Capital Accumulation, Productivity and Growth

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1. - Introduction

Economic growth accelerated in the second half of the nineties in most of the major industrial economies, often returning above the eighties average. However, in the major countries of Continental Europe (France, Germany and Italy) it remained well below that of the US, determining a new sharp widening of the gap between the two coasts of the Atlantic[1] and giving way to a widespread debate on the "decline" of the European economy. The debate has been particularly intense in Italy, where growth rates of per capita GDP have been in the last part of the nineties, and again in the first half of the new decade, among the lowest in the G7 countries, together with those of Germany and Japan[2].

One of the main explanations advanced in the literature for the general resurgence of growth, and, on the other hand, for increasing differentials among industrial countries, assigns a crucial role to IT investment and to innovation produced in the IT sectors[3]; however, the contribution of technology diffusion from the innovative sectors to the rest of the economy is increasingly considered as

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[1] For an history of the convergence pattern of Europe with respect to the US, see GORDON R.J. (2004*b*).

[2] See for instance TONIOLO G. - VISCO V. (2004); a number of evidence about the decline of Italian economy has recently been recollected in CENTRO STUDI CONFINDUSTRIA (2005). For a critical appraisal of the "declinist" view, see ISAE (2005*b*).

[3] See among others JORGENSON D.W. - STIROH K.J. (2000); VAN ARCK B. - INKLAAR R. - MC GUCKIN R.H. (2002); VAN ARK B. - MELKA J. - MULDER N. - TIMMER N. - YPMA G. (2002).

a key factor, almost as important as the original innovation activity in IT sectors[4]. Starting from these considerations, last year ISAE and CEIS launched the project *Monitoring Italy 2005*, with the goal of improving the understanding about these issues and helping to build a relevant agenda for future policy action. A Conference was organized by ISAE, University of Rome "Tor Vergata" and the *Rivista di Politica Economica*, where a selection of submitted papers was invited. The *Rivista di Politica Economica* is proud to host in this issue a further selection of the papers presented at the Conference and an invited Lecture given by Prof. Dale Jorgenson at the Conference's opening, all papers being previously unpublished.

The invited lecture of Prof. Dale Jorgenson opening the volume provides a brilliant and comprehensive introductive account of growth differentials. The rest of the volume is devoted to the analysis of some of the possible explanations of Jorgenson' findings; it is divided into three parts, dealing, respectively, with various aspects of the so-called ICT revolution, with the analysis of the firm-level determinants of productive efficiency and growth, and with the effects of internationalization and the completion of the common European Market.

2. - Output, Inputs and Productivity in G7 Countries

As Dale Jorgenson points out in his seminal contribution, the US reinforced their leadership among G7 countries in terms of output per capita[5] between 1980 and 2001. The gap with some of the major European countries has widened considerably in the last part of the sample: given the US level equal to 100 in 2000, in 1995 output per capita was 85.6 in the US, 65 in Germany and 62.1 in Italy. In 2001, the figures became respectively 100.3, 69.2 and 68.8 in the three countries (table 1, extracted from Jorgenson data).

[4] See for instance GORDON R.J. (2004*a*). ROBERTS J. (2004) argues that it is investments in IT and complementary organizational changes in the firm that have a huge positive effect on performance.

[5] Calculated with an internationally harmonised process, see SCHREYER P. (2000) and OECD (2002).

TABLE 1

LEVELS OF OUTPUT AND INPUT *PER CAPITA* AND PRODUCTIVITY

	Year	Output per capita	*Labor Input per Capita*			*IT capital Input per Capita*			*Non IT Capital Input per Capita*			Productivity
			Input	Hours worked	Quality	Input	Stock	Quality	Input	Stock	Quality	
US	1980	63.9	81.1	89.7	90.4	4.5	9.8	46.4	73.8	82.5	89.5	90.6
	1989	79.7	91.9	97.1	94.7	19.3	27.4	70.4	87.0	92.5	94.1	94.9
	1995	85.6	94.2	95.9	98.2	38.1	46.8	81.3	90.7	94.8	95.6	96.4
	2001	100.3	98.8	98.3	100.5	115.3	110.7	104.1	102.2	101.4	100.8	99.5
Canada	1980	67.6	73.0	91.4	79.9	1.0	0.8	118.4	73.1	44.1	165.7	105.4
	1989	78.8	82.1	96.6	85.0	3.9	3.7	107.4	83.1	51.5	161.2	105.9
	1995	79.6	82.3	90.9	90.6	11.2	9.7	115.0	79.9	53.0	150.7	105.9
	2001	91.9	89.3	96.3	92.7	45.6	31.8	143.4	84.0	57.4	146.5	109.7
Uk	1980	45.0	78.9	92.0	85.7	3.0	2.5	118.5	30.7	25.7	119.2	89.5
	1989	56.5	85.4	97.7	87.4	10.9	9.6	112.7	43.4	32.6	133.2	92.3
	1995	61.4	82.4	89.8	91.7	20.9	19.2	108.9	55.9	36.9	151.5	91.7
	2001	71.3	89.2	94.2	94.7	53.6	44.9	119.3	56.4	44.5	126.7	96.9
France	1980	45.9	63.0	79.3	79.5	4.2	3.5	117.5	41.3	38.0	108.5	98.6
	1989	54.1	59.4	71.2	83.5	11.9	9.9	119.7	53.9	44.0	122.6	101.5
	1995	57.0	61.7	67.6	91.2	19.1	18.0	106.2	57.9	48.3	119.9	99.9
	2001	64.0	65.3	69.7	93.7	38.1	33.4	114.1	62.6	54.1	115.8	103.6
Germany	1980	49.3	75.4	82.3	91.6	7.1	6.1	117.4	51.9	63.4	81.9	80.8
	1989	58.6	78.7	82.7	95.2	18.7	15.5	120.4	70.3	70.6	99.5	82.4
	1995	65.0	75.2	76.4	98.4	31.1	28.2	110.1	79.7	79.3	100.5	88.1
	2001	69.2	75.9	75.3	100.9	59.7	49.7	120.2	87.3	87.2	100.1	87.6
Italy	1980	45.9	48.8	71.4	68.3	6.7	4.6	146.8	41.6	38.2	109.2	106.6
	1989	57.3	51.0	72.1	70.7	18.8	13.1	143.2	71.3	54.8	130.0	103.2
	1995	62.1	50.6	68.9	73.5	31.2	23.8	131.0	81.2	64.4	126.0	105.6
	2001	68.8	55.1	72.3	76.1	60.3	44.1	136.6	94.7	75.1	126.1	102.5
Japan	1980	43.6	84.8	111.9	75.8	1.7	3.5	47.8	39.3	99.1	39.6	70.4
	1989	58.4	97.4	115.6	84.3	10.3	12.7	81.1	47.9	110.0	43.6	78.0
	1995	65.4	95.6	109.9	87.0	19.0	22.9	83.0	53.9	120.6	44.7	83.0
	2001	70.4	91.4	101.3	90.3	46.0	47.8	96.1	57.1	127.1	44.9	86.8

Source: JORGENSON D.W., in this volume (2005).

In fact, in this period G7 countries can be roughly clustered into two main groups in terms of per capita output growth (table 2, again obtained from a re-arranging of Jorgenson data): in the first, composed by the US, Canada, UK and France, growth sharply accelerated from the low figures of the first part of the nineties, standing above that of the previous decade. On the other hand, growth of per capita output remained below the average of the eighties in Italy, and was even slower than in the first part of the nineties in Germany and Japan.

Jorgenson growth accounting exercise allows us to decompose output per capita distinguishing the contribution of labor and capital inputs and productivity; input contribution can be further separated into that of capital and labor, both in terms of their stock and quality[6]. Moreover, looking more deeply into the role of capital accumulation, it is possible to distinguish between the contribution of IT and non-IT capital goods, again both in terms of their level and quality; similarly, as far as productivity is concerned, the paper looks at the different part played by IT and non-IT sectors[7]. Generally speaking, Jorgenson shows that international heterogeneity in per capita output growth can be mainly explained by different patterns of inputs growth; a particularly significant role in this sense has been played in recent years (and especially in the 1995-2001 period) by IT capital input.

2.1 *Capital and Labor Inputs*

Indeed, all the countries show in the last twenty years a spectacular rise of IT capital (both in terms of stock and quality): however, its level in the US in 2001 was more than double that of most other countries, because of higher IT stocks; on the other hand, IT capital quality in the other industrial economies considered (with the exception of Japan) was higher than in the US. Similarly, the US outperforms the others in terms of non-IT per

[6] Input quality reflects the composition of capital and labour input; see JORGENSON D.W. - YIP E. (2000) for a methodological description.

[7] See also TRIPLETT J. (1996).

TABLE 2

SOURCES OF GROWTH OF *PER CAPITA* OUTPUT

		Output growth per capita	*Growth in Labor input per capita*			*Growth in IT capital input per capita*			*Growth in non IT capital input per capita*			Productivity		
			Input	Hours worked	Quality	Input	Stock	Quality	Input	Stock	Quality	Total	From IT production	From non IT production
US	1980-1989	2.46	1.38	0.87	0.51	16.09	11.47	4.63	1.83	1.27	0.56	0.52	0.23	0.29
	1989-1995	1.20	0.41	–0.21	0.61	11.35	8.94	2.41	0.68	0.41	0.27	0.26	0.23	0.03
	1995-2001	2.64	0.79	0.41	0.38	18.47	14.34	4.12	2.00	1.11	0.88	0.54	0.48	0.06
Canada	1980-1989	1.92	1.47	0.69	0.78	17.66	18.88	–1.22	1.60	1.94	–0.35	0.06	0.14	–0.08
	1989-1995	0.17	0.04	–1.02	1.06	17.42	16.28	1.14	–0.66	0.47	–1.13	0.00	0.14	–0.14
	1995-2001	2.38	1.35	0.98	0.38	23.42	19.73	3.69	0.85	1.32	–0.47	0.58	0.17	0.41
Uk	1980-1989	2.54	0.88	0.67	0.21	14.43	14.98	–0.56	3.85	2.62	1.23	0.34	0.23	0.11
	1989-1995	1.38	–0.59	–1.41	0.81	10.91	11.50	–0.58	4.22	2.07	2.15	–0.11	0.32	–0.43
	1995-2001	2.50	1.32	0.79	0.53	15.69	14.16	1.53	0.15	3.12	–2.97	0.91	0.82	0.09
France	1980-1989	1.84	–0.65	–1.20	0.55	11.66	11.46	0.20	2.97	1.61	1.36	0.32	0.29	0.03
	1989-1995	0.85	0.61	–0.86	1.47	7.92	9.91	–1.99	1.20	1.58	–0.38	–0.26	0.29	–0.55
	1995-2001	1.93	0.95	0.50	0.45	11.55	10.35	1.20	1.30	1.87	–0.57	0.60	0.56	0.04
Germany	1980-1989	1.93	0.48	0.06	0.42	10.71	10.43	0.28	3.36	1.20	2.16	0.23	0.28	–0.05
	1989-1995	1.72	–0.78	–1.33	0.55	8.47	9.97	–1.50	2.09	1.92	0.17	1.12	0.43	0.69
	1995-2001	1.04	0.17	–0.25	0.41	10.87	9.40	1.47	1.52	1.59	–0.06	–0.10	0.65	–0.75
Italy	1980-1989	2.46	0.49	0.10	0.39	11.44	11.72	–0.27	5.97	4.03	1.94	–0.36	0.32	–0.68
	1989-1995	1.33	–0.13	–0.75	0.63	8.44	9.94	–1.49	2.17	2.68	–0.51	0.37	0.38	–0.01
	1995-2001	1.72	1.40	0.81	0.60	10.98	10.28	0.70	2.57	2.56	0.01	–0.49	0.68	–1.17
Japan	1980-1989	3.25	1.40	0.36	1.04	20.19	14.32	5.88	2.21	1.16	1.05	1.15	0.15	1.00
	1989-1995	1.90	–0.32	–0.84	0.52	10.22	9.84	0.38	1.95	1.53	0.42	1.04	0.20	0.84
	1995-2001	1.23	–0.73	–1.39	0.66	14.71	12.25	2.46	0.96	0.88	0.08	0.75	0.46	0.29

Source: JORGENSON D.W., in this volume (2005).

capita capital accumulation; also in this case, the gap is widening because of higher levels of capital stock, with US non-IT capital quality comparable to that of the other countries. It is worth noticing that the Italian economy is characterized in this period by a level of (IT and non IT) capitalization higher than that of the other countries except the US[8]. Accordingly, in terms of growth rates, the resurgence of growth in the fastest-growing cluster of countries went together with a powerful surge in IT investment. On the other hand, Germany, Italy and Japan show a much lower growth of IT-capital accumulation. Interestingly, in low-growth Italy non-IT capital stock grew at a pace comparable to that registered in faster-growing countries.

As for labor input, it emerges that at the end of the period considered the US leads all G7 countries in terms of its levels, due to both higher hours worked per capita and better quality; Japan and Canada are not so far down, while France and Italy rank at the bottom both at the beginning and end of the sample. However, both countries show an increase in the number of hours worked per capita and in labor quality since 1995. On the other hand, slow growth of per capita labor input also partly explains the sluggish performance of German and Japanese economies during the period.

2.2 *Productivity*

The analysis of productivity levels (defined as the ratio of output with respect to total input) show that Canada and Italy are among the leaders between G7 countries in all the periods considered; in the US, productivity levels are slightly behind those of the leader countries, while in France they have become the second-highest in 2001, starting from quite low figures in the eighties; Germany and Japan were, and still are, lagging behind. Noticeably, notwithstanding an actual decrease in productivity levels

[8] For an analysis of the high capitalisation of Italian economy, see for instance CENTRO STUDI CONFINDUSTRIA (2000).

between 1995 and 2001, Italian productivity remains above that of all the other G7 economies but Canada and France.

Overall, productivity contribution to growth was rather negligible in the eighties (with the exception of Japan) and in the first part of the nineties, becoming more relevant in the 1995-2001 period, especially in Canada, UK and France. The decline of productivity in the second part of the nineties in Italy and Germany was mostly driven by a negative contribution of non-IT producing sectors, whilst productivity in IT sectors increased at a speed comparable (or even higher, in the case of Italy) to that of the other G7 countries.

The growth accounting exercise confirms that the resurgence of growth in the US and in other G7 economies (mainly Canada, France and the UK) in the second part of the nineties may be mainly attributed to strong IT capital accumulation and to acceleration in productivity growth, especially in IT sectors; a significant role has been played also by increasing labor input (both hours worked and labor quality). On the other hand, the relatively poor performance of Italy and Germany is linked to the combination of two main factors: slower increase of IT-capital input (due both to slower accumulation and poorer quality of capital) together with, and foremost, declining productivity in non-IT producing sectors. On the other hand, in Italy labor and non-IT capital accumulation, even if starting from very low levels, played a role comparable to that observed in faster-growing countries in stimulating per capita output growth, while in Germany sluggish economic performance was also due to a slower growth of labor and non-IT capital inputs.

As far as labor input is concerned, according to many authors the explanation of its low level in Italy (and, more generally, in Europe), if compared to the US experience, has to do with rigidities in European labor market (see for instance Prescott, 2004); on the other hand, Blanchard (2004) argues that differences mainly reflect agents' preferences toward leisure: in this sense, the recent wave of product and financial markets reforms in Europe are supposed to be able to put pressure for reforms in the labor market as well, expected to eventually stimulate further convergence

in labor input, and then output, levels. As for the issues related to capital accumulation and productivity differentials, they are indeed the object of the other papers presented in this volume. The contributions have been selected among those received by the Conference organizers, in response to the published Call for Papers for *Monitoring Italy 2005*, and may be organized along three main axes of research, concerning, respectively, the ICT revolution, the analysis of the production process at the firm-level and the role of the internationalization of the world economy. In the following, we present a brief description of the main findings, trying to derive some first suggestion from the provided analyses.

3. - What is Determining Output and Productivity Growth Differentials?

The rest of this volume is devoted to the analysis of the possible determinants of the great heterogeneity in economic performances showed by Jorgenson; the main focus is on the analysis of, and the implication for, the Italian economy.

3.1 *The ICT Revolution*

A huge effort has been dedicated in the recent economic literature to the analysis of the supply-side effect of the so-called ICT revolution; on the other hand, little attention has been devoted to the study of the determinants of ICT (or IT) expenditures and to the effects of consumption of ICT goods. These issues are the focus of, respectively, Guerrieri, Jona-Lasinio, Manzocchi and Venturini two contributions' to this volume.

Both papers start from the consideration of the great international heterogeneity in ICT adoption and investment during the nineties. Confirming and providing further evidence with respect to the Jorgenson findings, they show that the main industrial countries may be clustered into two separate groups with respect to diffusion of ICT goods and ICT investment, the clustering close-

ly reflecting the one proposed by Jorgenson, which distinguishes between faster and lagging countries in terms of per capita output growth. In fact, the first group of countries, characterized as high consumers/investors of ICT, comprises the UK, Denmark, the Netherlands and the US, whilst the second group (comprising the larger countries of Continental Europe, namely France, Germany and Italy) is considered as composed by ICT low-consumers[9]/investors.

Trying to explain the determinants of IT investment behavior is the object of Guerrieri, Jona Lasinio and Manzocchi. They find that IT investment expenditures are negatively affected by real interest rate and growing share of labor costs, the latter pointing to a role of liquidity constraint in explaining accumulation of IT goods. However, the behavior of hardware and software investments is found to differ considerably. Hardware investment is also positively affected by growing domestic output (considered as a proxy of the growth of the national market) and higher R&D expenditures; a competitive advantage in the production of hardware (as measured by the export/import ratio in the hardware sector) is also found to be supportive of ICT capital accumulation. Financial variables and comparative advantage play the expected role for software accumulation as well. R&D intensity appears instead to be negatively correlated with software investment. According to the authors, the latter result may be due to the fact that sectors with low R&D intensity may tend to invest proportionally more in software than in hardware. Finally, both software and hardware investments are positively correlated with lagged accumulation of hardware (in the case of software) and software (in the case of hardware); on the other hand, IT investment is not affected by measures of regulatory strictness in the labor market.

As a first policy conclusion, the paper may be considered to suggest that helping the creation of a comparative advantage in IT production can boost IT investment and capital accumulation;

[9] Because of data limitations, Venturini takes actually into account only computer adoption at home.

moreover, R&D expenditures are found to stimulate IT growth, especially for hardware accumulation.

Venturini's paper focuses on the role of households' propensity towards Information and communication technologies in stimulating growth, extending to European countries the approach originally proposed for the US by Jorgenson and Stiroh (2000). In this context, output growth may be decomposed looking at the contribution of both factor inputs and final purchases of consumption and investment goods; the use of ICT products (by both households and firms) is supposed to be potentially very important in stimulating technology diffusion from the ICT-producing sectors, enhancing non-ICT capital deepening and growth. More specifically, from the output side growth may be decomposed in the following way:

$$(1) \qquad Y = Y_{nICT} + Y_{ICT} = Y_{nICT} + C_{IT} + I_{IT} + I_{COM} + I_{SW} + D_{IT}$$

where Y_{nICT} is the output from non-ICT sectors and Y_{ICT} (output from ICT) is further distinguished into IT consumption, IT, Communication and Software Investment and IT durable services. The analysis shows that a sizeable part of the impact of ICT growth remains hidden if the role of households consumption is not taken into account. In fact, the contribution of household ICT expenditures varies considerably across countries during the second part of the nineties, accounting for more than 20% of total IT share in the high consumers countries, being limited to slightly more than 10% in Italy (13%), France (14%) and Germany (12%).

Similarly, from the input side growth may be decomposed into the contribution of labor, capital and consumer durables services:

$$(2) \qquad Y = H + K_{ICT} + K_{nICT} + D_{IT} + D_{nIT} + TFP$$

where inputs are, respectively, hours worked, ICT and non-ICT capital services, IT and non-IT consumer durables services and total factor productivity. The results confirm the evidence previously provided by Jorgenson, showing that Europe was able in the

second part of the nineties to reduce the gap in hours worked (with negative implication on labour productivity); nonetheless, this was more than compensated by slower growth of capital and consumer durables inputs. More specifically, also from the input side consumer durables are shown to have provided a relevant contribution to growth, especially in faster growing countries, in the second part of the nineties; moreover, in this period country heterogeneity in terms of the contribution of consumer durables seems to be due specifically to home computers and, to a lesser extent, to vehicles.

As a conclusion, it has to be considered that, as is usual in this kind of analysis, data sample is not very recent, ending in 2002; from this point of view, some indicators point towards an acceleration of the diffusion of IT technologies in recent years. More specifically, an ISAE survey conducted on Italian households in February each year (table 3) shows that the penetration of Computers and Internet access has stabilised respectively around 50% and 40% of households in 2005, with a sizeable growth with respect to 2002; even if comparable data for the other countries are not available, this may be interpreted as a first evidence of a pattern of convergence for Italian households consumption of ICT goods. However, policies aimed at further stimulating IT adoption may significantly contribute, according to the paper' findings, to enhance output growth.

TABLE 3

ICT PENETRATION RATES ACROSS COUNTRIES

	2002							2002	2003	2004	2005
	Eu 9	*Eu 15*	*US*	*Uk*	*Den-mark*	*France*	*Ger-many*	*Italy*			
Mobile	74	77	45	81	77	66	66	83	82	78	
PC	49	48	57	56	68	33	50	44	50	51	48
Internet Access	35	34	51	45	54	20	33	34	37	41	39
Broadband	4	5	3	4	17	3	3	1			

Source: VENTURINI F., in this volume (2005); ISAE (2004); (2005).

3.2 *Productive Efficiency and Output Growth at the Firm Level*

A relevant part of this volume is devoted to the analysis of the determinants of productivity and growth differentials using firm-level data; selected papers deal with some of the most often-debated characteristic of the Italian economy, namely: the role of the organization of production in industrial districts (Becchetti and Castelli); that of the firm's financial structure (Nucci-Pozzolo-Schivardi); the large presence of small firms (Bonaccorsi and Giannangeli); the existence of consistent heterogeneity in the use of technologies and, consequently, productive efficiency, both between and within sectors (Bottazzi-Grazzi-Secchi).

Becchetti-Castelli state that a firm should not be considered as an isolated and homogenous statistical unit, without taking into account its space and product relationship with other firms. They identify space relationships in terms of the belonging to an industrial district[10]; on the other hand, product relationship has to do with the position of a firm inside the product' value chain[11]. Both space and product relationship are thought to have a positive influence on firm' intangible assets, enhancing human capital, organizational capacity and the quality of the relationship through the supply chain.

Using a sample of circa 4,500 Italian manufacturing firms, the authors find that belonging to an industrial district positively affects productive efficiency in using labor and capital inputs, even after controlling for the possible effects of a number of fairly standard control variables such as firm' size, age,

[10] The authors refer to the quantitative definition of industrial districts officially adopted by ISTAT. According to this definition, an industrial district is identified in two stages. In the first, the territory is divided into Local Labour Systems (LLSs); then, an industrial district is identified within a LLS if it satisfies the following requirements: *(i)* manufacturing employment share higher than the national average; *(ii)* SME employment share higher than the national average; *(iii)* LLS main industry employment share higher than the national average; *(iv)* share of employment in local units of SMEs in the LLSs main industry higher than national average.

[11] In this respect, the authors identify the firm status looking if they are, or are not, sub-contractee, defining as a subcontractee firm one which shows more than 70% of subcontracted net sales.

location and belonging to a group. This finding may be interpreted as a support to the hypothesis that the organization of production within an industrial district significantly helps accumulating social and human capital, enhancing productive efficiency and, ultimately, labor and capital productivity. Moreover, they also show that ICT investment is more beneficial, in terms of productive efficiency, for firms with poorer space relationship. The latter result may be thought as a confirmation of the importance of space relationship: it may in fact be interpreted as an evidence that ICT investment acts as a partial substitute for firms that are not benefiting from local agglomeration economies. Therefore, from a policy point of view, the paper confirms the importance of space relationship in favoring productive efficiency and sustaining growth; in this sense, it provides support to policies intervention aimed at sustaining local agglomeration economies and industrial districts.

Nucci, Pozzolo and Schivardi's paper analyzes the influence of the firm's financial structure on innovation activity and, ultimately, productivity. They point out that, according to the existing literature, the relationship between firm's leverage and innovation activity may be either negative or positive: more innovative firms are supposed to have lower leverage if there are bankruptcy costs (Jensen and Meckling, 1976) and conflicts of interest between debt-holders and equity-holders (Myers, 1977); alternatively, if conflict of interests between managers and shareholders (Harris and Raviv, 1990) and insiders and outsiders (Myers and Majluf, 1984) prevail, it is possible that lower leverage may have the opposite effect on innovation.

The authors test the two different hypotheses using a very large dataset of over 40,000 firms for the period 1982-1998 and estimating three different classes of models: in the first, TFP levels are directly correlated with the leverage and a set of control variables Z_{it} representing time, size and geography of the firms; in the second, the dependent variable is the degree of innovative activity, approximated by the share of intangible assets over total non financial assets, while the third model tests the relationship between TFP and innovation:

$$(3) \qquad TFP_{it} = \alpha + \beta\, LEV_{it} + Z_{it} + \eta_i + \varepsilon_i$$

$$(4) \qquad INN_{it} = \alpha + \beta\, LEV_{it} + Z_{it} + \eta_i + \varepsilon_i$$

$$(5) \qquad TFP_{it} = \alpha + \beta\, INN_{it} + \eta_i + \varepsilon_i$$

Estimation results support the view that firms with lower leverage are bound to undertake more intense innovative activities (via bankruptcy costs, or conflicts of interest between debt-holders and equity-holders), and that high propensity to innovate is likely to translate into higher TFP levels. The finding holds both looking directly at the relationship between TFP and leverage, and separately at those between innovation activities and leverage, and TFP and innovation activities. Moreover, the relationship between leverage and productivity is found to be non-linear, in the sense that it depends on firm-specific characteristics, being indeed stronger for firms with a lower share of short-run bank debt and with lower liquidity with respect to total assets. From a policy point of view, the paper ultimately suggest that lower leverage may imply faster accumulation of immaterial assets and, therefore, higher TFP levels; these findings may call for interventions favoring market finance and equity accumulation.

In their paper, Bonaccorsi and Giannangeli start from the consideration that, on the basis of the available empirical evidence, there is a very large difference in the rate of growth of a newly-born firm between Europe and the United States: North-American firms usually enter the market with a smaller employment size than their European counterparts, but, if they manage to survive, they expand much more rapidly and reach higher average size. In this respect, they try to assess the determinants of firm's growth in the initial years, looking at a sample of almost 4,000 Italian firms born in 1999 and 2000, operating in the main sectors of the Italian economy (agriculture, manufacturing, constructions and services). A specific questionnaire submitted to firms allows to evaluate the influence on post-entry growth of a number of firm-specific factors linked to founders' competences,

once controlling for the effects of initial size, financial resources, business strategies and industry-specific conditions.

The authors estimate a model of the probability that a firm will register an "high" growth rate in the first two years of its life, defining as high-growing firms those with an employment growth at least equal 30% (or at least 2 workers); these firms account for 4.71% of their sample. Founders' characteristic taken into account in the model are their education, age, past individual experience (professional, industry specific, family experience) and motivations.

The authors find that firms' growth does not depend on individual competencies of the founders, neither on their psychological motivation or on formal activity of business planning. Moreover, firms that were founded on some prospect of profit show higher growth probability than those created for the sake of independence and personal achievement of the founder. On the other hand, industry-specific experience of the founder is found to have a significantly positive influence on growth prospects of the newly-born firm; probability of rapid growth is also enhanced by initial financial resources of the firm, and by its initial size. These results are confirmed both looking at the whole sample and at manufacturing alone. For services, initial capital is found not to affect firm growth, denoting a difficulty of the proposed model to explain the dynamics of the service sector (even after controlling for possible effects of emerging from the black economy). Even if policy options are not explicitly considered by the authors, their findings seem to point towards the need for a financial system better able to discriminate between founders' attitudes/experience and to provide richer initial resources for the firms.

Similar policy conclusions — not explicitly mentioned by the authors — about the necessity of more competitive financial, and product, markets may be derived from the Bottazzi, Grazzi and Secchi paper. They look at the production process of a sample of Italian manufacturing firms, estimating — both with parametric and non-parametric techniques — a Cobb-Douglas production function, using firm-level data for the period 1989-1997. They argue that an aggregate estimation of the production function in-

evitably underestimates the importance of heterogeneity in the production process at the firm level; their results indeed support the view that this heterogeneity exists, and that it may have a relevant role in explaining labor productivity dynamics and, more in general, the efficiency of the production process. In particular, they find that, at the firm level, different combinations of labor and capital inputs may result in similar levels of output, even within the same sector of industrial activity; these findings point to the existence of a relevant degree of substitutability between capital and labor for the Italian firms in the period considered. Moreover, heterogeneity is shown to be persistent over time, and to be significantly influenced by the scale of activity of the firm, with the mix of inputs tending to substitute labor for capital as the size of firm increases. A similar heterogeneity is found also looking at labor productivity, denoting the simultaneous presence in a sector of firms with different level of efficiency (expressed in terms of labor productivity).

Indeed, the coexistence of efficient and less-efficient firms in the Italian markets may be interpreted as a signal of the presence of surviving market inefficiency, that in some sector may be linked to residual protectionist barriers[12] or, more in general, to excessively strict product and labor market regulation (on this see also below the contribution of Basile, Benfratello and Castellani); in this sense, lower regulatory barrier may be thought to reduce efficiency heterogeneity and ultimately boost productivity and growth.

3.3 *Internationalization and Growth*

The last part of the volume focuses on FDI attractiveness, that in this context may be considered as an indirect measure of economic performance, and on the role of international technology diffusion in stimulating "endogenous" growth.

[12] The sample ends in 1997; multi-fiber agreements expired in 2005, with dramatic effects on the competitiveness of Italian textile firm.

Basile, Benfratello and Castellani argue that in the last decade, while Europe has become one of the most attractive areas, Italian regions have been largely excluded from FDI flows. Two orders of explanation have been advanced for this finding: according to the first view, Italian regions may indeed have a low attractive potential for FDI flows; alternatively, it is possible that some negative country effect is at play, to be associated with national institutional characteristic.

The authors argue there is quite strong empirical support for the latter view, finding that Italian regions (with the only exclusion of Lombardy, which alone already attracts half of total Italian FDI inflows) may potentially attract much higher flows of FDI than what is actual the case. In other words, the relative poor amount of FDI inflows seems not to depend on some region-specific characteristic (i.e. market size and market potential; agglomeration economies; wages; R&D Intensities; schooling rates; transport infrastructure). Rather, they find that national factors, such as the inefficiency of bureaucracy and of the legal system[13], have a strong and significant negative impact on FDI. National corporate tax rate does not help to significantly explain the low attractiveness of Italy as a whole, even if it plays a role as a location constraint for the Southern regions.

Coherently, once simulating the outcome of policies aimed at improving the regional framework (through boosting R&D activities, education and infrastructure), the authors find that the effect is relatively low if compared to the impact of the above mentioned national characteristics. Therefore, as a policy conclusion, they suggest that regional policies such as those suggested in the study may be of little help for improving the performance of Italian regions, as measured by their attractiveness for FDI flows; on the other hand, existing differences in the efficiency of the bureaucratic apparatus and the legal system calls for national policies aimed at improving the regulatory framework and the functioning of the market economy. In this sense, these findings may

[13] For a more thorough analysis of the effects of the inefficiencies of the legal system in Italy, see MARCHESI D. (2000); (2003).

be considered as complementary to a number of recent contributions showing that less strict product market regulation eventually results in a boost to private investment (Alesina, Ardagna, Nicoletti and Schiantarelli, 2004) and multi-factor productivity growth (Nicoletti and Scarpetta, 2003)[14].

Finally, Guerrieri, Maggi, Meliciani and Padoan provide a non-standard contribution about the role of the business service sector (communication, financial services and insurance) in technology diffusion and, ultimately, in stimulating output growth. These sectors are thought to use IT innovation to enhance back-office efficiency; subsequently, learning leads to further innovation both in products and production process. In this respect, regulation in the production and import of services is supposed to affect growth, both because more intense national regulation depresses the production of services and because uniform low levels of regulation across countries favour production and import of services, stimulating technology diffusion and growth.

The authors use a differential equation model in which the endogenous variables are (the rate of growth of) output, domestic and imported services, and technology. In the model, output depends on factor inputs (labour and capital) and endogenous accumulation of technology and services (produced at home and abroad); the introduction of services in the production function is also explained considering services as an intermediate good. Services grow with output and technology, reflecting the view that they are an important intermediate input and that the share of "advanced" services increases with technology accumulation. Domestic technology is in turn affected by output, services, technological spillovers from abroad (depending on distance) and domestic human capital. The model is estimated with dynamic continuous time panel for nine European countries, the US and Japan, in the period 1988-1998.

A number of relevant results do emerge from the estimation: output is confirmed to be positively correlated with technology

[14] See also along these lines FAINI R. - HASKEL J. - BARBA-NAVARETTI G. - SCARPA G. - WEY J. (2004).

and inputs accumulation, as well as with domestic and imported services. In turn, both of the latter variables are also positively affected by output growth and technology accumulation, the latter influencing more strongly imported than domestic services. This result emphasizes the role of service integration via trade; the impact of EU-wide service regulation is confirmed by the fact that service home production and import is positively affected by national characteristics (modelled through a dummy variable) of a group of countries (Austria, Denmark, Germany, Netherlands and Sweden) which share the lowest intensity of regulation. On the other hand, strictness of national regulation are proved to have a significantly negative effect on both imported services and on those produced at home[15]. Finally, technology accumulation is found to depend on domestic factors and international diffusion.

The authors then derive some relevant policy implications, simulating the effects of various policy measures on the considered endogenous variables. The most important findings are that a growing and significant impact over output is obtained via deeper integration in the service market and by a reduction of the diffusion costs of technology. The elimination of the pervasiveness of national regulation on services plays a relevant role, even if it is smaller than that of service market integration; the impact of higher level of human capital is initially negligible, but tends to grow over time. These findings support the basic insights of the *Lisbon Agenda* as further emphasized by the Kok Report (2004), suggesting that economic growth in Europe may be enhanced by favouring trade in services (see also on this OECD, 2003), technology accumulation and diffusion, human capital accumulation (possibly integrating national education system) and less strict and more uniform product market regulation.

[15] For an assessment of the importance of intra-European trade in services, see also KOX N. - LEJOUR A. - MONTIZAAN R. (2004) and again FAINI R. - HASKEL J. - BARBA-NAVARETTI G. - SCARPA C. - WEY J. (2004).

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