ICT AND EMPLOYMENT GROWTH

IN ITALIAN INDUSTRIES

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BASIC FACTS

The 'Eurosclerosis': since the second half of the 1980s, the policy debate has focused on the low employment (and productivity) growth of the European economy, compared to US.

First half of the 1990s:

a) In the European Union:

- Rising rate of unemployment (peak of 10.5% in 1994)
- Decline of total workers (-0.7 per year over 1991-95)
- Labour productivity grew at 1.9 per year

b) In the United States:

- Increase of total workers (1.4 per year over 1991-95)
- Labour productivity grew at 1.1 per year

Second half of the 1990s:

a) Employment revival in EU: growth of total workers, with annual rates slightly inferior to those of US

b) US labour productivity growth outpaced the EU one: 2.5% versus 1.4% per annum

From a pessimistic orientation to a wave of optimism: the "European job machine"

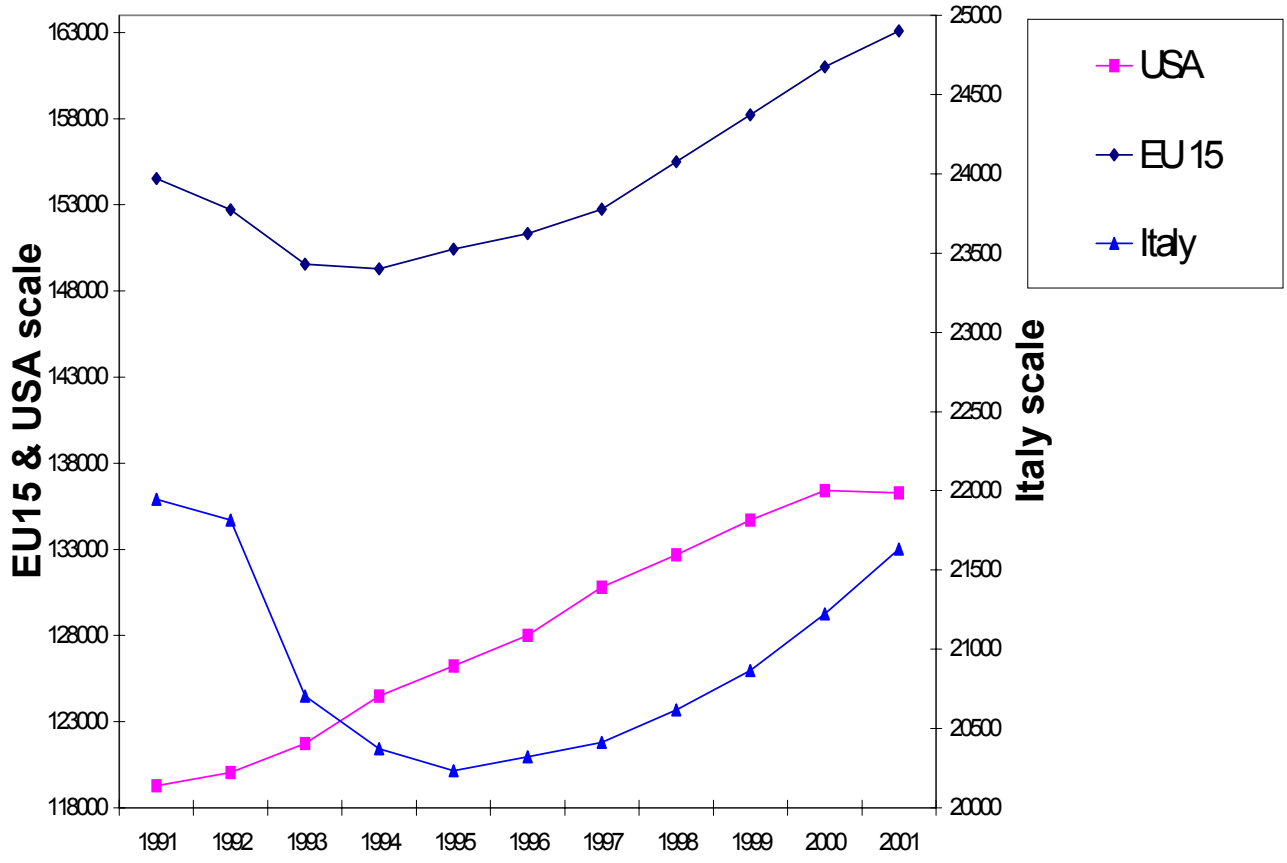
ITALY:

Italy experienced a path similar to the EU average.

The employment recovery in the second half of the 1990s is mainly accounted for by service industries: in particular financial, computer and other business services

This is a stylised fact for most OECD countries

Figure 1: Total employment in EU15, USA and Italy (thousands): 1991-2001



TWO MAIN EXPLANATIONS FOR EU EMPLOYMENT PATTERNS

1) The mainstream 'labour market rigidity' approach (Bertola, Ichino, Layard)

2a) The 'structural and technological change' approach (Freeman, Petit, Pianta, Soete, Vivarelli).

2b) The role of ICT

Our paper represents a first joint test of the two explanations for Italy, for the second half of the 1990s.

DATA

Survey on Firms' Accounts (ISTAT)

Highly disaggregated data (3-digit) on labour inputs, value added, labour costs and investment (total and ICT).

ICT classification (originally developed by Stiroh for US).

187 three-digit industries classified as:

a) ICT producers

b) ICT (intensive) users

c) Non-ICT industries

DESCRIPTIVE ANALYSIS

Table 2 – Average ICT intensity by ICT group in Italy: 1998-2000

	ICT expenditure/ Value added (%)	ICT expenditure/ Total investment (%)	ICT expenditure/ Total workers (thousands of €)
Secondary and tertiary industries			
Non-ICT	0.45	2.17	0.155
Producing	1.59	5.00	0.970
Using	0.94	5.77	0.331
Total	0.69	3.45	0.247
Secondary industries			
Non-ICT	0.44	2.07	0.175
Producing	2.09	8.50	0.876
Using	0.78	5.18	0.296
Total	0.57	2.93	0.228
Tertiary industries			
Non-ICT	0.49	2.33	0.135
Producing	1.45	4.25	1.017
Using	1.04	6.09	0.350
Total	0.82	3.96	0.262

Table 3 – Absolute and percentage changes of labour inputs in Italy: 1997-2000

	Δ. Workers	Δ %	Δ. Employees	Δ %	Δ. Hours	Δ %
Secondary and tertiary industries						
Non-ICT	724537	8.60	559864	10.07	903824	9.57
Producing	95121	19.30	65717	16.85	110156	16.65
Using	317857	6.76	185326	6.63	356380	7.38
Total	1137515	8.35	810907	9.27	1370360	9.17
Secondary industries						
Non-ICT	181212	4.12	150242	4.52	281442	4.98
Producing	-12969	-6.63	-9366	-6.03	-10203	-3.95
Using	3088	0.18	8195	0.57	39860	1.63
Total	171331	2.71	149071	3.04	311099	3.72
Tertiary industries						
Non-ICT	543325	13.51	409622	18.31	622382	16.40
Producing	108090	36.38	75083	32.00	120359	29.83
Using	314769	10.54	177131	12.95	316520	13.26
Total	966184	13.23	661836	17.24	1059261	16,09

Table 4 - Employment changes across ICT Producing Industries

	Δ workers	Δ employees	Δ hours
Secondary industries			
Office machinery and computers	-8314	-9067	-14955
Δ %	*-33.58*	*-38.74*	*-37.29*
Insulated wire and cable	0	-108	-277
Δ %	*0.00*	*-0.82*	*-1.26*
Electronic valves and tubes and other electronic components	2560	2725	9312
Δ %	*8.54*	*9.60*	*20.13*
TV and radio transmitters and other communication apparatus	-4841	-4755	-8028
Δ %	*-7.25*	*-8.40*	*-8.69*
TV and radio receivers & recording or reproducing apparatus	-1500	-1267	-1168
Δ %	*-16.63*	*-15.42*	*-9.16*
Medical and surgical equipment and orthopaedic appliances	-874	3106	4913
Δ %	*-1.70*	*12.13*	*10.98*
Tertiary industries			
Telecommunications	16965	16179	21611
Δ %	*17.91*	*17.14*	*13.60*
Hardware consultancy	-2719	-3117	-5527
Δ %	*-41.53*	*-59.07*	*-61.65*
Software consultancy and supply	51428	38163	62716
Δ %	*57.04*	*56.63*	*52.80*
Data processing	20294	11868	21983
Δ %	*25.91*	*22.82*	*24.71*
Database activities	716	546	1106
Δ %	*32.78*	*30.13*	*35.96*
Maintenance and repair of office, accounting and computing machinery	1452	108	-168
Δ %	*12.21*	*1.48*	*-1.29*
Other computer related activities	19954	11336	18638
Δ %	*150.39*	*175.13*	*157.58*

REGRESSION ANALYSIS

Employment change over the period 1997-2000:

$$\Delta \ln E_i = \alpha_0 + \alpha_1 \Delta \ln VA_i + \alpha_2 \Delta \ln W_i + + \alpha_3 \ln IN\_NICT_i + \alpha_4 \ln IN\_ICT_i + \alpha_5 DSERVICE_i + \varepsilon_i$$

where:

Δ ln: long differences of natural logs (1997-2000)

E: total labour input units (employees and hours worked)

VA: deflated value added

W: deflated unit labour costs

IN_NICT: intensity of non-ICT investment per unit of labour (average 1998-2000)

IN_ICT: intensity of ICT investment per unit of labour (average 1998-2000)

DSERVICE: dummy variable for services

Weighted-least-squares (WLS) with weights given by employees and hours worked (average 1997-2000)

Table 5 – WLS regressions: log differences of labour input 1997-2000

Dependent variable:	Δ ln Employees		Δ ln Hours Worked	
	Coeff.	T statist.	Coeff.	T statist.
Constant	-0.057	(1.175)	-0.061	(1.187)
Δ ln Value Added	0.592	(11.96)**	0.595	(12.33)**
Δ ln Unit Lab. Cost	-0.390	(3.297)**	-0.391	(3.614)**
ln (Non-ICT Inv./ Labour Input)	-0.003	(0.194)	-0.009	(0.619)
ln (ICT Investment/Labour Input)	-0.029	(1.307)	-0.030	(1.339)
DSERVICE	0.135	(3.386)**	0.166	(3.154)**
DSERV. * ln (ICT Inv./ Lab. Input)	0.057	(1.872)*	0.059	(2.131)**
Adjusted R^2	0.523		0.527	

* = significant at 0.1; ** = significant at 0.05.

Table 6 – WLS regressions: log differences of labour input 1997-2000

Dependent variable:	Δ ln Employees		Δ ln Hours Worked	
	Coeff.	T statist.	Coeff.	T statist.
Constant	-0.012	(0.316)	-0.001	(0.033)
Δ ln Value Added	0.594	(11.92)**	0.598	(12.26)**
Δ ln Unit Lab. Cost	-0.361	(3.090)**	-0.363	(3.359)**
ln (Non-ICT Inv./ Lab. Input)	-0.001	(0.019)	-0.005	(0.381)
DICTINTENSE	-0.033	(1.118))	-0.029	(1.023)
DSERVICE	0.071	(2.456)**	0.062	(2.198)**
DSERVICE* DICTINTENSE	0.018	(0.417)	0.019	(0.424)
Adjusted R^2	0.518		0.517	

* = significant at 0.1; ** = significant at 0.05.

MAIN CONCLUSIONS

Descriptive analysis:

a) In the aggregate, the Italian employment growth over 1997-2000 is almost entirely due to the tertiary sector;

b) ICT producing industries record an employment increase greater than non-ICT and ICT using industries;

c) Within ICT producers, service industries enlarge their employment basis by one third; this employment increase more than compensates the negative performance of secondary industries.

Regression analysis:

1) The employment growth over 1997-2000 is mainly explained by changes in value added and labour costs and the dummy for service industries

2) Controlling for these effects, *within service industries* a greater intensity of ICT investment is significantly associated with the increase of employment.

Further issues to be analysed:

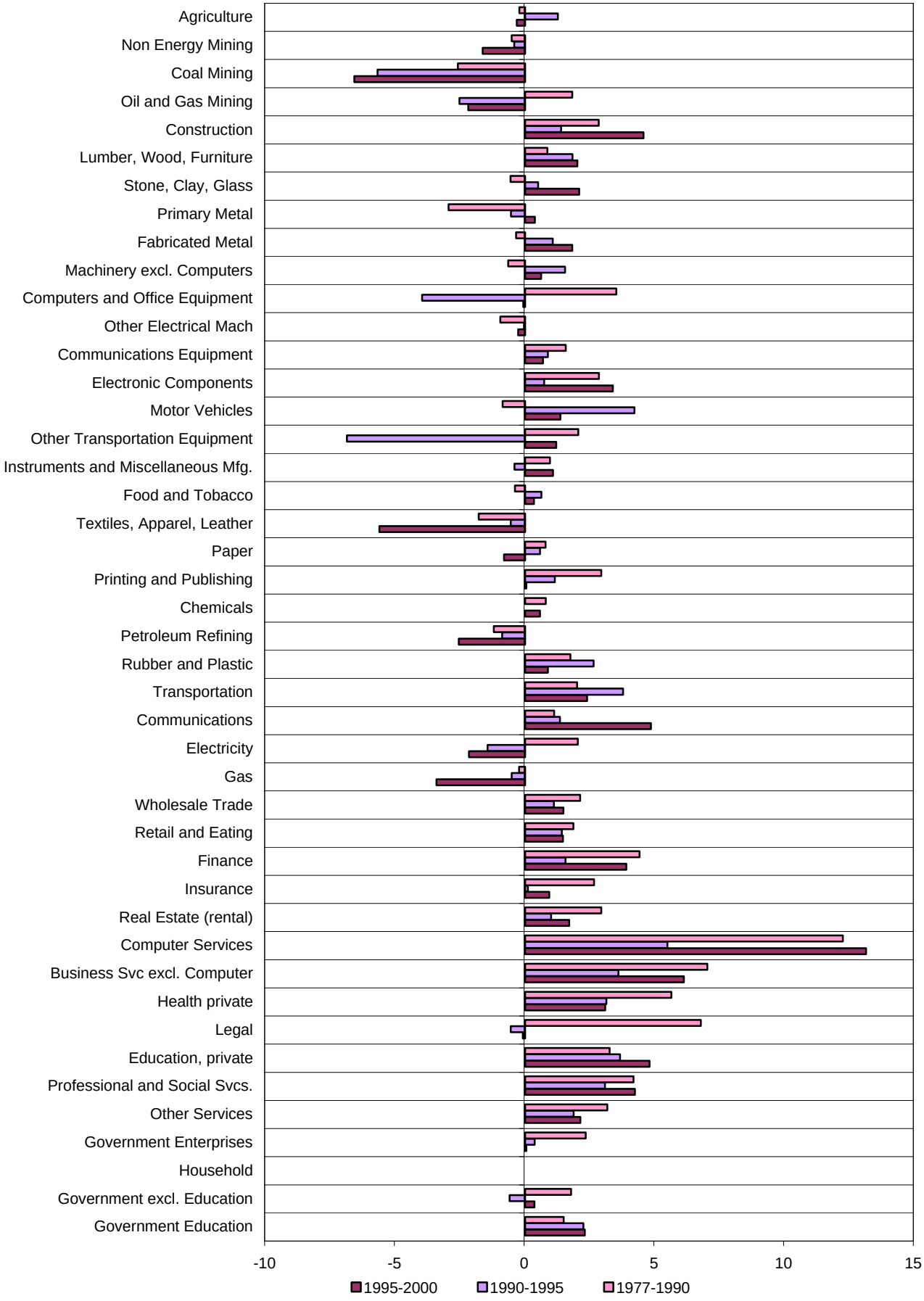
- The impact of ICT on the quality of jobs (skill-biased technical change).

- The impact of ICT on labour productivity.

In a preliminary test for Italian 3-digit industries, the intensity of ICT investment is not significantly associated with labour productivity.

The same finding emerges from other studies applied to the EU.

Jorgenson, Ho, Stiroh (2002): Growth of Industry Labor Input by Sub-Period



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