g\bar{n} - \theta\left(n^*K^* + n^*\bar{K} + K^*\bar{n}\right)\right]\right)] - 1\} \end{cases}$$

where e.g. $\bar{n} = n - n^*$. Further, $d = A(1-\alpha)n^{*-\alpha}$, $g = Aa(1-\alpha)n^{*-\alpha-1}$, and $l = An^{*1-\alpha}$.

From the homogeneous part of the system:

$$\begin{pmatrix} \dot{n} \\ \dot{q} \\ \dot{K} \end{pmatrix} = \begin{pmatrix} 0 & \frac{1}{c} & 0 \\ g + \theta K^* & \rho & \theta n^* \\ \frac{1}{h\rho}(g + \theta K^*(1-n^*)) & \frac{1}{h} & \frac{\theta}{h\rho} n^*(1-n^*) \end{pmatrix} \begin{pmatrix} \bar{n} \\ \bar{q} \\ \bar{K} \end{pmatrix} = M \begin{pmatrix} \bar{n} \\ \bar{q} \\ \bar{K} \end{pmatrix}$$

where in equilibrium we have $d\bar{n} = \theta K^* n^* \bar{n}$.

The eigenvalues of M derive from the characteristic equation:

$$M - \lambda I = 0 \Longrightarrow$$
$$-\lambda^3 + \lambda^2 \left[\rho + \frac{\theta}{h\rho} n^*(1-n^*)\right] + \lambda \left(\frac{g}{c} + \frac{\theta K^*}{c} + \frac{\theta n^{*2}}{h}\right) + \frac{g\theta n^*}{ch\rho} = 0$$

The sign sequence is $-\,?\,++$. So, one root is positive and the others are negative: thus, we have a saddle path. This is not surprising since the dynamic part of the model has three variables: two are backward-looking (K and n) while the other is forward-looking (q).

Let λ_1 and λ_2 be the negative solutions, and v and w the corresponding eigenvectors. The solutions of the differential equations are:

$$\begin{aligned} n_t &= \gamma v_1 \exp(\lambda_1 t) + \beta w_1 \exp(\lambda_2 t) + n^* \\ K_t &= \gamma v_2 \exp(\lambda_1 t) + \beta w_2 \exp(\lambda_2 t) + K^* \\ q_t &= \gamma v_3 \exp(\lambda_1 t) + \beta w_3 \exp(\lambda_2 t) + n^* \end{aligned}$$

where γ and β are the initial conditions. To calculate them, we use the initial values n_0 and K_0.

The initial conditions are then given by:

$$\begin{aligned} n_0 &= \gamma v_1 + \beta w_1 + n^* \\ K_0 &= \gamma v_2 + \beta w_2 + K^* \end{aligned}$$

5.1 The labor supply shock

The effects of the employment shock (a lower value of θ) is shown in figure 10.

5.2 The labor demand shock

The effects of the productivity shock (a lower value of A) is shown in figure 12.

5.3 A combination of the two shocks

In the last experiment we combine the two previous shocks (a lower value of θ and a lower value of A). The steady state moves from E to

FIGURE 10
The effects of labor flexibility

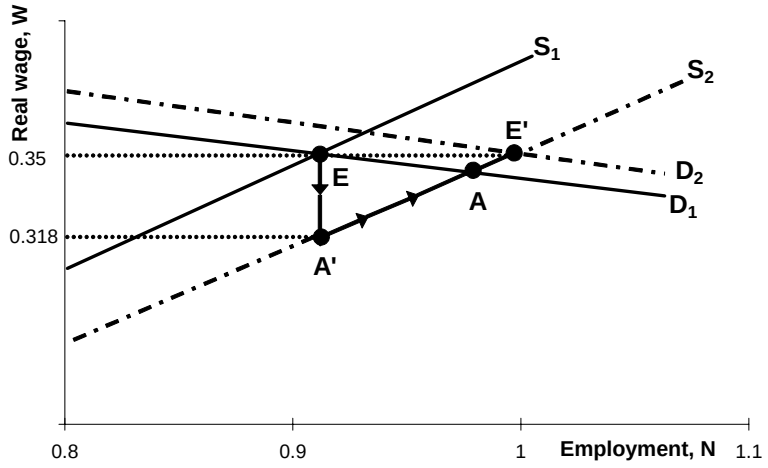


FIGURE 11

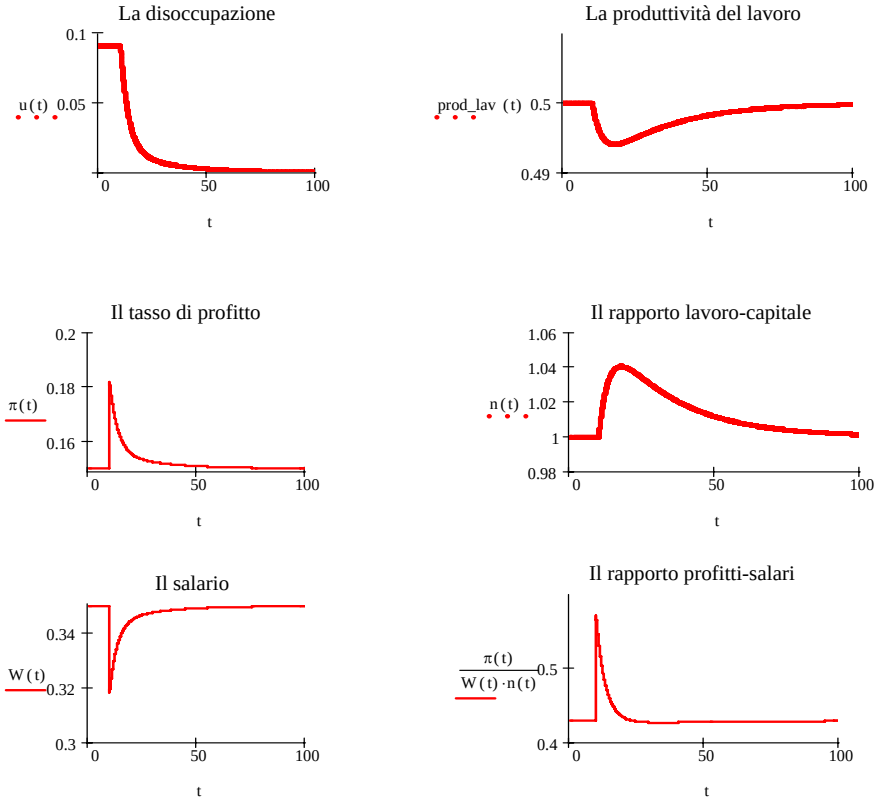


FIGURE 12
The effects of a technical progress slowdown

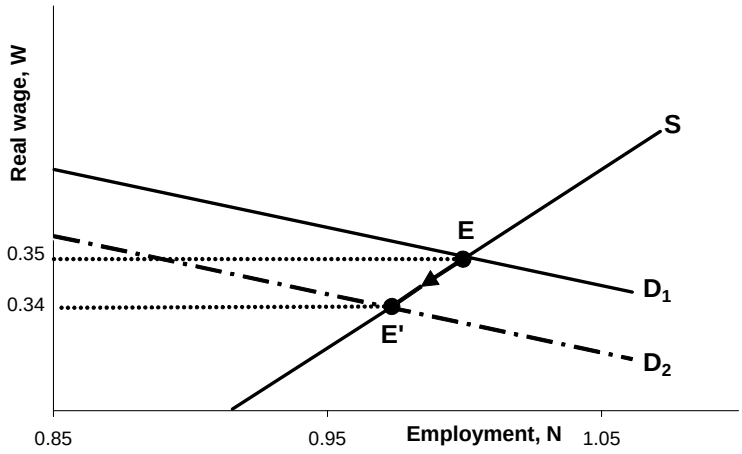
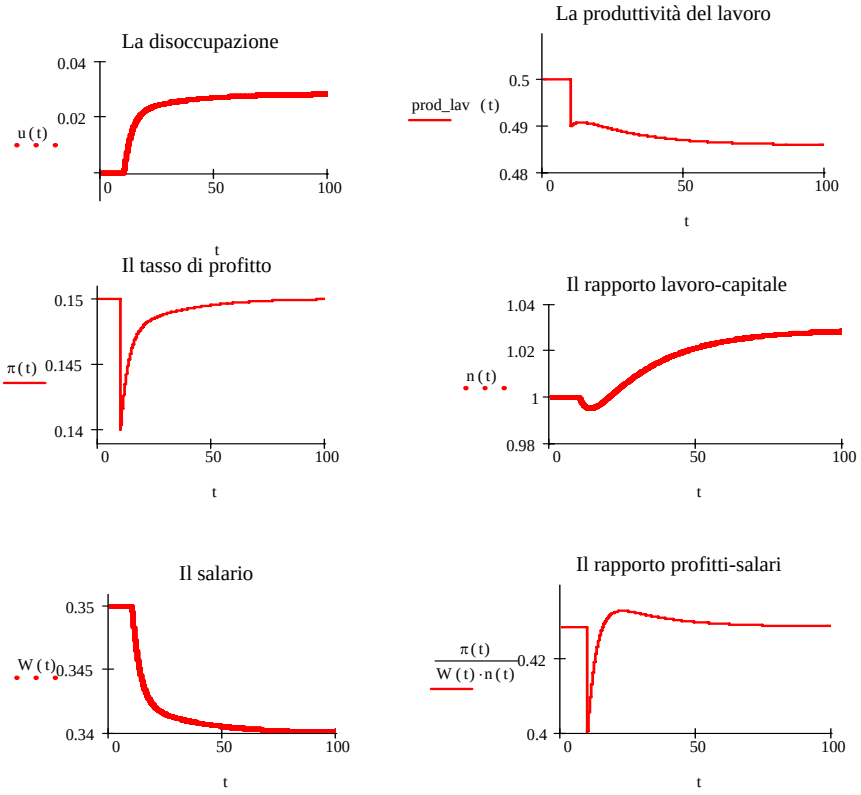
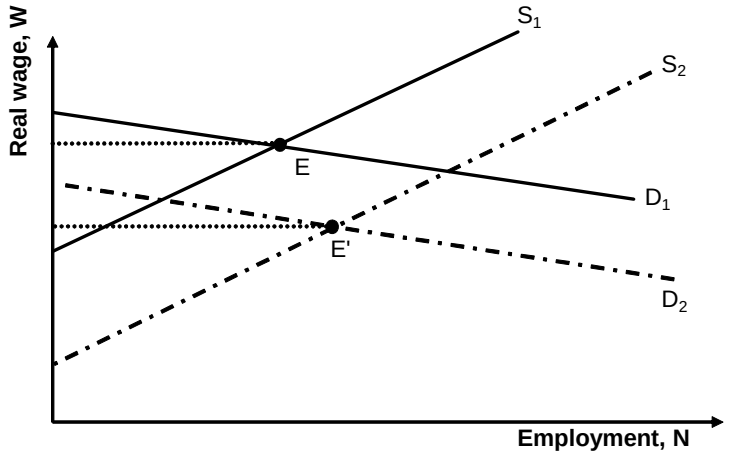


FIGURE 13

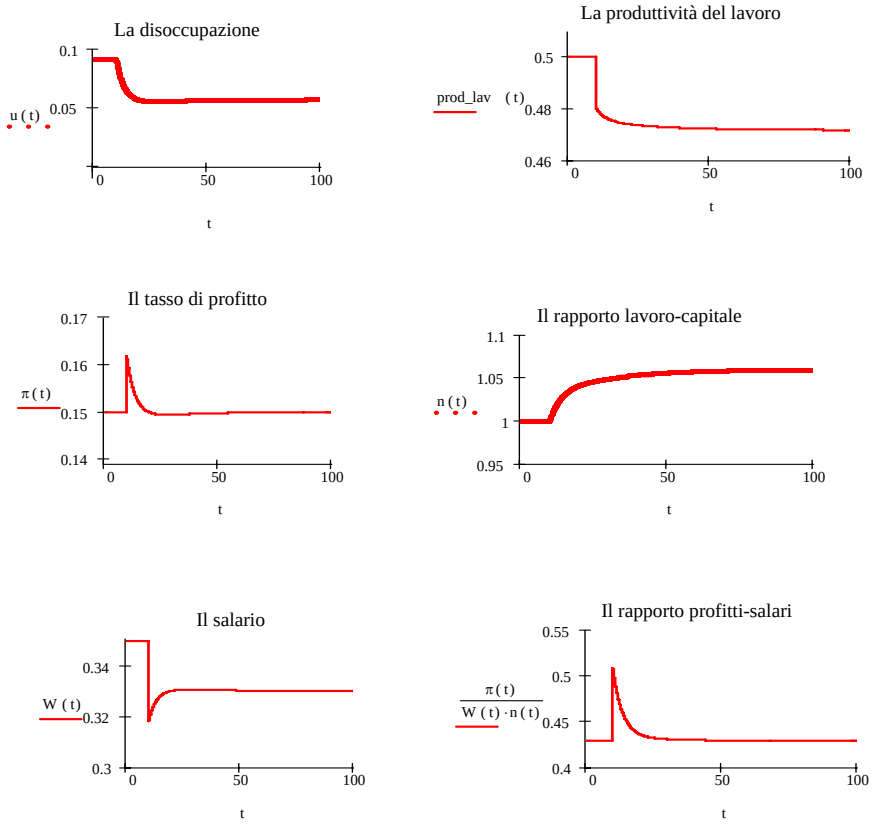




E'.

The combined effect of the two shocks

FIGURE 14



6 The structural VAR

To analyses whether productivity pattern is affected by technological or non technological shocks we need to identify both the nature and the size of the shocks driving productivity. We use a VAR methodology to analyze the contributions to the productivity slowdown. From the theoretical model we know that only a combination of two shocks is able to explain the four stylized facts seen above. These shocks are:

- *A (technological) shock to the labor demand.*
- *An (non technological) shock to the labor supply*

To these two shocks, we add a third shock to the aggregate demand to better capture the short run evolution of the economy and its effect on the comovement of productivity and employment.

- *A shock to aggregate demand.*

To quantify the relative importance of these shocks, we use the methodology of the Structural VAR.

The long-run restrictions derived from the model are:

1. Productivity shocks have a long run effect on productivity, employment and aggregate demand;
2. Employment shocks have a long run effects on employment and aggregate demand, but they do not affect productivity;
3. Aggregate demand shocks have only short run effects on employment and productivity.

These assumptions allow us to identify the SVAR. The VAR in the growth rate is:

$$X_t = C + \Pi X_{t-1} + u_t,\ t = 1,\ \ldots\ , T$$

with $X_t = [\Delta lp_t, \Delta ll_t, \Delta ld_t]'$, where $lp_t = \log(y_t) - \log(l_t)$ is the log of productivity,$ll_t = \log(l_t)$ is the log of employment, and $ld_t = \log(da_t)$ is the log of aggregate demand. The stationarity tests show it is possible a MA representation of the original VAR.

Let's indicate with ϵ_p, ϵ_l and ϵ_d the structural shocks of productivity, employment and aggregate demand. The SVAR is expressed as a distributed lag of these three shocks:

$$\begin{bmatrix} \Delta lp_t \\ \Delta ll_t \\ \Delta ld_t \end{bmatrix} = \begin{bmatrix} c_{11}(L) & 0 & 0 \\ c_{21}(L) & c_{22}(L) & 0 \\ c_{31}(L) & c_{32}(L) & c_{33}(L) \end{bmatrix} \begin{bmatrix} \epsilon_p \\ \epsilon_l \\ \epsilon_d \end{bmatrix} = C(L)\epsilon_t \qquad (10)$$

6.1 Impulse response functions (IRF)

From the previous hypothesis, we have the following IRF (the IRF results are similar across alternative specification of deterministic components, i.e. intercept, linear trend and dummies).

Technological shock. We interpret this shock as a shift of the labor demand curve. For Italy, Spain and the EU15 the initial shock determines in the medium and long run a permanent increase in the productivity and a corresponding rise in the employment.

FIGURE 15
Cumulated IRF of a technological shock on productivity and employment. European countries

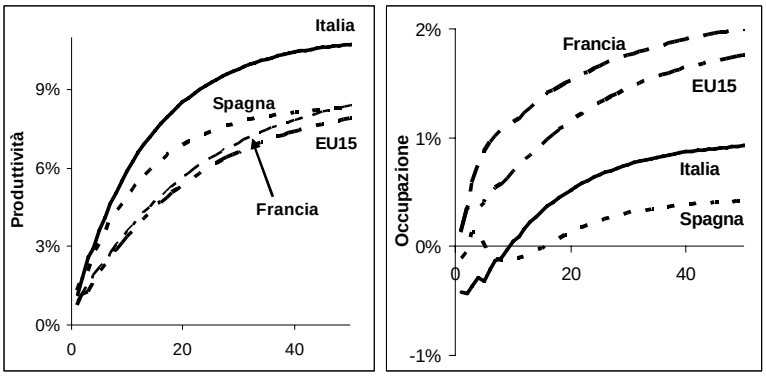
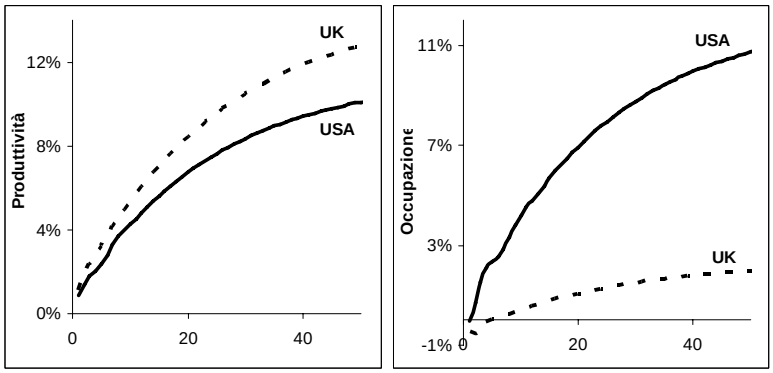


FIGURE 16
Cumulated IRF of a technological shock on productivity and employment. USA and UK



Employment shock. We interpret this shock as a shift of the labor supply curve. It has a permanent effect only on employment.

FIGURE 17
Cumulated IRF of an employment shock on employment and productivity. European countries

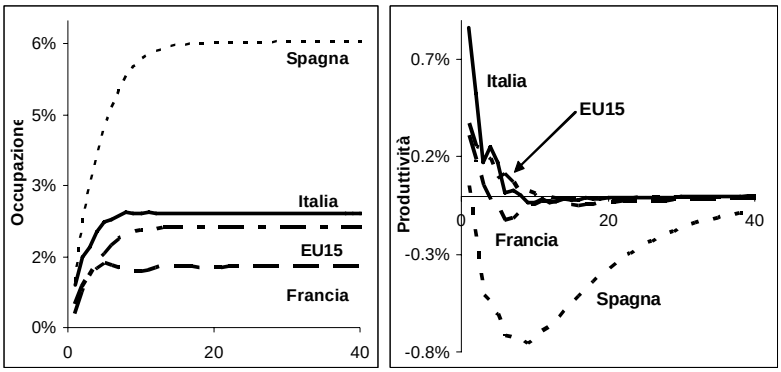
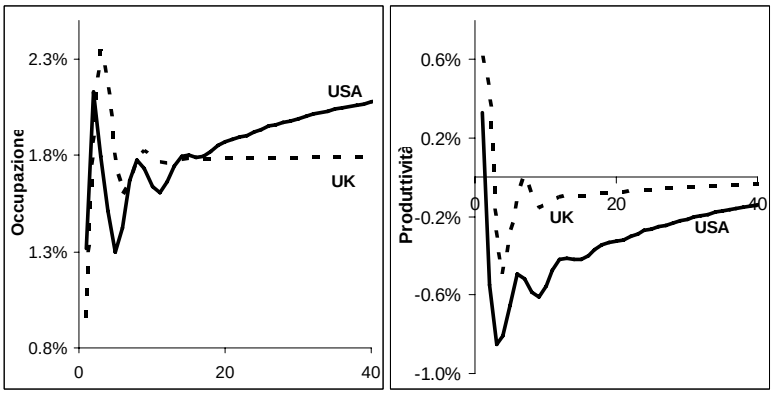


FIGURE 18
Cumulated IRF of an employment shock on employment and productivity. USA e UK



Aggregate demand shock. The aggregate demand shock has only transitory effects on the labor market equilibrium.

FIGURE 19
Cumulated IRF of a demand shock on productivity and employment. European countries

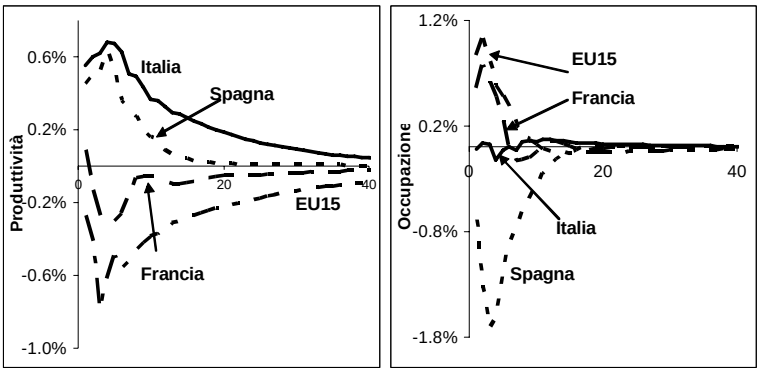
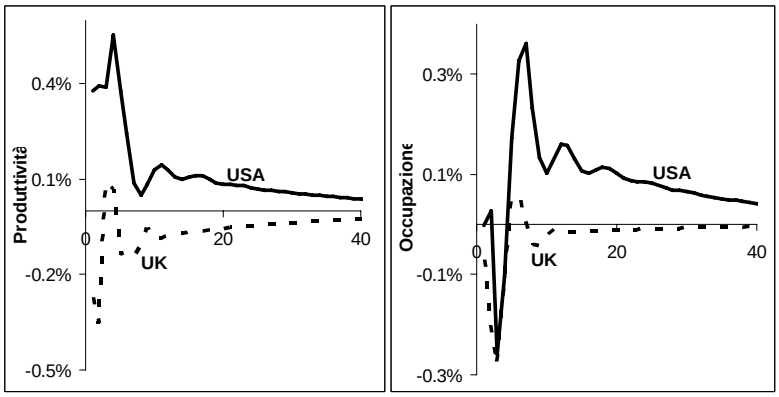


FIGURE 20
Cumulated IRF of a demand shock on productivity and employment. USA e UK



6.2 The historical decomposition

We now use the historical decomposition in order to quantify for the period 1995-2004 how much of the increase in employment can be explained by the productivity shock and how much by the employment shock. We focus on EU15 and Italy.

Technology *shock*. From this decomposition, whose results are shown in figure 21 and 22, we see that the structural technological shock explains a large part of the labour productivity, but it can not capture the employment dynamics. This is coherent with the result of the theoretical model.

FIGURE 21
EU15 - Labour productivity. Historical decomposition

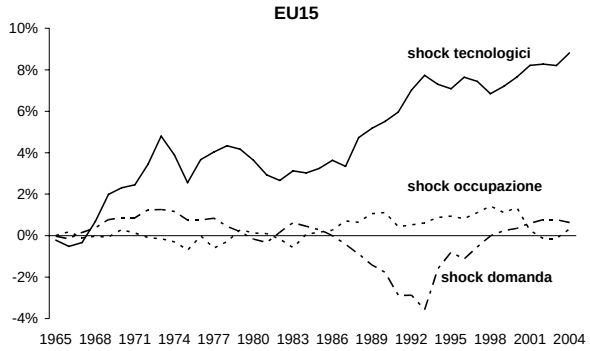
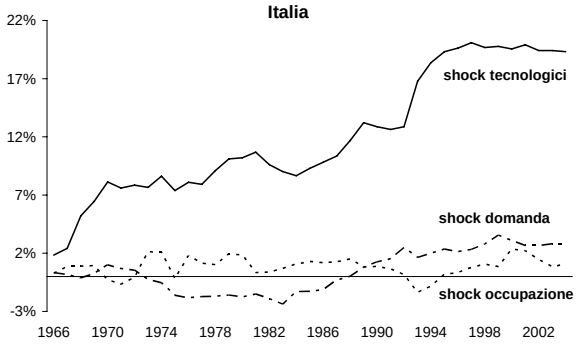


FIGURE 22
Italy – Labour productivity. Historical decomposition



Employment *shock*. From this second decomposition (figure 23 and 24), we see that the structural employment shock explains a large part of the employment increase, again confirming the results of the theoretical model. However, it does not explain the productivity dynamics.

FIGURE 23
EU15 – Employment . Historical decomposition

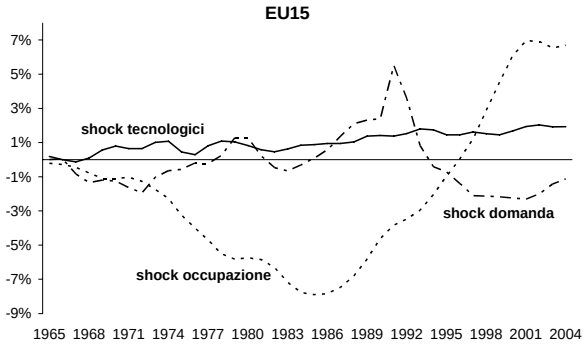
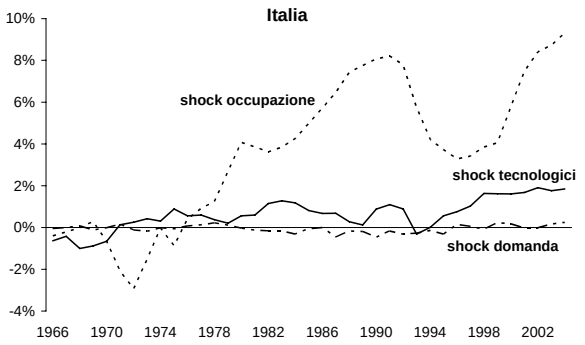


FIGURE 24
Italia – Employment. Historical decomposition.



Hence, only a combination of the two shocks can appropriately explain the employment-productivity trade off occurred in EU15 and in Italy during the last decade 1995-2004. In EU15 the two shocks explain half of the change in employment and productivity; in Italy the productivity shock explains the main part of the slowdown in productivity growth while is unable to explain the evolution of employment.

6.3 Variance decompositon

Variance decomposition confirms the previous conclusions.

TABLE 5
Variance decomposition

USA – Labour productivity				USA – Employment			
periods	productivity	employment	demand	periods	productivity	employment	demand
2	75	11	14	2	0	100	0
10	63	30	7	10	44	51	4
30	68	26	6	30	51	45	4
EU15 – labour productivity				EU15 – Employment			
2	72	18	10	2	2	10	88
10	75	9	16	10	6	36	58
30	80	7	13	30	8	48	44
Italy – labour productivity				Italy – Employment			
2	56	31	13	2	18	82	0
10	75	19	6	10	14	83	3
30	78	16	5	30	15	82	3

6.4 Conclusions

1. EU15 employment and productivity growth patterns have diverged sharply over recent years. These two facts, and the increase of the profits and the slowdown in capital deepening characterized the sluggish growth of the European economy in the last ten years. These facts are at least apparently contradictory.

2. Indeed, during the decade 1995-2004 (but also in the next year) profits did not sustain the accumulation of capital stock reorientating the new investment towards the ICT sector with high productivity. European firms, and specially Italian firms, preferred to remain in the traditional industrial sector, investing in capital saving technologies content with low productivity. The poor performance of European economy depends directly on the slowdown of labor productivity, and not on labor participation.

3. We argue that both non technological shocks and technological shocks are necessary to explain the dynamics of European countries in the last decade.

4. What is the root of the slowdown in labor productivity and technological progress in EU15 and Italy?An interpretation, coherent with the stylized facts described above, is that structural reforms in labor market induced firms to remain in the traditional sectors (non ICT) – increasing profits in the short run — avoiding to adopt innovations coming from the more dynamic sectors (ICT) of the economy. This phenomenon explains the aggregate slowdown of both TFP and labor productivity.