



**Labor Productivity:
A Comparative Analysis of the
European Union and United States, 1994-2007**

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Labor productivity: a comparative analysis of the European Union and United States, for the period 1994-2007*

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ABSTRACT

This article confirms that labor productivity in the European economies has continued to slow down in recent years. U.S. productivity growth has been higher than in the EU, but only since 2001. At the same time, both economies have modified previous employment performance: EU employment growth is now higher than in U.S. This article proposes that productivity growth be explained by demand dynamics, and investment in particular, not forgetting the influence of employment, along with other factors such as new technologies.

JEL: E20, O43, O51, O52.

Keywords: Labor Productivity; Demand; Employment; Labor Markets; Economic Sectors.

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1. INTRODUCTION

Among the many works published on productivity, one frequently recurring assumption is that labor efficiency has grown faster in the United States than in Europe since the mid-1990s. This notion has been embraced by most economists and politicians on both sides of the Atlantic. Better performance by the U.S. is essentially related to new information and communication technologies (ICT), as well as institutional factors. In fact, the term “Eurosclerosis” is used in characterizing European performance as compared to U.S., leading to various proposals on the need for Europe to follow the U.S. example, such as the Lisbon Strategy, adopted by the European Council in March 2000, and subsequent revisions made under the auspices of the European Commission (the Sapir Report, 2003) and the European Council (the Kok Report, 2004).

This diagnosis and prescribed therapy, encouraging both the increase of new technologies and the liberalization of markets, respond to a supply-led growth approach that is characteristic of the neoclassical theory. Within this theoretical framework, productivity growth is split between variations in capital intensity (capital–labor ratio), expressing an accumulation dynamic, and the total productivity of factors, expressing the overall efficiency generated by technical progress. As in these analysis long-term capital intensity in a static state is considered constant, the majority of these works highlights that technical progress is the engine of modern growth. The role of technical progress is further oversimplified as it is virtually equated with advances in new information and communication technologies (ICT) as well as in the institutional framework. The diffusion of ICT and more flexible institutions improve the overall efficiency of the economy because they reduce both production and transaction

costs. In particular, the absence of labor market regulation favours the generation, competition and mobility of employment, raising not only productivity but employment¹.

This article shows that empirical evidence does not confirm the assumption that the U.S. productivity dynamic is superior to Europe's. Labor productivity in the European economies has continued to slow down since the mid-1990s, but U.S. productivity growth has been higher than in the EU only since 2001. Besides, American productivity growth, though slightly higher than European, has not been especially intense. Finally, the data reveal that both economies have modified previous employment performance: EU employment growth is now higher than in U.S.

This article interprets these processes based on two central arguments: that demand dynamic, and investment in particular, structurally conditions productivity performance and, in turn, that this performance depends also on the extent to which employment accompanies economic growth. This approach does not deny that new technologies and labor market conditions are linked to productivity development, but through mechanisms more complex than those proposed by supply theories.

From this perspective, the diminishing productivity growth in the European economies must be understood in a scenario of weakening of aggregate demand. It is in this context that EU labor productivity growth rates have been declining, especially since the 1990s. At the same time the European economies dramatically increased their ability to create jobs, which also helps to explain the slow down in productivity growth. In parallel, U.S productivity has grown clearly faster than that of Europe (2001-07) only when this economy has shown little job creation. Such changes in the relationship between the growth rates of employment and

¹ Wolff (1997) includes an extensive selection of works by the main authors analysing productivity from a neo-classical perspective, such as Solow, Denison, Griliches, Abramovitz, Jorgenson, Baumol, and others. A critique approach to the neoclassical growth theory is developed by Palazuelos and Fernandez (2009).

productivity call into question the explanations used by the mainstream to interpret growth in both areas.

Finally, the empirical evidence reveals that ICT investments have been significantly higher in the U.S. than in Europe. However, the relationship between ITC and productivity growth is not linear, because such technologies are incorporated into productive activities through ICT investment, but their influence on productivity is mediated through conditions of employment and asymmetries between sectors and branches. If demand and employment policies are highly focused toward labor intense service sectors, productivity growth can not be much faster, especially when demand dynamic is weak.

This article is divided into five sections. The first presents the most important facts around productivity and employment growth, both in U.S and EU, between 1994 and 2007. The second develops a theoretical proposal for explaining productivity growth based on the aggregate demand dynamics and the evidence of a trade-off effect between productivity and employment. The next two sections explain how labor markets and new technologies are linked to productivity's pace of growth. The final section summarizes our main conclusions.

2. FUNDAMENTAL FACTS: GROWTH RATES AND LEVELS OF LABOR PRODUCTIVITY

Labor productivity is measured as the GDP per hour worked. For our purposes, the European countries are those fifteen that formed the EU before its 2004 enlargement. The reference period is 1994-2007, the initial benchmark being 1994 because at that point the European economies had already emerged from the recession which began in the early 1990s, while the U.S. economy had done so a year earlier. We believe that benchmarking must take into account the cyclical behavior of economies. Thus, we find our benchmark more appro-

priate than those employing discretionary “rounding” to years ending in zero or five.² Our period of study can be divided into two phases (1994-2000 and 2001-07) each containing the same number of years, separated by the recession that followed the 2000 stock-market crash and lasted until 2002 or 2003, depending on the country.

Our source of statistical information is the database of the Groningen Growth and Development Center (GGDC), used as an international benchmark in the majority of studies on productivity and employment. It provides basic data on GDP in two different constant units: 1990 U.S. dollars, converted at purchasing power parity according to the Geary Khamis method (GK); and 2007 U.S. dollars, updating the 2005 data, also in PPP, obtained by the Èltetò-Köves-Szulc method (EKS). However, the second series does not provide information on the former Federal Germany, thus disallowing EU aggregate data for periods prior to German unification.³ As growth rates are almost identical, we have used the data in 1990 U.S. dollars PPP-GK, to allow aggregation for the period of economic expansion (1950-73) and the following decades of slow growth (1974-93).⁴ These data are of interest in comparison with the reference period (1994-2007).

The data on labor productivity growth in U.S and EU (Tables 1 and 2) highlight the following facts:

² However, these benchmarking criteria do not involve substantive change in respect to results obtained when observing “round” periods such as 1990-1995, 1996-2000, 2001-2005.

³ In the case of Germany, the years 1991-93 are still calculated with data for West Germany, so that data from this period are uniform (avoiding the sudden leap to unification in 1991).

⁴ Overall, the interval from 1974 to 1993 was a period of slow economic growth, although it rose somewhat at certain stages, especially in the second half of the 1980s.

1) Productivity growth rates have fallen significantly from the 1970s, compared to the 1950-73 period, both in the EU-15 and the U.S. In Europe, where the pace of growth during the “Golden Age” was much higher than in the U.S., the average annual rate was reduced by over 50% in 1974-93. This lower pace of growth was further reduced (by another 35%) during 1994-2007. Meanwhile, in the U.S, the average rate was likewise reduced by 50% in 1974-93, but showed some recovery in 1994-2007.

2) The labor efficiency growth rate during 1994-2007 is slightly higher in the U.S (1.84%) than in the EU (1.59%). This difference implies that, over the fourteen-year period, U.S. productivity grew by 29%, while the European grew by 24.7%.

3) However, when this period is divided into two intervals split by the year 2000, two different scenarios emerge. European productivity maintained a downward trend, passing from an average of 1.95% per annum (during 1994-2000) to 1.24% (2001-07), while the U.S. productivity rate rose from 1.67% to 2.02%. Consequently, the highest rate of growth in U.S. labor efficiency corresponded to the second interval (2001-07), while in 1994-2000 the European rate of increase was higher than in the U.S. (Table 1).

4) Productivity slowdown has been widely verified among all European countries. Almost all EU economies recorded successive declines in 1950-73, in 1974-93, and in 1994-2007, as well as in both divided phases of the latter period.⁵ However, even in 2001-07, five countries (Finland, Sweden, the UK, Greece, and Ireland) maintained higher growth rates than the U.S. Other countries, notably Austria, Belgium, Portugal, and Spain, showed rates below 1%, while Italy’s productivity even failed to rise in the latest interval.

⁵ Table 1 shows that the exceptions are few. Only Greece and Spain have higher rates in 2001-07 than in the previous interval, while the UK and Sweden maintain similar rates.

5) Therefore, the highest growth rates in U.S labor efficiency apply to the current decade but not to the 1990s, when the thesis of “the superiority of U.S. growth compared to Europe” was coined.⁶ This fact deserves attention for three reasons. First of all, 2001-07 was not a “brilliant” period for the American economy, as the second half of the 1990s had been. Secondly, U.S. productivity growth (at 2%) was not dramatic; its “superiority” was due mainly to the weakening of the European efficiency growth rate (at 1.2%). And thirdly, economic growth during the last phase was affected by many “outlier” factors: the 2001-02 recession, a sharp decline in employment, a rise in public spending alongside increasing fiscal imbalances, the huge foreign trade deficit, and the real estate bubble. All these elements are part of a very specific macroeconomic dynamic, but they are not much in line with what are generally considered to be drivers of productivity.

6) Thanks to the aforementioned differences in the pace of productivity growth, the second half of the 20th century also saw a convergence between European and American productivity levels (Table 2). Large differences in 1950, when the EU-15 level amounted to only 42%, were progressively reduced, so that by 1995 the level stood at 88.5%. This was its peak, as the

⁶ Many who defend this thesis (cited in note 15) take a selective benchmark from 1996 to 2000 -- when U.S. productivity recorded an average rate of 2.14% per year -- in order to better highlight the role of new technologies. Thus, they omit the previous years 1994 and 1995, when growth rates were 0.9% and 0.1%, which seems unreasonable since ICTs were already at work. Even so, U.S. productivity growth during 1996-2000 was similar to (not higher than) in the EU (2.18%). Other articles, such as by Van Ark and Smits (2008), take the period 1996-2004 -- whose average rate was 2.35% -- to emphasize ICTs’ impact on productivity, but they omit 2005-07, when growth rates were successively 1.4%, 0.9%, and 1.3%. Why would these supply drivers have lost their impact in more recent years? Remarkable also is the inclusion of productivity results during the recession of 2001-02 -- when employment fell sharply -- but the exclusion of results after 2005.

subsequent slowdown in European growth reduced this difference to 86.6% in 2000, and to 82% in 2007.

7) Several European countries maintain higher productivity levels than the U.S. In 1994, Luxembourg, Belgium, and the Netherlands exceeded the U.S. level, France and Italy equaled it, and Germany was just slightly behind (Table 2). Midway through the period, in 2000, the first four countries and Austria were all above the U.S., while Germany and Italy were at U.S. levels. However, the weakness of European production in recent years left only Luxembourg and Belgium above the U.S. level in 2007, while Austria, France, and Netherlands remained close, but lower.

3. AGGREGATE DEMAND AND THE EMPLOYMENT-PRODUCTIVITY TRADE-OFF

As we have developed in previous articles,⁷ in terms of the macroeconomic dynamic, economic growth is primarily determined by demand and income distribution.⁸ Thus, labor productivity growth is structurally conditioned by the evolution of aggregate demand. At the same time, there is always a trade-off effect between employment and productivity, which is particularly intense during periods of weak productivity growth. Obviously, this proposition allows further clarifications, and does not deny that other factors also influence productivity's pace of growth, including wage response, distribution trends, or the sectoral structure of production.

⁷ Palazuelos and Fernández (2009), and Fernández and Palazuelos (2009).

⁸ Also from this approach, we highlight Cornwall (1994), Cornwall and Cornwall (2002), Eatwell (1996), Marglin and Schor (1990), Setterfield and Cornwall (2002), Stockhammer (2004), Mitchell et al (2006), Lorentz and Savona (2006), and Naastepad (2006).

Table 1. Labor productivity growth (average annual rates)

	USA	EU -15 *	Germany*	Austria	Belgium	Denmark	Spain	Finland	France	Greece	Ireland	Italy	Holland	Luxembur	Portugal	U.K	Sweden
PRODUCTIVITY PER HOUR (1990 US\$ PPP-GK)																	
1950-1973	2.57	4.69	5.83	5.91	4.75	3.81	5.92	4.71	5.11	6.41	4.47	5.55	4.36	3.63	6.53	2.85	4.09
1974-1993	1.32	2.48	2.87	2.62	2.63	2.29	4.19	3.00	2.71	1.70	3.37	2.50	1.78	2.35	1.70	2.50	1.31
1994-2007	1.84	1.59	1.78	2.46	1.35	1.50	0.45	2.54	1.74	2.29	3.71	0.90	1.53	1.58	1.94	2.22	2.36
1994-2000	1.67	1.95	2.22	4.06	1.78	1.95	0.05	2.81	2.26	1.47	4.66	1.77	1.94	1.97	3.00	2.18	2.41
2001-2007	2.02	1.24	1.33	0.89	0.93	1.05	0.85	2.28	1.22	3.11	2.76	0.04	1.11	1.19	0.89	2.25	2.31
GROSS DOMESTIC PRODUCT (1990 US\$ PPP-GK)																	
1950-1973	3.93	4.83	5.99	5.35	4.08	3.81	6.60	4.94	5.05	6.98	3.20	5.64	4.76	3.30	5.73	2.93	3.73
1974-1993	2.80	2.17	2.11	2.47	1.98	1.69	3.04	1.89	2.12	2.10	3.84	2.41	2.21	3.37	2.84	1.74	1.40
1994-2007	3.09	2.41	1.62	2.34	2.33	2.48	3.55	3.81	2.22	3.66	7.26	1.58	2.83	4.65	2.36	2.97	3.16
1994-2000	3.87	2.83	2.08	2.75	2.73	3.26	3.66	4.48	2.62	3.05	8.95	2.07	3.76	5.12	3.66	3.33	3.52
2001-2007	2.32	1.99	1.17	1.94	1.94	1.70	3.43	3.14	1.81	4.28	5.60	1.09	1.92	4.18	1.07	2.61	2.80
EMPLOYMENT (total hours worked by persons engaged)																	
1950-1973	1.33	0.06	0.15	-0.53	-0.63	0.00	0.64	0.23	-0.06	0.53	-1.22	-0.09	0.38	-0.32	-0.76	0.08	-0.35
1974-1993	1.46	-0.47	-0.74	-0.14	-0.63	-0.58	-1.10	-1.07	-0.57	0.40	0.45	-0.08	0.42	1.00	1.12	-0.74	0.09
1994-2007	1.23	0.80	-0.15	-0.12	0.97	0.97	3.08	1.23	0.47	1.35	3.43	0.67	1.29	3.02	0.41	0.74	0.78
1994-2000	2.17	0.86	-0.13	-1.25	0.94	1.28	3.61	1.62	0.35	1.56	4.10	0.30	1.78	3.09	0.64	1.13	1.08
2001-2007	0.29	0.75	-0.16	1.03	0.99	0.65	2.56	0.85	0.59	1.14	2.77	1.04	0.79	2.95	0.18	0.35	0.48
Hours per person engaged																	
1950-1973	-0.27	-0.66	-1.03	-0.46	-1.13	-0.89	0.15	-0.27	-0.44	-0.41	-0.64	-0.72	-1.00	-1.13	-0.64	-0.41	-0.89
1974-1993	-0.23	-0.59	-1.07	-0.67	-0.70	-0.66	-0.78	-0.43	-0.92	-0.36	-0.06	-0.57	-1.03	-0.53	-0.33	-0.76	-0.14
1994-2007	-0.10	-0.29	-0.56	-0.61	0.05	0.18	-0.47	-0.19	-0.49	-0.04	-0.71	-0.21	-0.23	-0.49	-0.37	-0.15	0.08
1994-2000	0.42	-0.30	-0.72	-1.40	-0.02	0.21	0.34	-0.05	-0.79	0.15	-0.85	-0.13	-0.45	-0.57	-0.67	0.06	0.40
2001-2007	-0.61	-0.27	-0.39	0.18	0.11	0.15	-1.28	-0.33	-0.19	-0.24	-0.47	-0.29	-0.01	-0.41	-0.08	-0.35	-0.23
Number of persons engaged																	
1950-1973	1.60	0.66	1.19	-0.07	0.50	0.89	0.48	0.49	0.38	0.95	-0.58	0.81	1.39	0.82	-0.12	0.49	0.55
1974-1993	1.70	0.31	0.34	0.53	0.07	0.07	-0.32	-0.64	0.35	0.76	0.52	0.49	1.47	1.53	1.46	0.03	0.23
1994-2007	1.33	1.11	0.41	0.50	0.92	0.78	3.57	1.42	0.97	1.39	4.17	0.88	1.52	3.53	0.79	0.88	0.70
1994-2000	1.75	1.15	0.9	0.14	0.95	1.07	3.26	1.67	1.15	1.41	5.10	0.43	2.24	3.68	1.32	1.07	0.68
2001-2007	0.91	1.07	0.23	0.85	0.88	0.50	3.89	1.18	0.78	1.37	3.25	1.34	0.80	3.37	0.26	0.70	0.72

* In order to guarantee the coherence of the data prior to and after reunification in 1990, the series of the period 1974-93 has been created from 1991 by applying the variation rates of the unified country to the FDR data.

Source: Drawn up from *Annual-Macroeconomic Database (AMECO)* and Groningen Growth and Development Centre (GGDC) Database

Table 2. Labor productivity and hours worked by persons engaged in European economies: relative levels (USA = 100)

	EU -15 *	Germany*	Austria	Belgium	Denmark	Spain	Finland	France	Greece	Ireland	Italy	Holland	Luxembur	Portugal	U.K	Sweden
PRODUCTIVITY PER HOUR (constant PPP US\$ 2007, EKS)																
1950	41.8	43.2	33.9	52.1	57.1	24.8	33.9	43.2	26.5	31.3	40.0	63.9	91.0	18.8	62.9	58.4
1973	65.2	74.6	70.9	84.4	75.2	51.9	54.5	75.7	61.6	47.7	77.2	95.1	115.3	44.8	67.0	81.9
1993	84.9	95.1	91.5	109.2	91.0	90.7	75.7	99.6	66.4	71.2	97.3	104.2	141.3	48.4	84.4	81.8
2000	86.6	98.8	107.7	110.0	92.8	81.1	81.9	103.7	65.5	87.3	98.0	106.2	144.2	53.0	87.4	86.1
2007	82.1	94.3	99.7	102.1	86.8	74.8	83.3	98.1	70.6	91.8	85.5	99.8	136.3	49.0	88.9	87.8
HOURS WORKED BY PERSON ENGAGED																
1950	111.1	118.2	104.6	119.7	106.8	102.2	101.4	111.4	115.7	120.7	107.9	114.5	124.3	114.0	100.4	105.2
1973	102.2	99.1	100.1	98.1	92.6	112.6	101.4	107.2	111.9	110.8	97.3	96.6	101.8	104.8	87.0	101.7
1993	94.6	86.0	91.7	89.4	85.0	100.7	97.4	93.3	109.0	114.6	90.9	82.2	95.9	102.7	88.6	91.4
2000	89.9	79.4	80.7	86.7	83.8	100.2	94.3	85.8	107.0	104.2	87.4	77.4	89.5	95.2	88.5	89.1
2007	92.2	80.7	85.3	91.2	88.4	95.6	96.2	88.4	109.9	105.2	89.5	80.7	90.8	98.8	90.9	90.8

Source: Drawn up from Groningen Growth and Development Centre. *Total Economy Database*.

The central argument raised by this theoretical proposition is the following: to the extent that economies are usually below full employment of labor and capital resources, aggregate demand determines the actual output growth rate and, consequently, the productivity and employment rates as well. Therefore, macroeconomic dynamics determine labor productivity's pace of growth. At the same time, however, this link is affected by factors that either promote or hinder job creation. Thus, given a certain (expansive or contractive) movement of aggregate demand, the higher (lower) employment growth results in lower (higher) productivity growth.

The structural determination of labor efficiency by aggregate demand is brought about through three processes: a) a *scale effect*, so that market expansion favors the increased use of installed capital facilities, thus reducing the capital-output ratio (K/Y); b) a *capitalization effect*, causing an increase in nonresidential investment (especially equipment), which raises the capital-labor ratio (K/L); and c) a *technological effect*, which is produced through investments in equipment that improves technologies, leading to an increase in the capital-labor ratio and a declining capital-output ratio. Each of these effects drives productivity growth⁹.

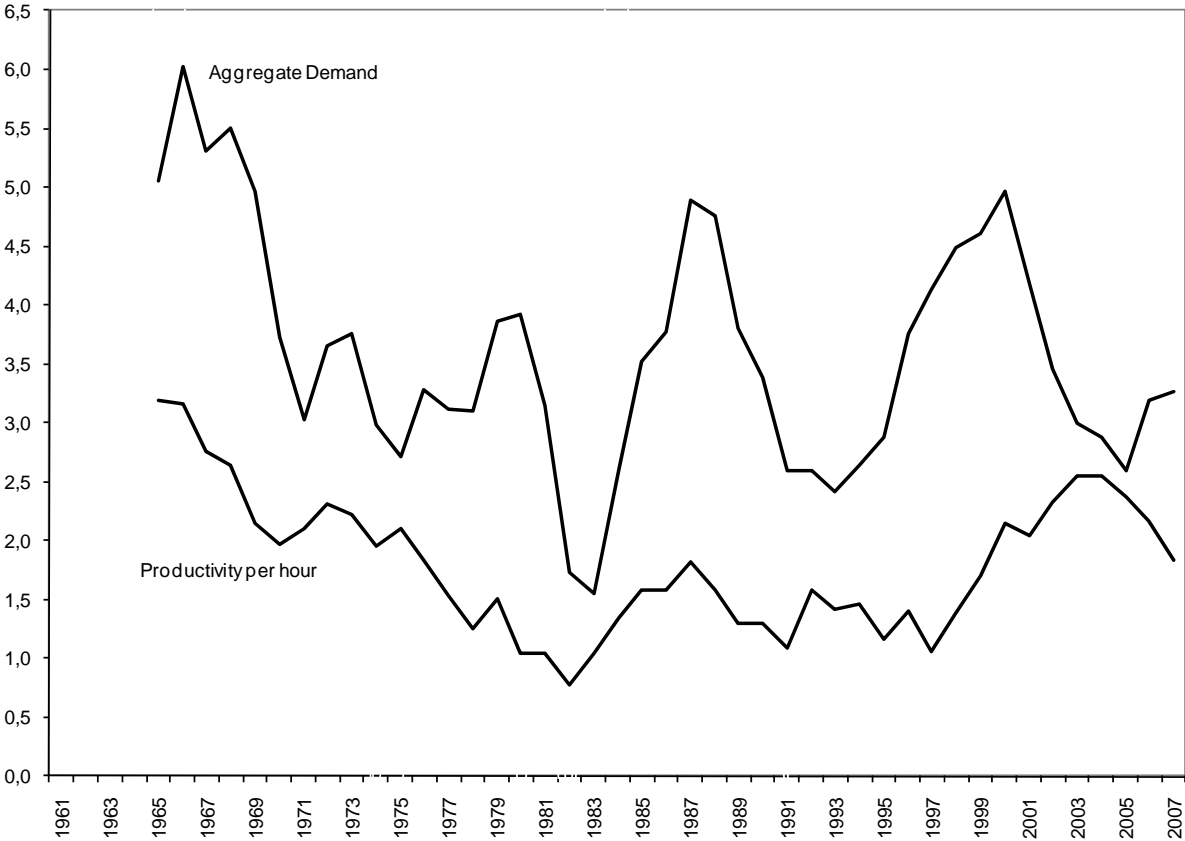
Examining first the relationship between aggregate demand and productivity growth, it is noted that the sharp increase in demand during 1960-73¹⁰ (the phase of fastest growth in the Golden Age, when average annual rates reached 5.8% for the EU and 4.5% for the U.S.) was followed by productivity increases of 4.7% and 2.6%, respectively. Since then, from 1974 to

⁹ The productivity level (Y/L) can be expressed as $Y/L \equiv (K/L)/(K/Y)$, being K the capital stock and L the employment. Thus, the labor productivity growth rate (q) equals the difference between the rates of growth of both ratios: capital-labor (k) and capital-output (s).

¹⁰ Aggregate demand includes consumption (government and household) and investment (private and public) plus exports. The calculations are made from the *Annual Macroeconomic Database (AMECO)*, published by the Directorate General for Economic and Financial Affairs of the European Commission (DGEF), whose data series began in 1960.

2007, significantly lower increases in aggregate demand (2.9% and 3.2%) have led to more moderate growth rates in productivity (2.2% and 1.5%). Figure 1 shows the evolution of both variables for the United States during 1961-2007, using moving averages of five years.¹¹

Figure 1. Aggregate Demand and Labor Productivity in USA, 1961-2007: average annual rates, five years moving averages



Source: Drawn up from AMECO and GGDC

At the same time, these data show that there is no strict proportionality between both variables. The difference between European and American growth productivity rates during 1960-73 are significantly higher than that of aggregate demand, because the EU failed to create employment (total hours worked), while employment in the U.S. grew at 1.3% per annum (Table 1). Again, demand growth rates were similar (2.5% vs 2.9%) during next period (1974-

¹¹ AMECO does not allow calculate aggregate demand annual data for the whole EU-15 until the 1990s; nonetheless, several of the major European countries have development profiles similar to those shown in the figure.

93) but the weakening of productivity growth as compared to the previous period was different (2.5% vs. 1.3%), since the EU suffered a severe fall in employment while the U.S. continued to create employment (-0.5% vs. 1.5%).

The trade-off between employment and productivity becomes even more evident during 1994-2007. Here aggregate demand in the EU showed some recovery, but productivity growth slowed, since the EU became a net job creator, at a significant rate (0.8%), breaking its record of four decades earlier. On the other side, U.S. demand also increased somewhat, with higher productivity growth rates due to less intense employment growth.

Thus, the employment path followed by the EU during the second half of the 20th century began to change in the 1990s, when many countries implemented policies that have since continued.¹² Simultaneously, there has been in the current decade a shift in the American growth style, toward less intense employment growth. From this criss-cross, two different scenarios have emerged:

- The European Union raised the aggregate demand growth rate in 1994-2000 (4% per year), but reduced its productivity growth rate (1.95%) alongside a significant increase in employment (0.86%). Later, in 2001-07, the EU slowed the aggregate demand growth dynamic (2.65%) as well as productivity (1.24%), because employment growth remained similar to the previous period (0.75%). Thus, the turnaround toward employment began in the 1990s has been consolidated, despite the fact that economic growth is significantly lower.
- U.S. aggregate demand growth in 1994-2000 was even higher than that of the EU (4.65%), but its productivity growth rate was slightly lower (1.8%) as job creation grew

¹² Artus and Cette (2004) contains an appendix (pp 217, ff) with major reforms by the European countries to create jobs.

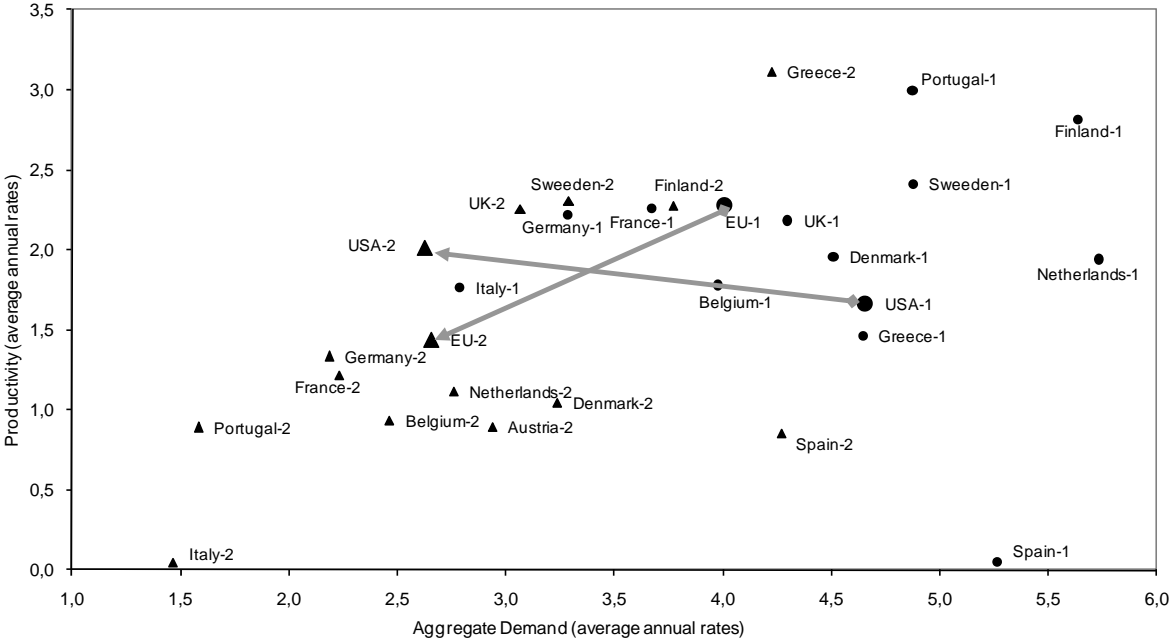
very intensely (2.2%). In contrast, the notable slowdown during 2001-07 in aggregate demand (2.63%) was consistent with higher productivity growth (2%), since employment growth was severely reduced, with an annual average rate of 0.3%, unusually low compared to past five decades.

Therefore we have a paradox: the EU-15 records its worst productivity results just when it manages to imitate the job creation that has always characterized the U.S. economy. At the same time, the U.S lags behind its traditional capacity to generate net employment, at the same time getting better productivity results. A satisfactory interpretation of this paradox is possible when seen through the macroeconomic dynamic, and the drivers which create employment, as we later demonstrate.

Figure 2 summarizes the evolution of aggregate demand and productivity of the fifteen European countries in the two aforementioned intervals of the overall period 1994-2007. Almost all follow the “EU pattern” characterized by declining growth rates in demand and productivity, plus remarkable job creation. From one phase to the next, each country’s position on the graph moves to the left and down.¹³ In Sweden and the UK, the slowdown in demand does not affect productivity growth as they reduce their pace of employment growth. Thus, these are the only two European countries that follow a trend similar to that of the United States, which is also included in the graph.

¹³ Greece and Spain show a different trend, as demand slowdown is soft, productivity growth rises (sharply in Greece and slightly in Spain), and job creation continue to grow. These particular performances require the explanation of additional factors, which would lead beyond the purpose of this work.

Figure 2. Aggregate Demand and Labor Productivity growth in 1994-2000 (1) and 2001-07 (2)



Ireland and Luxemburg are out of the figure, because they have much higher growth rates. Ireland: 1994-2000 (12.4% y 4.7%) and 2001-07 (5.2% y 2.8%). Luxemburg: 1994-2000 (7.4% y 2.0%) and 2001-07 (5.4% and 1.2%).
 Source: Drawn up from GGCD and AMECO.

**4. EMPLOYMENT AND PRODUCTIVITY SHARES IN ECONOMIC GROWTH:
 A BACK AND FORTH DEBATE?**

Although there has long been discussion over why European countries saw larger increases in labor productivity than the U.S., in the early 1990s that debate began to focus on differences in labor performance. Regular reports by the OECD reflected the focus: Europe showed greater productivity increases because it had serious problems increasing employment. Consequently, most of the work inspired by this approach has sought to establish the

reasons for, and the effects of, lower employment rates in the European economies, due as much to lower activity rates as to higher unemployment rates.¹⁴

Thus, the academic and political debates have taken, as their common belief, the notion that rigidity in European labor markets (in contrast to flexible U.S. markets) limits Europe's ability to incorporate more people into economic production. Some authors (such as Prescott, 2004) indicate that the main obstacle is the tax burden on employment, while others (Alesina et al, 2006) move this responsibility to demands by trade unions (higher wages and fewer work hours), as well as other political pressures that retract recruitment and tend to limit the number of working hours. Widening the range of causes, other authors (Ljungqvist and Sargent, 2006) point to the welfare state in European countries, where unemployment and other social transfers incentivize higher unemployment and inactivity. Another view is presented by Blanchard (2004), who argues that European citizens show a greater willingness toward leisure, which: slows the incorporation of young people to labor markets; reduces working hours per week; anticipates retirement age; increases the number of public holidays; and extends summer vacation. Blanchard's point is that this preference for leisure is only partly voluntary, as it is also largely influenced by labor market inefficiencies.

The corollary to all these approaches is that EU should create the institutional conditions to push the inactive and unemployed into the labor market. By doing so, the productivity gap between Europe and the U.S. would be considerably reduced.

In several recent papers, Robert Gordon has attempted to propose yet another reading. On the one hand, he identifies those major differences that drive Europe's proportionally lower employment, compared to the U.S. He estimates that two thirds of that differential can be

¹⁴ Representative works on this thesis: Layard et al (1991), Nickell and Layard (1998), Prescott (2004), Alesina and Giavazzi (2006), Baily and Kirkegaard (2004), Bassanini et al (2001), Blanchard (2001) and Blanchard and Wolfers (2000).

explained by the lower activity rate, and the other third by the higher unemployment rate, which is higher across all ages but especially among the young (19 to 24) and those older than 55 (Gordon, 2008).¹⁵ Next he insists that there is no single cause but a multiplicity of reasons behind EU-U.S. differences, emphasizing the diversity of labor situations within the European Union (Dew-Becker and Gordon, 2006, 2008). Moreover, Dew-Becker and Gordon (2008) examine the mechanisms of the trade-off between employment and productivity through a variety of elements related to employment taxes, employee protection, benefits to the unemployed, labor regulations, degree of unionization, and a dummy variable related to high-degree corporatism.

However, not even these more nuanced approaches escape considering U.S. labor markets as a (favorable) bench mark. Little do they bear in mind that the number of hours worked has hardly declined for decades, or that hours worked by employee in manufacturing continues to grow, and already exceed 41 hours per week (1980: 39.7, 1990: 40.5, 2007: 41.2), according to data from the Bureau of Labor Statistics (BLS). The same goes for the weak “broad guidelines” established by the Fair Labor Standards Act, which give rise to a precarious legal protection of the workers. Nor is it much considered that, according to the BLS, more than a fifth of private sector employees are not compensated for holidays or vacations, so that the percentage of workers with a week or less vacation per year keeps growing. Similarly, the U.S. minimum wage in 2005 (in constant dollars of that year) was one third below that of 1962, while the hourly earnings of employees in 2006 remained nearly 10% below that of thirty years prior.

¹⁵ The employment/population ratio (L/P) is divided into two ratios: employment rate and activity rate, so that $(L/P)=(L/AP)*(PA/P)$. Since $PA = L-U$ (unemployment), then the first term becomes $[1-(U/PA)]$, so $(L/P)=[1-(U/PA)]*(PA/P)$.

Should these data be ignored? Given the low levels of U.S. unemployment protection, or the weakness of most of public coverage, should the U.S. labor market serve as good reference for reforming Europe's (heterogeneous) labor markets? Does it make sense, in the 21st century, with societies richer and technological capability increasing, that a rising number of hours worked per employee be exalted as positive, or that countries reducing hours be viewed as negative?¹⁶ It is difficult, but necessary, to separate topics such as these from others where American society is clearly advantageous, such as in the increased activity rates of women and youth, or the greater social value placed on personal effort.

Beyond certain technical features, these are issues with profound social and political implications for developed economies. Criticism of the negative role exerted by any policies that "remove competitive tension in the labor market" may well serve to legitimate a conservative vision, but is not an objective argument, or a proper basis of reference for evaluating the (negative) conditions of the institutional framework of European labor markets. Without ignoring the obvious problems that exist in these varied markets, many authors have questioned the fundamentals underlying the comparison with the United States.¹⁷ Eventually, the OECD itself (in 2004) admitted that there was no obvious relationship between the evolution of employment and unemployment in respect to employment-protection legislation.

However, in view of recent events, this debate has begun to take a different perspective. With respect to the two components into which employment growth can be split: changes in

¹⁶ Hours worked per employed person are on average 8% less in the EU-15 than in the U.S. Despite the fact that during the current decade the U.S. has reduced its ratio by 4% (1,855 hours in 2000, and 1,777 in 2007), while most European countries have increased the ratio somewhat, only Greece and Ireland show rates above the U.S., while in Germany (at 1,433 hours), Austria (1,515), and Netherlands (1,434), levels are between 15% and 20% below the U.S.

¹⁷ See, for instance, Howell (2004, 2006), Groot et al (2004), Mitchell et al (2006), Welters and Muysken (2002), Freeman (2008), Stockhammer (2004), and Buchele and Christiansen (1999).

the occupation rate and changes in the number of hours worked by person engaged (Table 1), significant changes in the respective trends in both Europe and the U.S. have been observed.

In the interval 2001-07, when U.S. productivity growth exceeded that of the European Union, the U.S. slowed the rate of demand for new jobs (to 0.9%) and considerably the number of hours worked (-0.6%), increasing employment in total hours worked by just 0.3% annually. These are radically different features than those which characterized American labor performance during the second half of the 20th century.¹⁸

Meanwhile, Europe has moved into a very different scenario. The slowdown in productivity growth continues its process of convergence toward the “American labor model” (Cohen and Pisani-Ferry, 2008). The employment level is growing at an annual rate of 1.1%, and the decrease in the number of hours by person engaged is very slight (-0.3% per year), so that total employment has increased at a rate of 0.75% per annum.

Thus, almost all European countries have raised their activity and employment rates since 1994,¹⁹ incorporating new ranges of inactive and unemployed persons into labor markets, while the (higher) U.S. rates have hardly changed, despite that nation’s faster pace of GDP growth.

In light of these facts, it remains to be seen whether the debate on the relationship between the functioning of labor markets, job creation, and productivity performance is eventually reversed, now that superior U.S. labor efficiency is based on the growth-style previously at work in European countries. Should these productivity rates be detracted, and/or call into

¹⁸ The contrast is clear: the employment growth rate in 1994-2000 was 1.75%, while hours worked per employed person increased at 0.4%, so that the employment growth rate was 2.2%.

¹⁹ The activity rate in the EU rose rapidly in 1994-2007, from 67.1% to 72.2%. It was considerably higher in Denmark (80%), Sweden (79%), and the Netherlands (85.5%), while in Germany, Austria, Finland, and the United Kingdom it stood around 75-76%. Source: Eurostat.

question the accepted benefits of the U.S. labor market, due to its limited capacity to create jobs? Or is it wiser to escape such simplistic approaches, and to adopt a more complex perspective on the determinants of productivity growth and their relation to job creation from a macroeconomic perspective?

5. NEW TECHNOLOGIES, EMPLOYMENT, AND PRODUCTIVITY

The argument that U.S. productivity growth has, since the 1990s, been higher than that of Europe is generally explained by the outstanding role played by ICTs:²⁰ the production of goods and services related to computers, components, software and communications equipment, along with a diffusion through those branches of economy using such technologies, has indeed driven a sharp increase in productivity. The virtues of ICTs are wider still since they contribute to the better functioning of markets, to price stability (via continuous drops in the production costs of ICT), to the internationalization of production (with a subsequent rise in competitiveness), and to improving human capital.²¹ Greater development of ICT in the United States explains the “acceleration” of productivity growth, and its gap with EU countries.

However, we must reiterate that the U.S. productivity growth rate during 1994-2000 (1.67%), although has improved over the 1974-93 period (1.32%), cannot be regarded as an

²⁰ It should be remembered that, before they began to emphasize the role of ICTs, many academic works during the early 1990s showed skepticism over accepted methods of measuring productivity. Such accounting techniques were not able to precisely reflect labor efficiency growth. However, when such data (with the same methods) began to show better performance after 1996, that skepticism was soon forgotten.

²¹ Representative works on this thesis are: Jorgenson (2001), Jorgenson and Stiroh (2000), Jorgenson, Ho and Stiroh (2000, 2005), Oliner and Sichel (2000, 2002), McGuckin, Spiegelman and Van Ark (2005), Van Ark and Smits (2008), Timmer and Van Ark (2005), Van Ark, Inklaar and McGuckin (2003), Van Ark and Inklaar (2005), and Stiroh (2002 a y b).

“acceleration” and in any case proved lower than that seen in the EU-15 (1.95%) for the same period. It was later, in the 2001-07 phase, when U.S. productivity grew at a higher rate (2.02%) than in the previous interval and than in the EU (1.24%), where it continued to slow.

Without a doubt, investments in ICT have been significantly higher in the U.S. than in Europe, but the empirical evidence also reveals that the relationship between ITC and productivity growth is not linear. According to the *Total Economy Growth Accounting Database* (GGDC), during the period 1994-2004, gross fixed capital formation grew at an average annual rate of 5.2% in the U.S. and at 2.7% in the EU. At the same time, computer equipment, software, and telecommunications equipment accounted for 27% of fixed investment in the U.S., compared to 15% in Europe.²² Consequently, investment in ICT gradually increased its presence in U.S. total investment, from 15% in 1993 to 30% in 2000, and to 37% in 2004, while in the European Union it rose, respectively, from 8% to 17% and to 20%.²³

The behavior of capital-labor and capital-output ratios (Table 3) shows how investment and employment conditions influence productivity performance. Higher investment growth in the U.S. (compared to the EU, 1994-2004) implies a further increase in U.S. productivity, over that of Europe. That productivity growth gap is explained through the evolution of capital-labor and capital-output ratios, and it confirms the importance of distinguishing two separate time intervals.

²² The largest differences are seen in the growth of investment in telecommunications equipment (9.6% annually in the U.S. and 5.9% in the EU) and software (10.7% vs 8%).

²³ Obviously, these differences influence the evolution and composition of gross fixed capital stock. The capital stock growth rate from 1994 to 2004 was 2.8% annually in the U.S. and 2.3% in the EU.

Table 3. Capital Stock, and Capital-Labor and Capital-Output ratios, 1994-2004.
(average annual growth rates in each interval).

	1994-2004		1994-2000		2001-2004	
	USA	EU	USA	EU	USA	EU
Fixed Capital Stock	2.84	2.37	2.98	2.28	2.58	2.25
Employment (hours)	1.20	0.66	2.17	0.86	-0.48	0.31
Capital-Labor	1.62	1.60	0.79	1.41	3.08	1.93
Capital-Output	-0.38	-0.13	-0.86	-0.53	0.46	0.58
Labor productivity	2.01	1.73	1.67	1.95	2.62	1.36

Source: Drawn up from GGDC. *Total Economy Growth Accounting Database*.

- Between 1994 and 2000, despite the fact that the capital-output (K/Y) ratio declined more in the U.S., European productivity growth saw a higher rate, due to a larger increase in the capital-labor ratio (K/L). However, this larger increase in the K/L ratio did not derive from a greater capitalization rate. In fact the opposite is true: U.S. capital stock grew faster, but so did employment, so that the K/L ratio grew at an average rate of 0.8% annually, while in Europe it grew at 1.4%. Thus, the capital-labor ratio grew faster in Europe, because employment growth was lower.
- Between 2001 and 2004 (and thus including the years of economic recession), the U.S. productivity growth rate was almost twice that of the EU. As the K/Y ratio grew in both cases, and at similar rates, the differentiating factor is found in the behavior of the capital-labor ratio. This time, with similar increases in capital stock, this ratio grew faster in U.S. than in Europe because employment fell in America, while it continued to grow in Europe.

Thus, investment --especially in new technologies-- is key to explaining the dynamics followed by productivity. First, as a component of aggregate demand, increasing investment contributes to market expansion, so that the scale effect reduces the capital-output ratio, as found in the 1994-2000 phase of higher economic growth. Secondly, investment determines the growth of capital stock, so that the capitalization effect raises the capital-labor ratio.

Thirdly, investment in ICT and other technological innovations increases labor efficiency, either by increasing the K/L or decreasing the K/Y.

However, this causal relationship is not closed to other factors, which are also part of the economic dynamic that influences productivity growth. The employment trends analyzed in this article are among those factors, as becomes clearer when the sectoral and branch structure of the U.S. economy is studied.

During the second half of the 1990s, when the U.S. recorded its greatest growth rate in labor efficiency, production activities directly linked to ICT saw dramatic productivity gains, such as manufacturing of computers and other office equipment, with an average rate of 35% per annum, or of electronic components and accessories (at 29%), or communication equipment (at 17.5%).²⁴ However, employment in these branches recorded annual growth rates of only 1%-3%.

Other areas of high productivity, such as automotive and aerospace, saw similar employment growth, whereas many other branches of equipment production lost employment, as did production of industrial electrical equipment, appliances, professional equipment, and most machinery (engines and turbines, metalworking machines, agricultural, and both general and specialized industrial machinery). Apart from these equipment industries, chemicals and petrochemicals, the other major manufacturing branch, presented the same profile: significant productivity growth rates together with employment decline both in organic and inorganic chemicals, plastics and rubber.

This scenario became even more intense after the economic recession of 2001-02. The bulk of industries, especially those with a higher technological content, increased their productivity while reducing employment. Thus, between 1994 and 2007, the productivity of the

²⁴ Source: Bureau of Labor Statistics, News Releases, *Productivity and Costs*.

whole manufacturing sector grew at an average rate of 4.1% but lost employment at a rate of -1.4% per year.

Moreover, it must be considered that the manufacturing sector represents a shrinking proportion of both GDP and employment (13.8% and 10.5%, respectively, in 2007), so that its productivity dynamic is not representative of the economy as a whole. The overwhelming presence of service activities (78% of GDP and 82% of employment) means that services is now the most determinant sector in observing the behavior of the aggregate economy.²⁵ Within the service sector, there is a marked duality between:

- A minority group of activities related to finance, communications, and certain areas of commercial and business service, whose performance resembles that of manufacturing: high capitalization, greater use of new technologies, low job creation, and more highly skilled work. In these activities, the capital-output ratio is reduced while capital-labor ratio increases, leading to dynamic growth in labor productivity.
- A rather larger set of activities are those characterized by low capital endowment, lower diffusion of new technologies, high labor intensity, low-skilled jobs, and low value added. In these activities, the capital-labor ratio increases slowly and the capital-output ratio is reduced only slightly, or even rises, so that labor productivity either increases weakly or remains stagnant. Here are found the majority of activities related to welfare, education, health, public administration, leisure, and other personal services, as well as some business services and commercial networks.²⁶

²⁵ Source: Bureau of Economic Analysis. *Terciarisation* is lower in the EU, at around 71% of GDP. Source: Eurostat.

²⁶ Education, healthcare, hotels and restaurants, leisure, and other personal services account for about 11% of GDP and over 23% of employment. If public administration (mainly services) is added, these branches represent 22% of GDP and 40% of employment.

The features that characterize many service activities limit the influence of expanding demand on productivity.²⁷ A great many services take place in small establishments that operate with very tight capacity, so that the scale effect has limited room for expansion. Weak capital endowment means that the capitalization effect cannot be sufficiently expansive. The incorporation of technological progress depends on the potential of these facilities to incorporate capital goods and skilled labor, to raise the capital-labor ratio and lower the capital-output ratio. Most of these activities are not internationalized, and therefore are not affected by foreign demand, cannot be relocated, and do not face global competition.²⁸

5. CONCLUSION

From the viewpoint of labor efficiency, European economies are in a worrisome situation. The pace of productivity growth has fallen from period to period since the 1970s, so that the most recent phase (2001-07) showed an annual average growth rate of only 1.2%. This slowdown is repeated in almost all EU-15 countries, and only five had an average productivity growth rate above 2% per year.

At the same time, the thesis that U.S. productivity is still growing at an accelerating rate is not supported by the data, and neither has the U.S. rate been significantly above the European since the later 1990s. Such theses, widely extended through academic, professional, and political fields, argue that the U.S. productivity dynamic is superior to Europe's thanks to two

²⁷ Fernández and Palazuelos (2009), Artus (2004), Cahuc and Debonneuil (2004), Kin (2007), Lorenz and Savona (2006), Sasaki (2007), and Savona-Lorenz (2006).

²⁸ Services place poorly in foreign trade, as exports and imports represent under 4% and 3% of GDP, respectively, while service production nears 78% of GDP.

main factors: America's greater ability to generate and disseminate ICT, and the better functioning of its labor market.

First, empirical evidence reveals that the pace of U.S. productivity growth during 1994-2000 reached 1.7% annually. This is a rate slightly higher than recorded during the 1974-93 period, but can in no way be described as an "acceleration" in the speed of growth. Only when benchmarking is discretionally manipulated (by leaving out 1994 and 1995, when productivity grew below 1%, despite good economic growth) does the average rate rise beyond 2% during 1996-2000.

Second, empirical evidence denies that U.S. productivity growth over the period was above that of the European Union. During the first phase, 1994-2000, the average EU was 1.95% per year, or 15% higher than in the U.S. Even when the range is limited to 1996-2000, the European growth rate (2.18%) was similar to that of the U.S. (2.14%).

Third, the data reveal that during the second phase (2001-07), U.S. productivity growth was above that of the EU, because the U.S. economy slightly increased its rate while the EU continued on a downward trend.

Such differing performances cannot simply be explained by "American superiority", since productivity results have been significantly influenced by changes in employment trends. In 2001-07, U.S. employment grew slowly, deepening its tendency to reduce the average number of hours worked per employed person, while at the same time slowing its pace of job creation.

Simultaneously, in 2001-07, precisely the opposite occurred in the EU-15, as most EU economies worked to consolidate a trend begun in the previous period, focusing much more than in past decades on job creation by braking the continuous decline in hours worked per person and by raising both its occupation and activity rates.

These facts force a new interpretation of the fabled influence of ICT and labor markets over the pace of productivity growth. Macroeconomic analysis provides a broader and more consistent explanation for economic growth and productivity performance. From a macrodynamic viewpoint, the slowdown in aggregate demand since the 1970s has been the first determinant of the lower productivity growth rate, when compared to 1950-73. Within this demand dynamic, differences in framework between the U.S. and EU economies are clearly due to trade-off effects between employment and productivity.

This trade-off effect provides a satisfactory interpretation for the influence of new technologies on productivity. Such technologies are incorporated into productive activities through ICT investment, but their influence on productivity is mediated through conditions of employment. In 1994-2000, the higher U.S. investment in ICTs (versus the EU) resulted in faster growth of capital stock and a greater decline in the capital-output ratio; however, the American capital-labor ratio increased less than the European, due to the high U.S. rate of job creation. As a result, labor productivity increased more in the EU than in U.S. Later, in the interval 2001-04, these trends changed. The United States maintained a higher investment rate while its capital-output ratio (now rising) grew less than in the EU, while the capital-labor ratio registered an even greater difference: it recorded sharp growth in U.S., due to the fact that employment was now decreasing, while it continued to grow in the EU, so that the capital-labor ratio increased at a slower pace. Therefore, U.S. productivity growth was, in the end, considerably higher than that of the EU.

Finally, asymmetries between sectors and branches within the service sector contribute to an explanation of why, if employment grows strongly during very dynamic periods in aggregate demand (such as 1994-2000), productivity cannot grow much faster, despite an improving growth rate. However, when demand dynamism is lower (as in 2001-07), productivity growth can be even higher, if such lower-demand growth leads to slower progress in job

creation. This has not occurred in most EU economies, which have chosen since the 1990s to implement employment policies highly focused toward the service sector, which in return become obstacles to productivity growth, especially when aggregate demand is less dynamic than that of U.S.

From the perspective of the European countries, the ultimate conclusion of this analysis is that a “productivity problem” does in fact exist, due to a previous “demand problem” (a problem of consumption and, especially, of “investment”, related to salary constraints and the need to expand and modernize production structures). While such problems remain unsolved, European economies will not be able to generate greater demand growth, and any policy focused toward increasing job creation will result in low productivity growth.

REFERENCES

- Alesina A., Glaeser E. and Sacerdote B. (2006): “Work and Leisure in the U.S. and Europe: Why So Different?”, *NBER Macroeconomic Annual 2005*, 20, 1-64.
- Artus P. and Cette C., 2004. *Productivité et Croissance*, Conseil d’Analyse Économique, La Documentation Française, Paris.
- Baily M. and Kirkegaard J. (2004): *Transforming the European Economy*, Institute for International Economics, Washington.
- Bassanini A., Scarpetta S. and Hemmings P. (2001): “Economic Growth: The Role of Policies and Institutions. Panel Evidence from OECD Countries”, *OECD Economics Department Working Paper*, 283.
- Blanchard O. (2004): “The Economic Future of Europe”, *Journal of Economic Perspectives*, 18 (4), 3-26.

- Blanchard O. and Wolfers J. (2000): “The Role of Shocks and Institutions in the Rise of European Unemployment: The Aggregate Evidence”, *Economic Journal*, 110, 1-33.
- Blanchard O. (2001): *The Economics of Unemployment: Shocks, Institutions and Interactions*. Lionel Robbins Lectures, London School of Economics.
- Buchele R. and Christiansen J. (1999): “Employment and Productivity Growth in Europe and North America: the Impact of Labor Market Institutions”, *International Review of Applied Economics*, 13(3), 313-32
- Cahuc P. and M. Debonneuil (2004): *Productivité et emploi dans le tertiaire*, Repport du Conseil d’Analyse Économique, La Documentation Française, Paris.
- Chen E. and J. Pisan-Ferry (2008): Economic institutions and policies in the US and the EU. convergence or divergence?, in Eichengreen B., Mandesmann M. and Stiefel D. (2008), *The European Economy in an American Mirror*, Routledge, London, 261-91.
- Cornwall J. (1994): *Economic Breakdown and Recovery*, Sharpe, New York.
- Cornwall J. and Cornwall W. (2002): «Supply Analysis of Productivity Growth», *Structural Change and Economic Dynamics*, vol. 13 (2), 203-29.
- Dew-Becker I. and Gordon R. (2006): “The Slowdown in European Productivity Growth: A Tale of Togsers, Tortoises and Textbook Labor Economics”, Presented at NBER Summer Institute, Macroeconomics and Productivity Workshop, Cambridge, Mass, July.
- Dew-Becker, I. and Gordon R. (2008): “The role of labor-market changes in the slowdown of European productivity growth”, NBER.
- Eatwell J. (ed) (1996): *Global Unemployment: Loss of jobs in the 90s*, Sharpe, New York.
- Eichengreen B., Mandesmann M. and Stiefel D. (2008): *The European Economy in an American Mirror*, Routledge, London.

- Epstein G. (ed) (2005): *Financialization and the World Economy*, Edward Elgar, Cheltenham.
- Fernández R. and Palazuelos E. (2009): “Productividad del trabajo y estructura sectorial en las economías europeas”, *Revista de Economía Mundial*, in press.
- Freeman R. (2008): “How Well do the Clothes Fit? Priors and Evidence in the Debate over Flexibility and Labor Market Performance”, in Eichengreen B., Mandesmann M. and Stiefel D. (2008), *The European Economy in an American Mirror*, Routledge, London, 104-16.
- Gordon R. (1997): “Is there a Tradeoff between Unemployment and Productivity Growth?”, D. Snower and G. de la Dehesa (eds), *Unemployment Policy: Government Options for the Labor Market*, Cambridge University Press, Cambridge, UK.
- Gordon R. (2003): “Exploding Productivity Growth: Context, Causes, and Implications”, *Brookings Papers on Economic Activity*, 34 (2), 207-98.
- Gordon R. (2004): “Why was Europe Left at the Station when America’s Productivity Locomotive Departed?” *NBER Working Paper*, no. 10661, August.
- Gordon R. (2008): “Comparing Welfare in Europe and the United States”, in Eichengreen B., Mandesmann M. and Stiefel D. (2008), *The European Economy in an American Mirror*, Routledge, London, 15-40.
- Groningen Growth and Development Centre (GGDC): *Total Economy Database*, www.conference-board.org/economics/downloads/TED08II.xls
- Groningen Growth and Development Centre (GGDC): *Total Economy Growth Accounting Database*, www.ggdc.net/dseries/totecon.html
- Groot H., P. Tang, R. Nahuis (2004) : “Is the American Model Miss World? Anglo-Saxon model and a European-style alternative”, *Discussion Paper Series*, 04-06, Tjalling C. Koopmans Research Institute.

- Howell D. et al (2004): *Fighting Unemployment: the Limits of Free Market Orthodoxy*, Oxford University Press, New York.
- Howell D. et al (2006): “Are Protective Labor Market Institutions Really at the Root of Unemployment? A critical Perspective on the Statistical Evidence”, CEPTR 14, July.
- Jorgenson D. (2001): “Information Technology and the US Economy”, *American Economy Review*, 91 (1), 1-32.
- Jorgenson D., Ho M. and Stiroh K. (2000): “Lessons for Europe from the US Growth Resurgence”, *CESifo Economic Studies*, 49, 27-48.
- Jorgenson D., Ho M. and Stiroh J. (2005): *Information Technology and the American Growth Resurgence*, MIT, Cambridge.
- Jorgenson D. and Stiroh K. (2000): “Raising the Speed Limit: U.S. Economic Growth in the Information Age” *Brookings Papers on Economic Activity*, 1, 125-211.
- Kin H-J. (2007): “The Shift toward the Service Economy: Causes and effects”, *Bank of Korea Economic Papers*, 10 (1), 169-211.
- Labini P. (2006): *Torniamo ai classici*, Laterza, Roma.
- Layard R., Nickell S., and Jackman J. (1991): *Unemployment, Macroeconomic Performance and the Labor Market*, Oxford University Press, Oxford.
- Ljungqvist L. and Sargent T. (2006): Comment in Alesina, Glaeser and Sacerdote, in *NBER Macroeconomic Annual 2005*, 20, 65-77.
- Lorentz A. and Savona M. (2006): “Demand, Technology and Growth of Services. A Model with Evolutionary Micro-Founded Structural Change”, XVth International Conference, Granada, September.

- Marglin S., J. Schor (1990): *The Golden Age of Capitalism. Reinterpreting the Postwar Experience*, Clarendon Press, Oxford.
- McCombie J., Pugno M. and Soro B. (eds) (2002): *Productivity Growth and Economic Performance : Essays on Verdoorn's Law*, Palgrave Macmillan, London.
- McGuckin R. Spiegelman M, Van Ark B. (2005): “The Retail Revolution. Can Europe Match US Productivity Performance?”, *Research Report R-1358-05-RR*. The Conference Board, New York.
- McGuckin R. and Van Ark B (2001): “Making the most of the Information Age: Productivity and Structural Reform in the New Economy, Perspectives on a Global Economy”, *Report 1301-01.RR*, October.
- Mitchell W. and Muysken J. (2004): “The Brussels-Frankfurt: An answer to the wrong question”, Centre of Full Employment and Equity, Callaghan, *Working Papers*, 04-08.
- Mitchell W., Muysken J., Van Veen T. (2006): *Growth and Cohesion in the European Union. The Impact of Macroeconomic Policy*. Edward Elgar, Cheltenham.
- Naastepad C. (2006): “Technology, demand and distribution: a cumulative growth model with an application to the Dutch productivity growth slowdown”, *Cambridge Journal of Economics*, 30 (3), 403–434.
- Nickell S. and Layard R (1998): “Labor Market Institutions and Economic Performance”, *CEP Working Paper*, 407.
- OCDE (2008): *Compendium of Productivity Indicators*, OECD Statistics Directorate, Paris
- OECD (2004): *Les Sources de la Croissance Économique dans les pays de l'OCDE*. OCDE, Paris.
- OECD (2007): *Employment Outlook*, OECD, Paris.

- Oliner S. and Sichel D. (2000): “The Resurgence of Growth in the Late 1990s: Is Information Technology the Store?”, *Journal of Economic Perspectives*, 14 (4), 3-22.
- Oliner S. and Sichel D. (2002): “Information Technology and Productivity: Where Are We Now and Where Are We Going?”, *Federal Reserve Bank of Atlanta Economic Review*, 87 (3), 15-44.
- Palazuelos E. and R. Fernández (2009): “Demand, employment, and labor productivity in the European economies”, *Structural Change and Economic Dynamics*, vol.20 (1).
- Pisani-Ferry J. (2004): “Les marchés du travail et la croissance en Europe: idées, reçues et vraies questions », en P. Artus y C. Cette, *Productivité et croissance*, Conseil d’Analyse Économique, La Documentation Française, Paris.
- Prescott E. (2004): “Why Do Americans Work So Much More Than Europeans?”, *Federal Reserve Bank of Minneapolis Quarterly Review*, 28 (1) 2-13
- Sasaki H. (2007): “The Rise of Service Employment and Its Impact on Aggregate Productivity Growth”, *Structural Change and Economic Dynamics*, 18 (4), 438-459.
- Savona M. and A. Lorentz (2006): “Demand and Technology Determinants of Structural Change and Tertiarisation: An Input-Output Structural Decomposition Analysis for four OECD Countries”, BETA, Document de travail 2006-01, CNTS, ULP, Université Louis Pasteur, Strasbourg.
- Setterfield M., J. Cornwall (2002): “A neo-Kaldorian perspective on the rise and decline of the Golden Age, in M. Setterfield (ed), *The Economics of the Demand-led Growth: Challenging the Supply-side Vision of the Long Run*, Edward Elgar, Cheltenham.
- Stiroh K. (2002a): “Information Technology and the U.S. Productivity Revival: What Do the Industry Data Say?” *American Economic Review*, 92(5), 1559-76.

- Stiroh, K. (2002b): “Are ICT Spillovers Driving the New Economy?” *Review of Income and Wealth*, 48(1), 33-58.
- Stockhammer S. (2004): *The Rise of Unemployment in Europe*, Edward Elgar, Cheltenham.
- Timmer M. y Van Ark B (2005): “Does Information and Communication Technology Drive EU-US Productivity Growth Differentials?”. *Oxford Economic Papers*, 57 (4), 693-716
- Van Ark B. and Inklaar R. (2005): “Catching Up or Getting Stuck? Europe’s Troubles to Exploit ICT’s Productivity Potential” *GGDC Research Memorandum*, GD-79.
- Van Ark B. and Smits J.(2008): “Technology regimes and productivity growth in Europe and the United States. A comparative and historical perspective”, in Eichengreen B., Mandesmann M. and Stiefel D. (2008), *The European Economy in an American Mirror*, Routledge, London, 41-61.
- Van Ark B., Inklaar R. and H. McGuckin R. (2003): “ICT and productivity in Europe and the United States, Where do the differences come from?” *CESifo Economic Studies*, 49(3), 295-318..
- Welters R., J. Muysken (2002): “Long-term unemployment as a screening device and its consequences for active labor market policies”, *Centre of Full Employment and Equity, Callaghan, Working Papers 02-03*.
- Wolff, E. (ed.) (1997): *The Economics of Productivity*, Edward Elgar, Cheltenham.