

THE ROLE OF HUMAN CAPITAL AND FDI IN GROWTH AND CONVERGENCE BETWEEN EU COUNTRIES

INFANTE Davide, (ITALY)

ABSTRACT

The paper verifies whether the growth founded on the technological catching up, on which great part of the run-up of the European countries towards a common level of income per capita was based, is also practicable today given that in the EU countries that, compared to the others, present strong lags in terms of markets development, and income levels have entered. For this purpose, after having seen the limits of the analysis based on the absolute convergence predicted by the neoclassical model, the paper starts from the model of growth and catching up by Dowrick and Nguyen (1988) in order to arrive at the construction of a growth equation and conditional convergence that, holding account of the works by Romer (1986, 1990), Lucas (1988) and Mankiw, Romer and Weil (1992), allows us to estimate the role either of the technological catching up or of the growth determined by the investment of human capital in research and development, and by spillovers from foreign direct investment. These two new forces, united to the expansion of the employment rate, push towards growth giving greater impulse also to the technological catching-up.

KEY WORDS

growth, convergence, catch-up, European Union

INTRODUCTION

The enlargement of the European Union from fifteen to twenty five countries has been realised in a context characterised by (i) a slowdown of the European Union catching up in productivity and income per capita to the United States, (ii) a divergent growth pattern between European countries, and (iii) a strong dualism identified by a club of rich European countries and a newcomer block of poorer countries, mostly of them with a non market economy heritage. This set of elements has contributed to see the realised enlargement not as a new growth opportunity, but as a historical compulsory duty to reimburse those European countries that have suffered the negative effects of the socialist regimes.

The composition of the European Union is destined to change once again with the forthcoming admission of Bulgaria and Rumania in 2007 (EU27), but other former socialist countries are placing new applications for adhesion and further EU enlargement. The start of the talks for the adhesion of Turkey is one of the reasons that is marking the debate, in some of the old member countries, to ratify the Treaty on the European Constitution and it risks to put the ratification procedure in crises. The new European frame places important questions about the future economic and social development of the Union.

It is obvious that the resistance to the adhesion of new countries is placed with greater force at a time in which a slowing down of the economic growth of the former EU15 member countries exists. Will these countries resume a greater rate of growth than the one registered during the last decade? The slowing down in economic growth, recorded from the major European countries in the last years, has taken place in the presence of a sustained growth of the United States, which have been able to fully exploit the benefits of the new information and telecommunication technologies. In so far as it is emblematic the title of a paper written by Robert Gordon in 2004 that literally recites "Why was Europe left at the station, when America's productivity locomotive departed?". The slow growth, that many European countries have recorded in the last ten years, places a problem about how to maintain the

European cohesion that until the nineties had been founded on a common process of growth and convergence that had mitigated national egoisms.

The aim of the present paper is to verify whether the growth founded on the technological catching up, on which great part of the run-up of the European countries towards a common level of income per capita was based, is also practicable today given that in the EU countries that, compared to the others, present strong lags in terms of markets development, and income levels have entered. For this purpose, after having seen the limits of the analysis based on the absolute convergence predicted by the neoclassical model, the paper starts from the model of growth and catching up by Dowrick and Nguyen (1988) in order to arrive at the construction of a growth equation and conditional convergence that, holding account of the works by Romer (1986, 1990), Lucas (1988) and Mankiw, Romer and Weil (1992), allows us to estimate the role either of the technological catching up or of the growth determined by the investment of human capital in research and development, and by spillovers from foreign direct investment.

The principal source of the used data is the Penn World Table 6.1 database, on which basis we construct the main growth indicators for the period 1950-2000, integrated with others database (OECD, ILO, UN) in order to estimate the increase of the same indicators from 2001 to 2003.

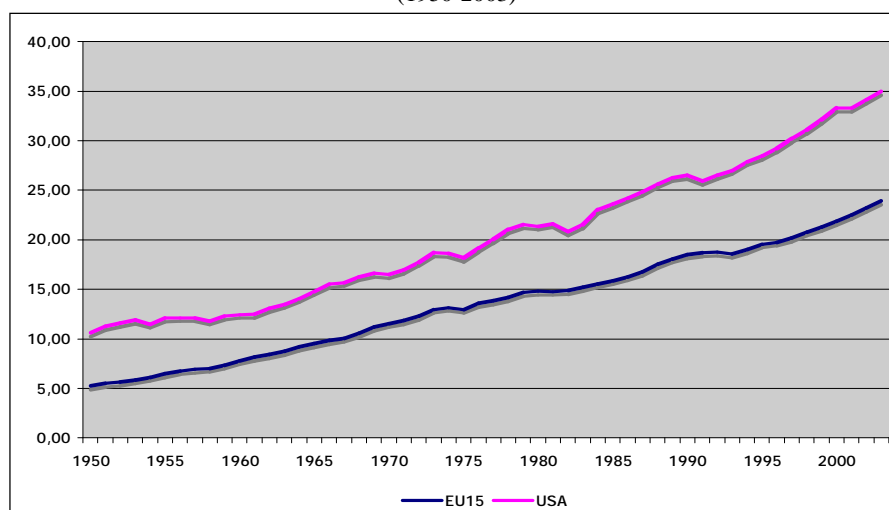
THE EXISTING DIFFERENCES IN INCOME PER CAPITA

In the first place, the increase of the European Union to ten new countries has aroused some worries for the legacies of the low growth of EU15, recorded since the second half of the nineties, when the differences between EU15 and USA became persistent. Some leading European countries fear that the financial resources and the efforts, to assign to the development of the new ten countries, will be subtracted from those resources finalised to re-launch the economies of the fifteen European countries in those fields that, according to some authors, have mainly registered technological gaps compared to the United States. Therefore, it is useful to verify the gap in terms of income per capita that the European Union is registering in comparison to the United States, let alone the dispersion of incomes that exists between the 25 countries of the Union.

2.1. The persistence of the difference between EU and USA

In the last fifteen years, the economies of OECD countries have endured deep modifications under the combined push of the new information and communication technologies and the consequent globalization of the markets. The country that has seemed more ready to adapt itself to the new competitive context has been the USA that quickly joined the new paradigm of the ICT and the opportunities offered by the globalization process. Such rapid adaptation has brought the USA economy to consistently increase in its own productivity that has led to rates of growth of output much higher than those recorded in European countries. Consequently, during the nineties, the process of economic convergence, that started after the second world war and led the European countries to progressively close the gap between themselves and the standard of living of the USA population, has been interrupted.

Fig. 1 – Real GDP per capita (thousands of dollars at constant 1995 prices)
 (1950-2003)



Source: Penn World Table 6.1

The USA GDP growth rates, in the years from 1991 to 2003, systematically turned out higher than those recorded in EU15 countries (on average the 3,22 percent for the USA against the 2,16 percent for the fifteen European countries). That happened in the presence of a much higher rate of growth of USA population (1,7 percent), than the one recorded in EU15 (0,37 percent).

2.2. Convergence and divergence between EU15 countries

The persistent lag the EU15 has registered during the last decade towards United States is the result of different growth pattern of the fifteen national economies. During the nineties the harmonious growth pattern of European countries has been interrupted, and each country has tried to solve the adaptation to the new global economic context according to its own economic strategy. The growth convergence European model that worked during the fifties-seventies has exhausted. The income per capita rates of growth (see table 1) registered in the fifteen European countries, during the period 1950-1973, have been at a fast pace, largely faster than those registered in the same period in the USA. This growth differential has permitted to the average European income per capita to pass from 39 percent in 1950 to 69 percent in 1973, compared to that of USA.

Table 1 – Growth rates of income per capita and relative income per capita in EU15 countries

Country (isocode)	Income per capita growth rates				Relative income per (EU15=1)				Country (isocode)
	1950-03	1950-73	1973-90	1990-03	1950	1973	1990	2003	
AUT	3,40	4,73	2,54	2,18	1,06	0,99	1,07	1,10	AUT
BEL	2,75	3,57	2,15	2,09	1,48	1,06	1,08	1,09	BEL
DNK	2,35	3,16	1,33	2,27	2,05	1,34	1,18	1,22	DNK
ESP	3,65	5,74	1,74	2,44	0,70	0,83	0,78	0,83	ESP
FIN	3,10	4,14	2,52	2,00	1,24	1,01	1,09	1,09	FIN
FRA	2,80	3,98	2,18	1,52	1,35	1,06	1,08	1,02	FRA
GBR	2,18	2,47	1,80	2,18	1,87	1,04	0,99	1,02	GBR
GER	3,36	5,04	2,12	2,00	1,04	1,05	1,05	1,05	GER
GRC	3,17	5,57	0,77	2,04	0,71	0,81	0,65	0,65	GRC

IRL	3,51	2,72	3,31	5,19	1,05	0,62	0,77	1,16	IRL
ITA	3,33	4,77	2,65	1,69	1,00	0,95	1,04	1,00	ITA
LUX	2,94	2,35	2,58	4,44	2,47	1,34	1,46	2,00	LUX
NLD	2,51	3,15	1,76	2,36	1,71	1,11	1,05	1,11	NLD
PRT	3,81	5,59	2,44	2,46	0,55	0,63	0,67	0,71	PRT
SWE	2,28	3,01	1,70	1,73	1,90	1,20	1,12	1,09	SWE
EU15	3,33	5,02	2,07	1,99	1,00	1,00	1,00	1,00	EU15
USA	2,25	2,47	2,04	2,14	0,39	0,69	0,70	0,68	EU15/USA

(*) Source: Penn World Table 6.1 up to 2000, updated to 2003 on the base of OECD GDP growth estimation

In the following decade, signed by two petrol crisis, the average rate of growth of the fifteen European countries have notably decreased and there has been registered different economic performances. This tendency to a differentiated growth between European economies has been accentuated during the nearest period (1990-2003), that, with the exception of Ireland, Spain and Portugal, has seen a faster growth of the high income countries, with the notably exception of big countries such as Germany, France, and Italy. Given these rates of growth, the fifteen countries relative incomes present a convergent trend between 1950-1973 and a divergent trend in the following period.

2.3. The dualism inter EU25 countries

With the year 2004, the new enlargement of the European Union has aroused some worries in the first place because of the many new disparities that are now present, given the inclusion of countries that have an economic development well below that of former members. In table 2, some growth indicators for the decade 1993-2003 are reported for the 25 member countries, for the EU15, and the USA.

Table 2 – Some growth indicators of EU25 countries

Country (isocode)	Population (thousands) (*)	Income per capita (**)		Relative income per capita (EU15=1)		Income per capita growth rate 1993-03	Years to doubl for the income per capita
		1993	2003	1993	2003		
AUT	8.098	20.301	26.307	1,07	1,10	0,020	35,1
BEL	10.374	19.918	26.072	1,05	1,09	0,021	33,8
DNK	5.390	21.873	29.261	1,15	1,22	0,022	31,3
ESP	40.809	14.465	19.875	0,76	0,83	0,024	28,6
FIN	5.213	17.535	26.190	0,92	1,09	0,031	22,7
FRA	61.540	19.453	24.368	1,02	1,02	0,017	40,4
GBR	60.502	18.327	24.308	0,96	1,02	0,022	32,2
GER	82.520	20.296	25.250	1,07	1,05	0,017	41,7
GRC	10.981	11.968	15.598	0,63	0,65	0,020	34,4
IRL	3.991	14.946	27.764	0,79	1,16	0,048	14,7
ITA	58.095	19.337	24.022	1,02	1,00	0,017	41,9
LUX	450	31.423	47.882	1,65	2,00	0,032	21,6
NLD	16.224	19.975	26.463	1,05	1,11	0,022	32,4
PRT	10.444	12.778	16.954	0,67	0,71	0,022	32,2
SWE	8.959	19.319	25.988	1,02	1,09	0,023	30,7
CYP	773	13.497	19.220	0,71	0,80	0,027	25,7
CZE	10.258	12.173	14.792	0,64	0,62	0,015	46,7

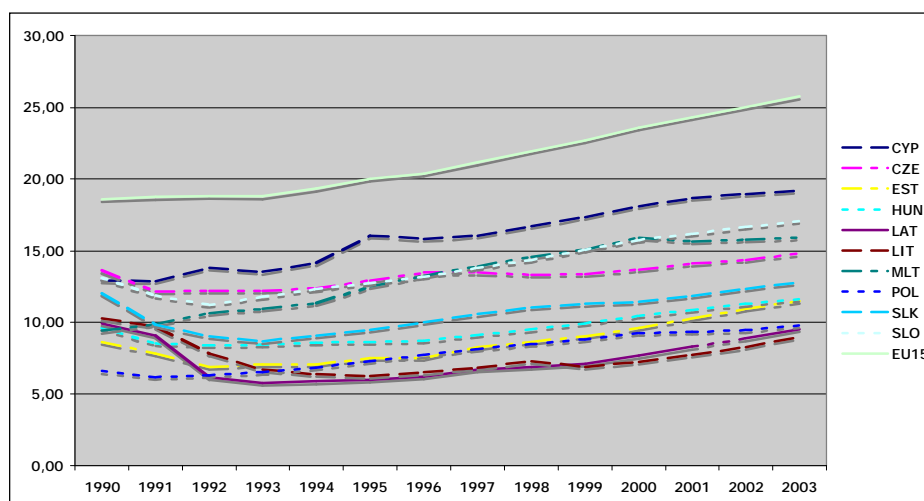
EST	1.340	7.048	11.495	0,37	0,48	0,038	18,6
HUN	9.945	8.425	11.611	0,44	0,49	0,025	28,4
LVA	2.319	5.766	9.518	0,30	0,40	0,039	18,2
LTU	3.660	6.675	8.986	0,35	0,38	0,023	30,6
MLT	395	10.923	15.909	0,57	0,66	0,029	24,2
POL	38.623	6.524	9.802	0,34	0,41	0,031	22,3
SVK	5.417	8.678	12.793	0,46	0,53	0,030	23,4
SVN	1.989	11.772	17.084	0,62	0,71	0,029	24,4
EU15	383.589	19.014	23.934	1,00	1,00	0,018	39,5
USA	291.085	26.965	34.958	1,42	1,46	0,020	35,1

(*) Source: Onu and World Bank. (**) Real income per capita (Source: Penn World Table 6.1 up to 2000, updated to 2003 on the base of OECD GDP growth estimation)

In the first column the population of the twenty five countries in 2003 is reported, to show the dimension of each country and its relative weight in the EU. The two successive columns indicate the income per capita in constant prices (in dollars 1995) at the beginning and at the end of the period of reference. In the two successive columns the income per capita relative to that of the EU15 in 1993 and 2003 is reported. In the sixth column there are the rates of growth of income per capita in the decade 1993-2003. In the last column the so-called "Lucas' rule" is applied in order to calculate the number of years needed to double the country income per capita, under the hypothesis that the average growth rate recorded in the previous decade is maintained constant over time.

From table 2 marked differences of income per capita between the EU15 countries and the new ten countries emerge. If we exclude two small countries from the analysis, like Cyprus and Malta, we notice that, in 2003, of the former socialist eight countries only Slovenia presents an income per capita higher than a country of the Union (Greece). The income per capita of the other countries varies from a minimum of 38 percent of the EU15 for Lithuania to a maximum of 62 percent for Czech Republic. It is also true that such countries in ten years have grown (with the exception of the Czech Republic) at rates higher than the mean of the EU15. The exit from the recession, caused by the transition from the socialist system to a market economy, has pushed such countries to a fairly fast growth.

Fig. 2 – Real GDP per capita (thousands of dollars at constant 1995 prices) in EU15 and EU10 (1990-2003)



Source: Penn World Table 6.1

Nevertheless, the income per capita lag from other European countries is still very large (figure 2) and the speed of growth is not enough to cover it in a fair period of time. If we apply the Lucas' rule, that states a country that grows at a rate g doubles its income every $70/g$ years, then we can see that, of the eight countries of Central and Eastern Europe, only Latvia would double its income per capita in a reasonable period of time (18 years). All other countries would double their income in a period of time that goes from 22 years for Poland to 30 years for Lithuania (in this calculation the Czech Republic cannot be included because it faced a longer recession from transition than the other seven former socialist countries). As far as the countries of the EU15 are concerned, only the small countries would double their yield in a time inferior to 30 years. All the great countries (Germany, France and Italy, with the exclusion of Great Britain and Spain) will double their income per capita in an arc of time larger than 30 years. It is obvious that such calculations are pure indicatives and count only under the hypothesis that the rate of growth recorded in the former decade will remain also in the future.

In any case the comparison of the times for the doubling of the income per capita between all the countries says that, given the speed of growth recorded in the past decade, the strong differentials between the new and the old member countries has a big chance to remain for the next thirty-forty years.

WHICH MODEL OF GROWTH?

We can consider the year 1986 as the year of the rebirth of the interest towards the growth theory and, strange to say, it happens for the contemporary appearance of three seminal works by Abramovitz (1986), Baumol (1986) and Romer (1986) that point out the reflectors at the neoclassical growth model from completely different points of view. Abramovitz and Baumol construct a long-run analysis of the convergence between countries, based on the hypothesis of the decreasing returns to factors of production, that is the main hypothesis of the neoclassical growth model, while Romer (1986, 1990), together with Lucas (1988), puts in evidence how the presence of spillovers in capital (learning by doing) and in labour (human capital) can contrast the decreasing fall of the returns and trigger endogenous growth that can lead to divergence. Great part of the following growth literature served primarily to carry out a research contribution to the former (neoclassical growth theory) or the latter direction (endogenous growth theory).

The Baumol (1986) model supports the existence of a long-run trend in income (or productivity) per capita convergence between countries. This emphasizes two questions. Firstly, when we talk of convergence in income levels, it is understood a negative relationship between growth and relative income per capita. The explicative mechanism that it is proposed is simple: being laggards in productivity levels implies a strong potential for growth, because developing countries are able to bring into production a backlog of new technologies available on the world market, while countries that already using these new technologies have less opportunity to growth because to grow faster they have to move their technological frontier. Secondly, for catching up it is necessary that the output rate of growth must be greater than the population growth rate. If we assume the population rate of growth constant across countries the Baumol convergence equation can be expressed as following

$$\frac{1}{t} (\ln Y_{(i,t)} - \ln Y_{(i,t-1)}) = a + b \left(\ln \frac{Y}{N}_{(i,t-1)} - \ln \frac{Y}{N}_{(j,t-1)} \right) + e_i \quad (1)$$

where the right side of the equation is the average growth rate of real GDP, while the right side is the income per capita ratio of country i to country j (that in our estimation is the average income of EU countries) at time $t-1$. If convergence is found than the sign of the b

parameter is negative. Equation (1) states that countries that start, in comparison to others, with a lower income per capita register a higher rate of growth. In this way, the variance of growth rates between countries can be explained by the relative position of the starting income per capita, that can disguise either the use of different technologies or a different use of productions factors.

However, an analysis of growth and relative convergence based on the Baumol model cannot be exhaustive, since it does not hold account of the influence exercised by the growth of production factors. Countries' differentiated growth in the accumulation of capital and labour can accelerate or diminish the process of convergence pushed by the relative backwardness in the income. Consequently, Dowrick and Nguyen (1988), starting from a Cobb-Douglas production function, augmented by a common rate of exogenous technical progress and by a catch-up function, propose a model in which the GDP growth depends on the rate of growth of the factor inputs, on a common and exogenous rate of technical progress and on the level of income per capita, relative to the reference (leader) country. The process of convergence in income per capita, implies a tendency to catching-up in the total factor productivity, that can systematically be diminished or increased if the factor intensity varies systematically, according to the income. Hence, for Dowrick and Nguyen, the convergence turns out conditioned by the accumulation of production factors.

However, Dowrick and Nguyen do not take into consideration some elements put in evidence from Baumol and then resumed in the theory of endogenous growth. The first one regards, the mechanism through which the exogenous technical progress moves from one country to another, while the second regards the mechanism through which countries can improve their technological capability.

The role of foreign direct investments (FDI), as a mechanism of acquisition of exogenous technical progress, has been put in evidence both by Baumol (1986, 1994) and Lucas (1988, 1993). The main motivation that pushes the foreign firm to invest in a country is the search for greater profits. Firms are always on the search for countries in which the returns of capital are the highest one and, therefore, they head towards countries where the level of accumulation is lower, carrying with them technologies not existing in those countries.

From another side, according to Romer (1990), the differentials in the growth rate of productivity can be explained by the extension of the research sector in the economy, and technical progress becomes endogenous in the measure in which technological spillovers hinder the fall of the marginal product of capital, "making move" the time in which the investment stops being productive. Such spillovers are possible in the presence of a minimal level of human capital dedicated to the research sector. If all the human capital existing in a country, Romer states, is dedicated to the production of final goods, then the effects of spillovers are finite, with consequent decreasing returns of capital as predicted by the neoclassical theory.

Therefore, on the basis of such observations the growth and convergence model that is proposed in the present paper is the following:

$$\frac{1}{t}(\ln Y_{(i,t)} - \ln Y_{(i,t-1)}) = a + b \left(\ln \frac{Y}{N}_{(i,t-1)} - \ln \frac{Y}{N}_{(j,t-1)} \right) + c(I/Y)_i + d \frac{1}{t}(\ln L_{(i,t)} - \ln L_{(i,t-1)}) + g(FDI/I)_i + h(HC_{R\&D}/N)_i + e_i \quad (2)$$

Where the left side of the equation is the country i annual average rate of growth of real GDP, while on the right side $Y/N_{i,t-1}/Y/N_{j,t-1}$ is the logarithm of initial period country i income per capita, relative to that of country j; I/Y is the period mean ratio of investment to GDP;

$1/t(\ln L_t - \ln L_{t-1})$ is the rate of growth of employment during the period t in country i ; FDI/I is the period mean ratio of foreign direct investment to total investment; HC/N is the period mean ratio of scientists and engineers applied to the research sector of the total population.

THE RESULTS OF THE ESTIMATED GROWTH AND CATCHING UP MODEL

As it was said previously, the entry of ten additional countries in EU15 places many question marks on the possibility of a process of convergence of the 25 economies that now constitute the European Union. The greater perplexities regard eight of the ten new countries that have not completed their transition towards the market economy, and still have income per capita below average EU15, high unemployment rates, and problems of structural adjustment of the economy. Therefore, we can ask whether such new countries will be able to converge towards the income per capita of EU15.

To give an answer to such a question we have estimated the previous growth model for the period 1990-2003, using data related to 23 EU countries (Luxemburg and Malta are not included in the sample because we could not find values for scientists and engineers applied to the research sector). The estimations were made in order to reflect three theoretical approaches. Column 1 of table 3 reports the estimated results of the neoclassical model of convergence.

Table 3 – Results of the estimated model of growth and catching up in the countries of the enlarged European Union during period 1990-2003

Estimated models	(1)	(2)	(3)	(4)
Constant	2,38	3,84	3,00	0,29
<i>OLS t-statistics</i>	8,91	2,55	2,19	0,19
<i>White t-statistics</i>	10,74	2,73	2,44	0,20
Y/N	-1,22	-1,41	-1,33	-1,75
<i>OLS t-statistics</i>	-2,44	-2,57	-2,74	-3,99
<i>White t-statistics</i>	-4,49	-3,18	-2,79	-4,50
I/Y		-0,09	-0,06	0,03
<i>OLS t-statistics</i>		-1,27	-1,07	0,46
<i>White t-statistics</i>		-1,27	-1,06	0,45
\dot{L}		0,76	0,85	0,69
<i>OLS t-statistics</i>		3,77	4,67	4,25
<i>White t-statistics</i>		2,24	2,83	2,97
SE/N			1,12	0,85
<i>OLS t-statistics</i>			2,53	2,12
<i>White t-statistics</i>			3,03	2,54
FDI/I				0,05
<i>OLS t-statistics</i>				2,83
<i>White t-statistics</i>				2,86
N. Paesi (*)	23	23	23	23
R^2 corretto	0,18	0,48	0,60	0,71
<i>White chi-quadro</i>	2,07	16,02	19,05	11,91
<i>Reset F-test</i>	2,36	4,38	3,11	6,81

Notes: In italics are reported the usual tests for parameters significance, for correction of heteroschedasticity, and for the model functional form. (*) Luxemburg and Malta are not included.

Column 2 reports those related to the neoclassical model of growth and conditional convergence, while columns 3 and 4 regard the estimated results of the growth and conditional convergence model, modified according to critics of the theory of the endogenous growth.

The model of absolute convergence (column 1) tells us that the convergence towards the average EU15 income per capita proceeded to an average rate of 1,2 percent per year. The explicative capacity of the model is 18 percent. When we pass to the estimation of the second model (column 2), and introduce the hypothesis that the growth is influenced also from the rates of growth of capital and labour accumulation, we verify that the conditional convergence model works fairly and the explicative capacity of the model rises (the adjusted R square reaches the value of 0,48).

The annual rate of convergence passes to 1,42% (compared to the 1,22 previous model) demonstrating that, also when the relative income per capita is not the single explicative factor of the GDP growth, its influence turns out increased (increases the value of the coefficient) rather than diminished. Such a conclusion is confirmed also by the low value, let alone from the negative sign, taken by the coefficient of the investment rate. The investment rates in this case are confirmed as a factor that does not contribute to the growth and convergence, since countries that have high income per capita have also high rates of capital accumulation, while the contrary is true for those that have lower income per capita. The parameter relative to the growth of employment remains positive and significant and assumes a value of 0,76. We can conclude that the new countries carry to the inside of the Union a contribution to the growth either through the technological catch up or through the growth of employment.

The columns 3 and 4 bring, within our approach to the growth of the countries of the enlarged Union, the characterizing role of the two variables that we have identified as the human capital engaged in research and development and the exogenous technical progress to the country, coming through foreign direct investment. The added two variables improve the overall explicative capacity of the model (the adjusted R² reaches now 0.71) and renders obvious that their insertion increases the tendency to catch-up through a higher value of the coefficient of the initial period relative income per capita.

The rate of technological catching up which increases the country's technological efficiency, through the shift of the production frontier, still increases and arrives at an annual medium value of 1,75%. Such a result confirms that the new countries carry to the inside of the Union a rate of growth of productivity that cannot be attributed only to the growth of the factors of the production but also to the increase of the technological efficiency, since such countries continue to carry to their inside a backlog of technologies not exploited during the former planned economy.

The driving forces of growth, on the one hand, turn out employment and, on the other, human capital (scientists and engineers) engaged in the research sector. The variable relative to the investment rate does not turn out meaningful while the composition of the same investments turns out meaningful. A greater presence of foreign direct investment on the total of the investments pushes the growth up more than general investment and, probably, this latter result is due to the typology of investments carried out by the EU countries.

CONCLUSION

We have verified that a convergence process founded only on the technological backwardness of the new member countries does not reach very high values. At the best a rate of catching up of approximately 2 percent would require about 35 years in order to bring the new countries to an income per capita similar to the EU15 average. That means the lever of technological efficiency catching up does not turn out sufficient to support the growth and the convergence between European countries. Probably, in the new member countries a technological capability not yet adapted to the new competition required by market mechanisms is still present. The deficiency for capital accumulation to be the growth driving

force, has induced us to introduce some variations to the mechanism of growth based on factors accumulation. The mechanisms in order to increase the technological capacity of the enlarged EU pass through two roads: the international flow of new technologies coming through foreign direct investments and the investments in human capital in research and development. These two new forces, united to the expansion of the employment rate, push towards growth giving greater impulse also to the technological catching-up. The perspectives of growth and convergence of the new member countries will depend very much on their ability to widen the level of employment, to modernize their production structure through foreign direct investments and human capital invested in research and development.

The difference that we have found passing from an absolute process of catching up to a conditional convergence process is based on the hypothesis that in the first case it is assumed that all the countries converge towards a common level of income, while in the second case every country converges towards its own level of steady state, that it can be various from country to country and influenced by the tendency of some variables such as the investment rate, the rate of growth of employment, the investment rate of FDI, and the investment rate of human capital in research and development. The differences between countries in the level and the trend of these state variables are those that explain the speed with which the economies approach their steady-state (de la Fuente, 2000), whose position is determined by the current values of conditioning variables. Our decision to test our growth model using the trend values of GDP growth and relative income per capita has gone exactly in the direction to identify for each country its different steady-state variables.

LITERATURE

1. Abramovitz, M. (1986), "Catching Up, Forging Ahead, and Falling Behind", *Journal of Economic History*, June 1986, 46, 383-406
2. Baumol, W.J. (1986), "Productivity Growth, Convergence, and Welfare: What the Long-Run Data Show", *American Economic Review*, 76 (5), 1072-85
3. Baumol, W. J., Nelson, R.R., Wolff, E. N. (1994), *Convergence of Productivity. Cross-National Studies and Historical Evidence*, (edited by), Oxford, Oxford University Press
4. Breuss, F. (2002), "Benefits and Dangers of EU Enlargement", *Empirica*, 29, 245-274
5. Dowrick, S. e Nguyen, D. (1989), "OECD Comparative Economic Growth 1950-1985: Catch-up and Convergence", *American Economic Review*, 79 (5), 1010-1030
6. Gerschenkron, A. (1962), *Economic Backwardness in Historical Perspective*, Cambridge, Belknap Press of Harvard University Press
7. Gordon, R. J. (2004), "Why Was Europe Left at the Station, When America's Productivity Locomotive Departed?" CEPR Discussion Paper, N. 4416, June
8. de la Fuente, A. (1995), "Catch-up, Growth and Convergence in the OECD", CEPR Discussion Paper, N. 1274, November
9. de la Fuente, A. [2000], *Convergence across countries and regions: Theory and empirics*, EIBPapers, Volume 4 N. 2, pp. 25-45.
10. Delhey, J. (2001), "The Prospects of Catching Up for the New EU Members", *Social Indicators Research*, 56, 205-231
11. Gerschenkron, A. (1962), *Economic Backwardness in Historical Perspective*, Cambridge, Belknap Press of Harvard University Press
12. Infante, D. (1995) 'Catching-up, Growth and Innovation Processes', Research Report No. 2/1995, Centre for Southern European and Mediterranean Studies, Roskilde University, Roskilde
13. Islam, N. (1995), "Growth Empirics: A Panel Data Approach", *Quarterly Journal of Economics*, CX (4), 1127-1170

14. Jones, C. I. (1998), Introduction to Economic Growth, New York, W. W. Norton and Company
15. Kaitila, V. (2004), "Convergence of Real GDP per capita in the EU15. How do the Accession countries fit in?", Helsinki, ENEPRI, Working Paper N. 25/January
16. Lucas, E.R. (1988), "On the Mechanics of Economic Development", Journal of Monetary Economics, 21, pp. 3-42
17. Lucas, E. R. (1993), "Making a Miracle", Econometrica, 61, 2, 251-72
18. Mankiw, N.G., Romer, D., Weil, D.N. (1992), "A Contribution to the Empirics of Economic Growth", Quarterly Journal of Economics, 107, 407-37
19. Romer, P.M. (1986), "Increasing Returns and Long-Run Growth", Journal of Political Economy, 94, 1002:37
20. Romer, P. M. (1990), "Endogenous Technological Change", Journal of Political Economy, 98, S71-S102

CONTACT ADDRESS

Davide Infante, Department of Economics and Statistics, University of Calabria, Italy
d.infante@unical.it

Recenzent: doc. Ing. Ľubica Bartová, CSc.