# Unemployment rate as performance indicator. A critical approach from the macro perspective.

**(3rd. draft)**

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## 1. Introduction.

Often the unemployment rate is used as a straightforward performance indicator of the economy. At first glance the rational for such use of the unemployment rate is forward. If the purpose of economic activity is to transform productive resources into goods and services, *caeteris paribus* an economy that uses all or most of its labor force should clearly be considered as a better performing economy than one that lacks the ability to put all or most of its labor force into work and thus leaves idle some of the productive resources at its disposition. Nevertheless, when comparing the economic performance of countries, it is convenient to go a step further and include in the analysis the ability of the different economies when it comes to actually transforming the employed labor force into goods and services. In fact, in economic theory labor demand is considered to be a *derived demand*, meaning that its demand is explained not by itself, but by the existence of demand for goods and services that use labor as a factor of production. If labor demand is a derived demand, then an assessment of the performance of the economy could certainly profit from an evaluation of how well a specific social system manages to transform labor input into goods and services. It will be argued in this paper than when discussing the performance of an economic system it is convenient to distinguish between *economic performance* and *labor market performance*. The former related with the ability of a social system to deliver goods and services, and the latter related with the important, but more specific issue, of how well the labor market, manages to match supply and demand. Other papers of this volume deal with the suitability of the unemployment rate as an index of labor market performance, in these pages we will focus on the qualities of the unemployment rate as an index of economic performance.

The ability to deliver goods and services of an economy can be captured, from a very simple approach (although not without shortcomings, as the growing literature on growth and well-being shows[1]) by the GDP per capita. At the same time, GDP per capita can be expressed as labor productivity per hour of work, times the average working hours per year, times 1 - the unemployment rate, times the participation rate, times the relation between the ratio of working age population to total population[2]:

GDP pc = GDP/ population = GDP/ total hours of work per year, ($\Pi_h$) ·
Total annual hours of work/ employment, (j)·
1- unemployment/labor force (1-u) ·
Labor force/ Working age population (a) ·
Working age population/total population (d)

$$(1)\ \text{GDP pc} = \text{GDP/ population} = \Pi_h \cdot j \cdot (1-u) \cdot a \cdot d$$

So we could have the paradox that, in terms of delivering goods and services, an economy with a low unemployment rate but low labor productivity could be behind another economy with a larger unemployment rate but with higher productivity. That is the case of most less developed economies or, without leaving Europe, of the neighboring countries of the Iberian Peninsula: Spain and Portugal, the former with a higher unemployment rate and higher output and income per capita[3].

The objective of this paper is, accordingly, to analyze if there are different paths, combinations or even trade-offs, of employment and productivity levels than can lead to the same level of economic performance (in terms of per capita income). If that is the case, in order to talk about performance we would need more than just the unemployment rate. Obviously, the consideration of the productivity and its rate of growth along with the unemployment rate could help to address this problem.

[1] On this issue see, for example, Sharpe (1999).
[2] A similar approach can be found in Van Ark and McGuckin (1997)
[3] The countries of the former Soviet Bloc before the fall of the Berlin Wall, with guaranteed job, are also a good example of the potential problems associated with using unemployment as an indicator of performance of a whole economy. Of course, behind the low unemployment rate of the soviet economy there was the extended practice of soviet firms of labor hoarding, so we could talk of the existence of large hidden unemployment. Nevertheless, the open unemployment rate was low.

## 2. The simple arithmetic of GDP p.c. growth.

As we can see from equation (1), the evolution of GDP per capita is the result of the behavior of five different components, each one responding to different stimulus. The first element, productivity per hour[4], responds to the sector composition of the economy, the stock of physical and human capital used in the production of goods and services, and technology, including both the technology embodied in the physical capital and the intangible technology used in the production process. The second component, the average number of hours worked, depends of the preferences of individuals when it comes to decide between labor and leisure and of the decision collective taken by society in relation to the same matter, including here the choices concerning the use of part time labor, the regulation of working time (40 hours in most European countries) and institutional rigidities in choosing hours. The third element of the equation is the unemployment rate. Among the elements affecting this component we can mention the level of effective demand, and the efficiency of the labor market matching supply and demand. In fourth place we have the labor force participation rate, or ratio between labor force and potential labor force (population between 16 and 64, inclusive). Again, institutional and cultural factors as well as personal preferences plus economic factors like demand and wages will explain the value of this component. Last we have the ratio of potential labor force or working age population to total population, mostly explained by demographic factors.

If we look at table 1 and 2, we can see that countries have different performances in these five fields that combined explain the level of GDP per capita. Having "good marks" in terms of employment (*i.e.* low unemployment rate) doesn't warrantee an over all good final performance in terms of GDP per capita. This is the case, for example, of Portugal, country that ranks number four in terms of employment rate and last in terms of GDP per capita. In this case, the low rate of unemployment and the above average hours of work per year are not enough to compensate its well below average productivity per hour, leaving Portugal with an income per capita half the American. On the other end, Spain shows a well above average unemployment rate,

[4] It is out of the scope of this paper to study the growing difficulties related with the measurement of labor productivity. For a good review of the problem faced when measuring productivity growth see the OECD Productivity Manual (2001). For a summary of the manual see Schreyer (2001)

triple than the Portuguese, but having a productivity per hour 45 % higher and slightly higher working hours per worker, allows the country to enjoy a GDP per capita 11 % higher than the Portuguese.

Table 1. GDP per capita and its components. (1998)

| | GDP p.c. (US$, PPP) (1990) | Productivity per hour (US$, PPP) | Annual hours actually worked | 1-Unemployment rate | Labor force participation rate | Potential labor force/ Population |
|---|---|---|---|---|---|---|
| Portugal* | 15326 | 18,9 | 1704 | 0,95 | 0,61 (0,70) | 0,83 |
| Spain | 17041 | 27,5 | 1833 | 0,82 | 0,63 | 0,66 |
| UK | 21159 | 26,5 | 1731 | 0,95 | 0,76 | 0,64 |
| Sweden | 21371 | 28,7 | 1629 | 0,93 | 0,78 | 0,63 |
| Finland | 21894 | 29,4 | 1727 | 0,89 | 0,72 | 0,67 |
| France | 21927 | 35,4 | 1604 | 0,89 | 0,67 | 0,65 |
| Netherlands ('97) | 22471 | 35,7 | 1365 | 0,95 | 0,72 | 0,68 |
| Japan | 24314 | 25,6 | 1842 | 0,96 | 0,78 | 0,69 |
| Germany | 22921 | 34,6 | 1503 | 0,92 | 0,71 | 0,68 |
| Australia | 23200 | 27,4 | 1860 | 0,93 | 0,73 | 0,67 |
| Canada | 24856 | 30,1 | 1767 | 0,93 | 0,75 | 0,67 |
| Denmark | 25209 | 30,4 | 1638 | 0,96 | 0,79 | 0,66 |
| Norway | 27719 | 39,1 | 1399 | 0,98 | 0,81 | 0,64 |
| USA* | 30438 | 32,0 | 1957 [a] | 0,95 | 0,67 (0,77) | 0,76 |
| STD | 3688 | 4,91 | 167,113 | 0,039 | 0,058 | 0,051 |
| AVERAGE | 22846 | 30,10 | 1682,78 | 0,93 | 0,72 | 0,68 |
| C. VAR (%) | 0,1614 | 0,1633 | 0,0993 | 0,0421 | 0,0807 | 0,0752 |

Source: Author's analysis of KILM (2001-2) data.

(*)The labor force participation rate is calculated for the age group 15-64, while the data of employment used to calculated (1- the unemployment rate) includes the population 16+ (Spain, UK, and the USA), 16-74 (Sweden, Norway and Finland), 15-64 (Netherlands) and 15+ (the rest). For those countries with marginal employment for the age group 65 and older, considering total employment when calculating (1- unemployment rate) does not have an important impact on the estimated value. Nevertheless, there are two countries, Portugal and the USA where the consideration of the 1- unemployment rate taking into account all those employed (including those 65 and over) lead to a substantial reduction in the estimated rate (*i.e.* negative unemployment). For those countries, the labor force participation column includes two values, the one in parenthesis corresponds to labor force participation rate of those 15-64, while the other corresponds to the labor force participation rate of those 16 –USA- or 15 –Portugal- and over, the latter obviously lower as most of those 65 and over are out of the labor force. In coherence with this, the labor force participation rate for the last two countries is defined as labor force 15+ over population 15+.

(a) The average annual hours of the US corresponds to the CPS estimates. According to Van Ark there are good reasons to believe that the CPS estimates are too high. Using the total hours number from the BLS Productivity Database and the total number of persons employed from the CPS, the

estimate of annual hours per person is much lower (around 13 % lower for 2000) [5]. Obviously, lower number of hours would show in higher productivity per hour (although not per worker). For example, with an average of 1700 hours per year, productivity per hour in the US jumps from 32$ to 37$.

Table 2. Relative position on the countries of the sample (USA= 100) (1998).

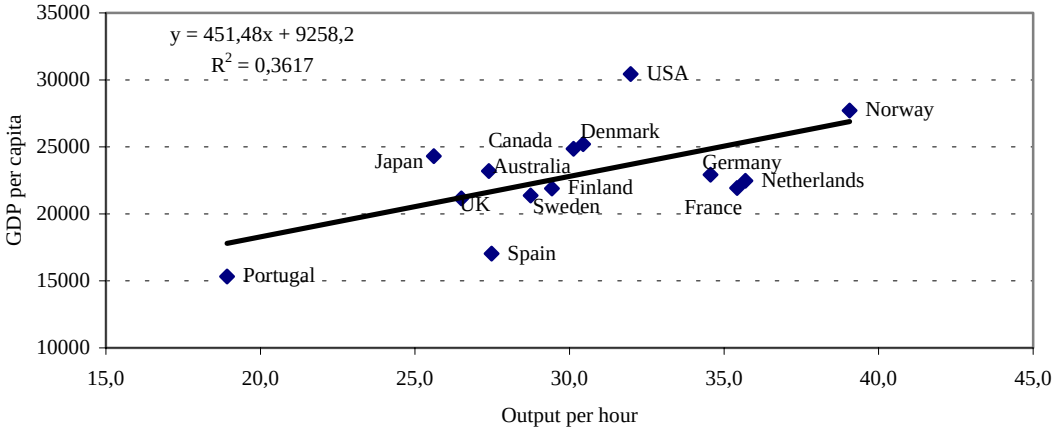
| | GDP p.c. ($, PPP) | Productivity per hour ($, PPP) | Hours actually worked | 1-Unemployment rate | Labor force participation rate | | Working age labor force/ Population |
|---|---|---|---|---|---|---|---|
| | | | | | A | B | |
| Portugal | 50,35 | 59,06 | 87,07 | 100,00 | 90,43 | 90,91 | 109,21 |
| Spain | 55,99 | 85,94 | 93,66 | 86,32 | 94,03 | 81,82 | 86,84 |
| UK | 69,52 | 82,81 | 88,45 | 100,00 | 113,43 | 98,70 | 84,21 |
| Sweden | 70,21 | 89,69 | 83,24 | 97,89 | 116,42 | 101,30 | 82,89 |
| Finland | 71,93 | 91,88 | 88,25 | 93,68 | 107,46 | 93,51 | 88,16 |
| France | 72,04 | 110,63 | 81,96 | 93,68 | 100,00 | 87,01 | 85,53 |
| Netherlands | 73,83 | 111,56 | 69,75 | 100,00 | 107,46 | 93,51 | 89,47 |
| Japan | 79,88 | 80,00 | 94,12 | 101,05 | 116,42 | 101,30 | 90,79 |
| Germany | 75,30 | 108,13 | 76,80 | 96,84 | 105,97 | 92,21 | 89,47 |
| Australia | 76,22 | 85,63 | 95,04 | 97,89 | 108,96 | 94,81 | 88,16 |
| Canada | 81,66 | 94,06 | 90,29 | 97,89 | 111,94 | 97,40 | 88,16 |
| Denmark | 82,82 | 95,00 | 83,70 | 101,05 | 117,91 | 102,60 | 86,84 |
| Norway | 91,07 | 122,19 | 71,49 | 103,16 | 120,90 | 105,19 | 84,21 |
| USA | 100,00 | 100,00 | 100,00 | 100,00 | 100,00 | 100,00 | 100,00 |

* (A): Taking population 15 and over in Portugal and the US. (B) Considering only population 15-64.
Source: Author's analysis of KILM (2001-2) data.

The importance of productivity as a determinant of the differences in GDP per capita among the OECD countries included in the sample is also shown by the much higher dispersion of productivity, with a coefficient of variation of 0,1633 compared with 0,0993 of working hours, 0,0807 of activity rate and 0,0421, the lowest, of employment rate. In other words, the countries of the sample, are much more similar to each other in terms of labor force participation rate, hours of work or employment, than in terms of productivity. In fact the coefficient of variation of GDP per capita, 0,161 is of the same magnitude than the coefficient of variation of output per hour. Figure 1 and 2, representing the relation between GDP per capita and productivity and GDP p.c. and employment, capture very well this results.

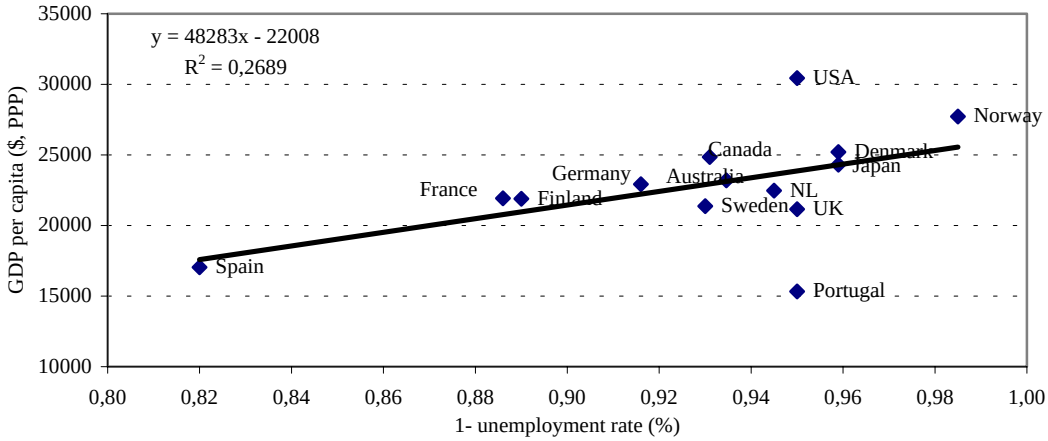
[5] Personal communication of Van Ark to A. Sharp (9/5/2002).

Figure 1. GDP per capita and productivity




Source: Author's analysis of KILM (2001-2)

Figure 2. GDP per capita and 1 - unemployment rate

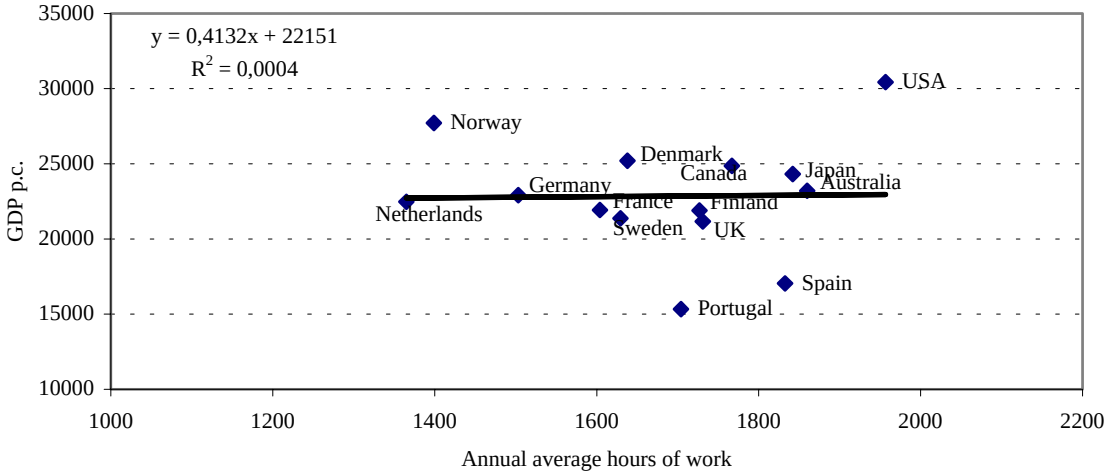



Source: Author's analysis of KILM (2001-2)

As for the role of work hours in explaining GDP per capita, in Figure 3 we can see that, excluding the USA, that clearly follows a different path, there seem to be a negative relation between GDP and working hours, as if long working hours where used to compensate the low productivity. The historical downward trend of working time, from the slightly less than 3000 annual hours per person employed of the 1870s to the less than 1600 of the late 1990's could be taken as a confirmation of this hypothesis[6].

[6] Simple average of 15 countries, Maddison (2001) table E-3, P. 347.

Figure 3. GDPpc and hours of work




Source: Author's analysis of KILM (2001-2)

A different way to look at the role of productivity, employment and the rest of the variables in explaining GDP per capita is by calculating the part played by the different variables in GDP p.c. growth. Table 3 reproduces the results obtained from the analysis of GDP per capita growth from 1980 to 1998 for a sample of ten OECD countries, plus other five countries for shorter periods of time[7]. As we can see in the table, almost half of the countries have contributions of productivity to GDP growth over 100 %, meaning that all the growth in GDP per capita in these countries is explained by productivity. In fact a value over 100 % mean that the rest of the factors had an overall negative impact on GDP growth, compensated by the increase in productivity. The contribution of productivity to per capita GDP growth goes from a minimum of 47 % (USA) to a maximum of 170 % (Germany). As for the rest of the variables involved in the analysis, in most countries the change in demographic structure contributed to GDP growth by increasing the proportion of population potentially active. The results are mixed in terms of the contribution of the activity rate to growth. The Netherlands stands out with a contribution of the activity rate to GDP p.c. growth of almost 81 %. This increase in activity rate, obviously related to the explosion of part time work, more than compensates the reduction of average

[7] GDP per capita (and productivity) is expressed in real 1990 PPP US dollars. As our purpose with this analysis is to compare the contribution of the different factors to GDP p.c. growth in different countries, the use of PPP $ allows us to do such comparison taking into account the differences in purchasing power of the different currencies. The data on real GDP per capita in PPP is taken from the data base of the GGDC, the rest of the data is taken from KILM (2001-2), complemented, in the case of Italian work hours of 1998, with data taken from Evans *et al.* (2001)

working time, leaving a net positive contribution to GDP p.c. growth of 30 %, about the same that the combined effect of the increase in activity rate and working time of the USA (in this cases both positive). United Kingdom, Portugal and the USA, are the only countries where the evolution of the employment rate shows a positive contribution to GDP p.c. growth[8]. Last, all countries, but Sweden (starting from a very low number of working hours) and the USA, show negative contribution of working time to GDP per capita growth. Nevertheless, only in France, Germany, Japan and the Netherlands, the value is significant, although for different reasons. Japan starts from a very high value of annual working hours, so even after the reduction, by the end of the '90s Japan was, after the USA and Australia, the country with longest working hours of the sample. In the Netherlands the reduction in working time is explained by the increase in part time employment, and its outstanding use of this type of work arrangement (reaching 30 of employment by the end of the '90s, starting from 18 % in 1983). In Germany, the reduction of working time often has been interpreted, Schief (2002), as a measure to maintain the employment levels in firms facing adverse economic situation (defensive working time reduction). Last in France, the reduction of working time is the result of the increase in part time work (of similar intensity but starting from a lower volume) and of a policy of legally mandated reduction of working time (in the 90's).

As a summary, in figure 4 we can see the contribution to GDP growth in four distinctive cases included in table 3: the USA, the only country with positive contributions in all of the fields, Spain a country with pitiful marks in terms of employment but good gains in productivity, Netherlands, with a model of GDP p.c. growth based on the increase in activity rate and part time work, and Germany, the country with the highest contribution of productivity growth to GDP p.c. growth but with negative or negligible contributions of the rest of the factors.

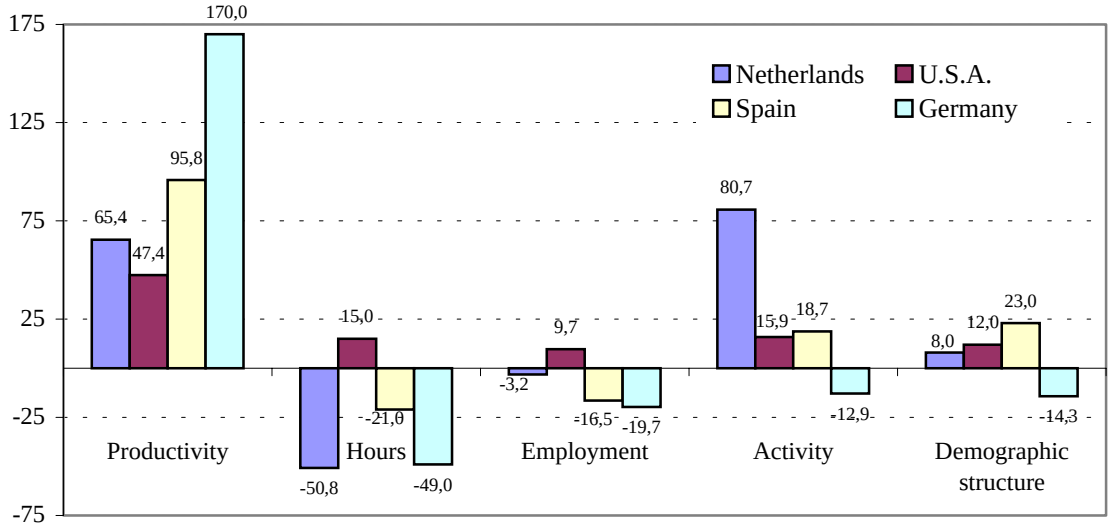
[8] The abnormally high value of the UK is partly explained by the coincidence of the starting year, 1980, with a severe recession in this country. In fact, of the countries considered in the sample, according to the data used in the analysis (GDP in 1990 dollars -converted at Geary Khamis PPP-) only three, UK, USA and Denmark had zero or negative growth in 1980. Out of these three countries, the UK showed, by far, the worst behavior with a cent decrease in GDP over two per.

Table 3. Contribution to GDP growth by factor (%)

| Country | Period | GDP p.c. growth (1990 $, PPP) | Contribution to GDP p. c. growth (%) | | | | |
|---|---|---|---|---|---|---|---|
| | | | Productivity per hour | Hours | 1- unemployment rate | Participation rate | Demographic structure |
| Australia | 1980-99 | 49.0 | 82.4 | -1.9 | -2.7 | 13.1 | 9.1 |
| Denmark | 1980-99 | 49.6 | 117.0 | -6.7 | -0.3 | -8.2 | -1.9 |
| Finland | 1980-99 | 47.1 | 136.6 | -12.6 | -18.0 | -2.4 | -3.5 |
| Japan | 1980-99 | 51.7 | 115.5 | -33.9 | -6.6 | 20.4 | 4.5 |
| Norway | 1980-99 | 58.0 | 98.6 | -17.6 | -9.1 | 20.2 | 8.0 |
| Portugal | 1980-99 | 60.3 | 85.9 | -14.4 | 5.2 | -1.4 | 24.8 |
| Spain | 1980-99 | 55.4 | 95.8 | -21.0 | -16.5 | 18.7 | 23.0 |
| Sweden | 1980-99 | 28.7 | 103.3 | 33.3 | -21.7 | -15.8 | 0.9 |
| U.K. | 1980-99 | 46.1 | 79.6 | -9.7 | 26.2 | 2.9 | 1.1 |
| U.S.A. | 1980-99 | 37.7 | 47.4 | 15.0 | 9.7 | 15.9 | 12.0 |
| Canada | 1980-98 | 25.9 | 89.5 | -9.1 | -3.7 | 22.3 | 1.1 |
| France | 1980-98 | 29.3 | 168.3 | -43.6 | -29.0 | -5.1 | 9.4 |
| Italy | 1980-98 | 33.6 | 134.5 | -28.5 | -17.2 | 5.2 | 5.9 |
| Netherlands | 1980-97 | 33.5 | 65.4 | -50.8 | -3.15 | 80.7 | 8.0 |
| Germany | 1991-00 | 13.2 | 170.0 | -49.0 | -19.7 | 12.9 | -14.3 |

Source: Author's analysis from KILM (2001-2), GGDC and Evans *et al.* (2001).

Figure 4. Contribution to GDP by factor: USA, Netherlands, Germany and Spain




Source: Table 3

Summing up, we can say that productivity differentials play a major role in explaining the differential rate of growth and level of income per capita in the group of countries analyzed, while differences in the unemployment rate have a marginal impact. Following Esteban (1999) we can decompose the dispersion of GDP per capita, as shown by the Theil Index, as the sum of the indices corresponding to the five factors considered in the analysis: productivity, hours of work, employment, participation rate and the demographic structure. As we can see in Table 4, slightly less than half of the dispersion is explained by differences in productivity per hour, and more than a fifth by differences in hours of work. These two factors explain slightly less than 2/3 of the dispersion of GDP per capita. The rest of the dispersion of GDP per capita is explained by factors related with the labor market and changes in the demographic structure, among them the unemployment rate. This last variable plays a relatively marginal role, being responsible for only 4% of the difference[9].

Table 4. Decomposition of per capita income inequalities (1998).

| | GDP p.c. ($, PPP) | Outpu per hour ($) | Hours | 1 - unemployment rate | Activity rate | PLF/ Pop. |
|---|---|---|---|---|---|---|
| Theil Index | 0,01181 | 0,00777 | 0,00471 | 0,00071 | 0,00244 | 0,00245 |
| % | | 42,95 | 26,07 | 3,94 | 13,48 | 13,56 |

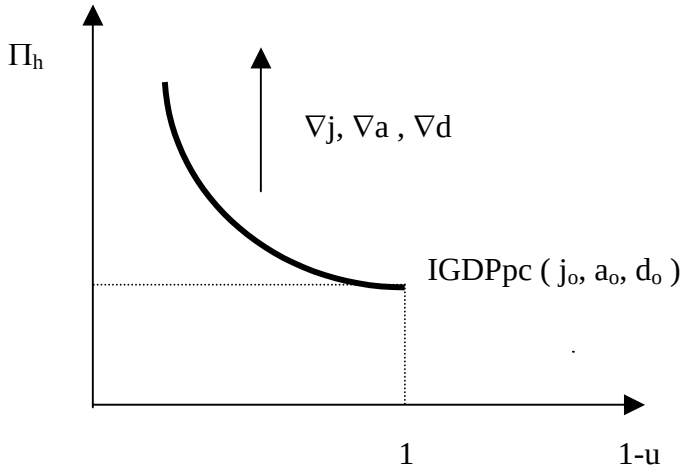
Source: Author's analysis from KILM (2001-2) and GGDC data.

In this section we have argued that from the point of view of GDP per capita, the employment rate and output per hour have an impact on GDP growth as the one depicted in figure 5. Higher values of either j, a, or d, would move the "Iso-per-capita-income-curve" upwards, and allow a higher GDP p.c., while movements along the curve would generate the same GDP per capita with different combinations of productivity and employment. Thus, from the point of view of GDP per capita either way, employment intensive growth or productivity intensive growth can lead to the same outcome. Obviously, the option in favor of increasing employment as a source of GDP growth is only viable in the short-medium run, as in the long run there are limits to the value of the unemployment rate, 0, while $\Pi_h$ is, at least theoretically, upper

[9] A similar analysis, although without decomposing labor productivity in hours of work and productivity per hour, is developed in Duro and Esteban (1998), for the OECD countries and the period 1970-1990, showing a relative reduction of the role of productivity differences in explaining GDP per capita from 88% in 1970 to 67 % in 1990 (the combined impact of hours and productivity in our analysis is 69 %).

unbounded. Obviously, and increase in the participation rate, in the population of working age or in the hours of work would move the Iso-per-capita-income-curve downwards.

Figure 5. Curve Iso-per-capita-income




But the indifference in terms of GDP p.c. outcome of both paths of growth doesn't mean there are no other important welfare differences between both "models". As long as most people get their share of final output from their participation as suppliers of labor in the production process, a hypothetical model based on high values of employment would lead to a different result in terms of income distribution, that an alternative model based of high values of $\Pi_h$, as relying on higher productivity would concentrate the same output in fewer hands. As we can see in figure 6, in both the EU(11) and the USA income from work is the major source of income of the population making 71.4 % of total income [10]. Therefore, in order to be "socially acceptable" a model of GDP p.c. growth based on productivity growth with stagnant employment would probably need of other extra-market mechanism of distribution to allow the participation of the population excluded from the labor market of the fruits of growth. The so called "European Social Model" with relatively extensive, although quite different between countries, unemployment compensation and other social transfers would be an example of such a process.

[10] Furthermore, usually unemployment concentrates in the lower deciles of income distribution, so low employment growth would hurt more those with less income. In Spain, for example, in 1991, 20 % of households in the first decile had at least one member unemployed and 6 % more than one, compared with 10 % and 0.6 % in the top decile.

Figure 6. Componets of gross family income, EU(11) -1994, and US (1999)


(*) UE(11) = unweighted average

Source: Eurostat. European Community Household Panel (2nd. wave), and Mishel *et al.* (2001), p. 85.

### 3. Productivity and employment in the short run.

So far we have focused on the incidence of changes in productivity, hours of work, employment rate, activity rate and demography (potential labor force relative to total population) in explaining the evolution of GDP per capita, our chosen measure of economic "efficiency", using the terms efficiency in a vulgar, *i.e.* non technical, meaning. Evidently, in the long run GDP growth is necessarily related with productivity growth, as proven by the data shown above, as the rest of the variables have clear limits. Both the employment rate and the participation rate have a maximum value of 1, while there are also limits to the value of potential labor force to total population set by the biological renovation of the population and the process of ageing. Hours of work also have a physiological limit, although more diffuse, and probably, at least from a historical perspective, there is plenty of room to increase annual hours of work if considered desirable or necessary.

In this section though, we will change the approach and focus on the relation between employment and productivity. If, as we just argued, GDP per capita growth is

explained mostly by the behavior of productivity, it might be interesting to explore the relation in the short –medium run, between changes in productivity and changes in employment rate.

Making use again of simple transformation, one minus the unemployment rate (1 – u ) can be written as:

(2) $1 - u = GDP/ \Pi_h \cdot j \cdot f \cdot a \cdot N$

where $\Pi_h$ is the productivity per hour, j, the number of hours on the job, f, the level of effort measured as hours effectively worked relative to hired hours, a the labor force participation rate and N total population of working age [11].

Therefore, the changes in employment rate will respond to the following equation:

(3) $\dot{(1-u)} = \dot{GDP} - \dot{\Pi}_h - \dot{j} - \dot{f} - \dot{a} - \dot{N}$ (where the dot means rate of change)

According to expression 3, any increase in productivity that it is not followed by compensatory movements in the rest of the variables will lead to an increase of the unemployment rate. For example, an increase in productivity of 3 % will need either a GDP growth of 3 %, or a reduction in hours of effective work (f . j) of 3 % in order to leave the unemployment rate, unchanged. A reduction of the labor force participation rate or of the population of working age of the same amount would also allow to maintain constant the unemployment rate in face of a productivity increase, but in this case there would be a reduction in employment, although masked by a reduction in the labor force, leaving the unemployment rate untouched.

[11] (1) (1-u) = W / LF, W = workers, LF = Labor Force
(2) $\Pi_h$ = GDP / W . j . f , where f = effective hours of work / j
(3) W= GDP/ $\Pi_h$ . j . f
(4) (1-u) = GDP/ $\Pi_h$ . j . f . LF
(5) LF = a. N, where a is the activity rate, and N total population of working age
(6) (1-u) = GDP/ $\Pi_h$ . j . f . a . N

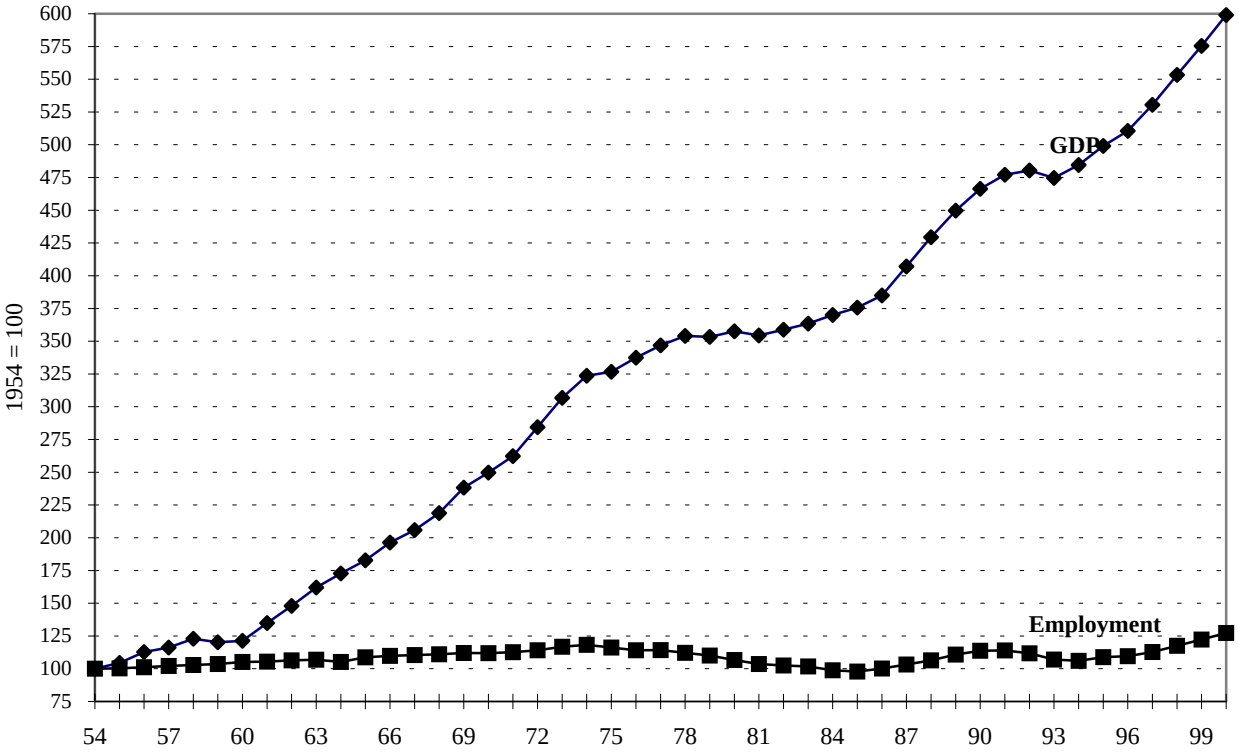
Thus, it is clear than in a *caeteris paribus* scenario there would be a perfect trade off between productivity and employment. Obviously, in a *non caeteris paribus* world, things are quite different. Once we allow for positive changes in demand (or GDP) or negative changes in working hours, the two major mechanisms of productivity absorption, things change[12].

If we take Spain as an example, in figure 7 we can see how from 1954 to 2000, employment grew a mere 25 % (most of it since 1996), while GDP multiplied itself by 6, *i. e.*, 20 times more than employment. In other words, with the productivity of 1954 Spain would have needed 52 million more workers (on top of the 14.5 already employed) to produce the GDP of year 2000. This relation is also valid for shorter periods. Thus, with the productivity of 1990, Spain would have needed two million supplementary workers to deliver the GDP of 2000.

The difference in both trajectories (GDP and employment) reflects the huge increase in productivity experienced by the Spanish economy in the second half of the XX century. Obviously, this increase in productivity was met by an increase in demand that facilitated its absorption without affecting employment negatively. Nevertheless, what is true in the long run is not necessarily so in each and every of the short run periods that form the long run. For example, from 1974 to 1985 Spain experienced productivity growth in a context of sluggish growth of demand that lead to an important reduction of employment (from 118 to 98).

[12] Gordon (1997) addresses the problem of the relation between productivity growth and unemployment from a different (supply side) perspective. According to Gordon, a structural shock may create in the short run a positive trade-off between productivity and unemployment, but it would also set in motion a dynamic path of adjustment, eliminating in due time the trade-off. For example, in the standard labor market analysis, an increase in wages would lead to a movement northwest along the labor demand curve, leading thus to an increase in productivity and unemployment. Nevertheless, the following reduction in production would subsequently lead to a reduction in the rate of capital utilization and to the corresponding reduction in the profit rate and future investment. As a result of which there would be an inward movement of the labor demand curve and a reduction of productivity. So at the end we would have a constant rate of capital utilization and a constant productivity (due to the reduction in capital) and increasing unemployment.

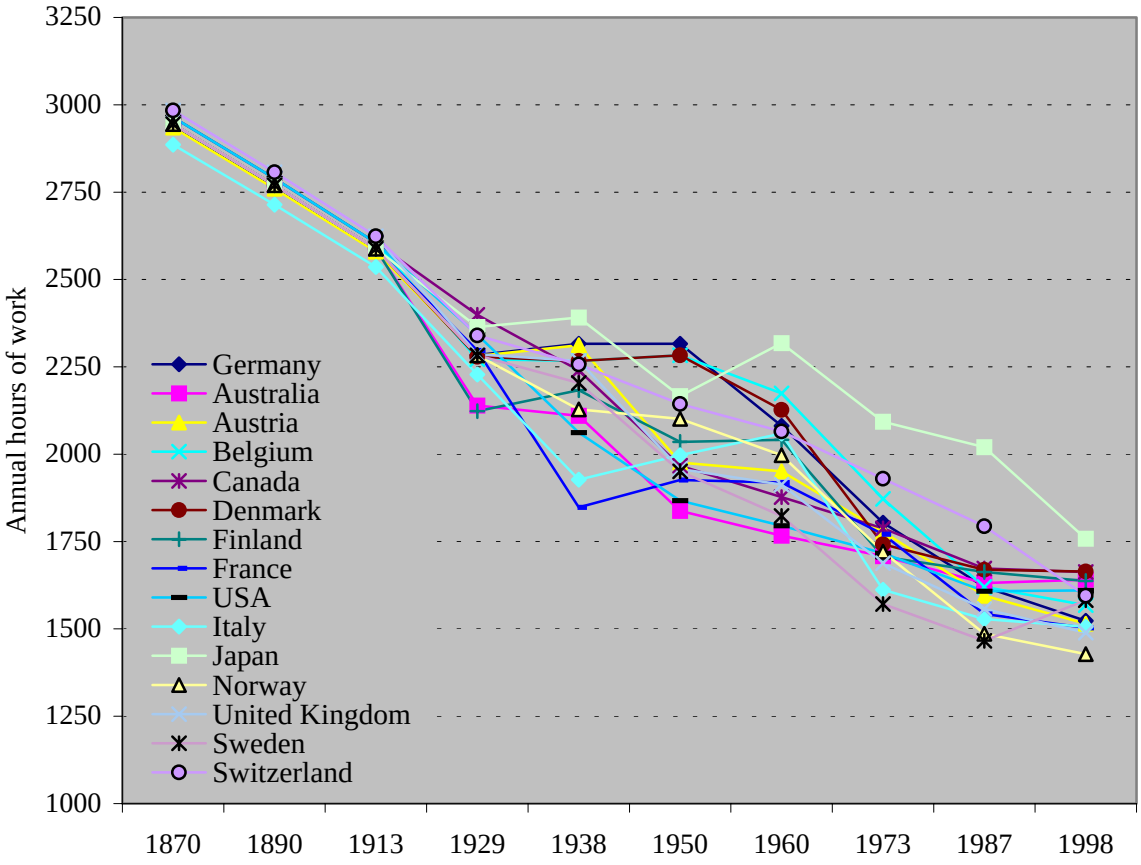
Figure 7. Real GDP and employment in Spain, 1954-2000.




Source: Author's analysis from INE data.

The second mechanism of productivity absorption in the long run has been the reduction of working time, either by means of a reduction of the daily hours of work (the vindication of the 8 hour work day), or by means of a reduction of the number of working days through the generalization of long vacation periods. Figure 8 reproduces the evolution of annual working hours for a group of countries, showing a clear and general downward trend from slightly less than 3,000 hours at the end of the XIX century to about half that number by the end of last century. In this respect, it is interesting to note how the trend levels out in the last decade, with increases in working hours in countries as Sweden or the USA.

Figure 8. Annual hours of work per person employed (1870-1998)




Source: Maddison (2001), p. 354.

Summing up, we can say that in the long run, the increase in effective demand, in first place, and the reduction in working time, in second place, made compatible the absorption of productivity gains and the maintenance of employment. Nevertheless, that doesn't mean, as mentioned by Hicks, that we have theoretical certainty that increases in productivity will always lead to changes in the economy as to warrant its absorption without negative impact on the level of employment. Starting with David Ricardo's famous chapter *on machinery* (*Principles of Political Economy and Taxation*, 3ed edition, 1820) to Jeremy's Rifkin *End of Work*, passing through John Maynard Keynes' words about the coming of age of "technological unemployment" pronounced in a conference given at Madrid in 1930, every time there is an important advancement in productivity there are voices pointing to the possibility of that advancement affecting negatively the level of employment (or real wages). Looking at the economic history of what is now the developed world it seems there is no reason to fear such an outcome.

Nevertheless, from a theoretical point of view nothing warrantees that such a process of adjustment will prevail, at least without significant time lags.

## 4. Mechanisms of productivity absorption.

An increase in productivity could lead to the following "automatic" changes that will, in turn, generate increases in effective demand so as to compensate, fully or partially, the negative impact of the initial increase in productivity on employment:

a. If the productivity increase is translated into lower prices there will be an increase in demand (both domestic and foreign), compensating, totally of partially the decrease in employment under the *caeteris paribus* assumption. Furthermore, the reduction in prices will have a positive impact on real wages, increasing thus the level of effective demand. This mechanism of productivity absorption was detected for the British economy (1924-1950) by Salter (1986), establishing a negative relation between the behavior of prices and the productivity increases of the different sectors of the economy. Furthermore, the increase in effective demand during this period was strong enough to generate a positive relation between productivity increase and employment, as a result of which those sectors with higher productivity increases show also higher employment creation. In order to have increases in demand of high intensity as a result of the reduction in price resulting from increases in productivity it is necessary to have a high price elasticity of demand. In fact, Appelbaum and Schettkat (1993, 1995) argue that the apparent negative relation between employment growth and productivity growth of the OCDE countries in the '80s can be explained by a reduction in the price elasticity of demand, following the so called Harrod's law[13], of many of the consumption goods that played a major role in the "consumption revolution" of the ´60. As a result of

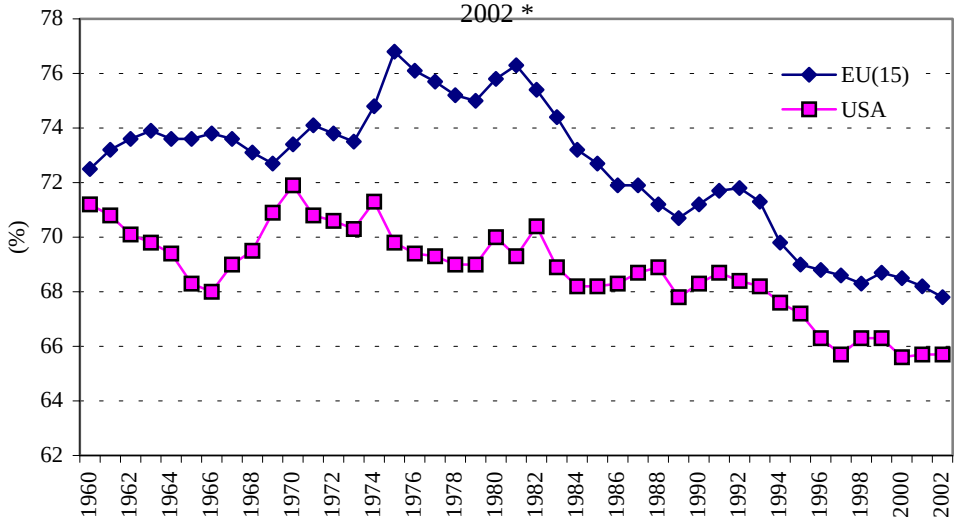
[13] As income increases, the demand curve moves to the right, leading to a reduction in the price elasticity of demand.

which, the same increase in productivity, leading to the same decrease in price, would generate a lower increase in demand.

b. If firms do not translate higher productivity into lower prices, there will be an increase in mark ups and consequently in profits. This increase in profits could lead to an increase in investment and demand, although the investment function depends on other factors that can be more important than liquidity or profitability itself. In any case, the increase in profits will either generate an increase in dividends or an increase in the value of the shares, and the corresponding "wealth effect", increasing effective demand. That would be the core of the so called (Bluestone and Harrison, 2000) "Wall Street Model".

c. The increase in productivity could lead to an increase in wages and salaries, also increasing effective demand. If this is the case, as the propensity to consume out of wages is usually higher than the propensity to consume out of capital income, we should expect a higher increase in effective demand than in the previous case. We can say that the increase of wages along with productivity explains the lack of problem in absorbing the increases in productivity of the past. As it is well known, the constancy of factorial distribution through time is one of the stylized facts of XX century economics, a constancy that means that wages have increased more or less at the same rhythm than productivity. In this respect, the last two decades of the XX century mark a point of departure from this behavior, as in most countries (figure 9) there has been a redistribution of income towards capital income and against labor, i.e., an increase in the profit share. If this change in the dynamic behavior of aggregate wages is something permanent and not transitory, we could (depending on how profits are used) expect more problems in the future when it comes to absorb further increases in productivity.

Figure 9 Adjusted wage share (total economy). EU(15) and USA, 1960-2002 *




(*) % of GDP at factor cost. Adjusted to take into consideration the differences in self-employment.

Source: European Economy (2000), table 32, p. 287.

d. If there is no matching change in demand, or an encompassing reduction in working time, an increase in unemployment is to be expected. This increase in unemployment could lead in the short-medium term, depending on the characteristics of the labor market, to a reduction in wages in some sectors, allowing the economy to regain the original level of employment, although with a higher degree of income inequality (low productivity – low wage jobs).

## 5. Productivity and employment in a set of OECD countries.

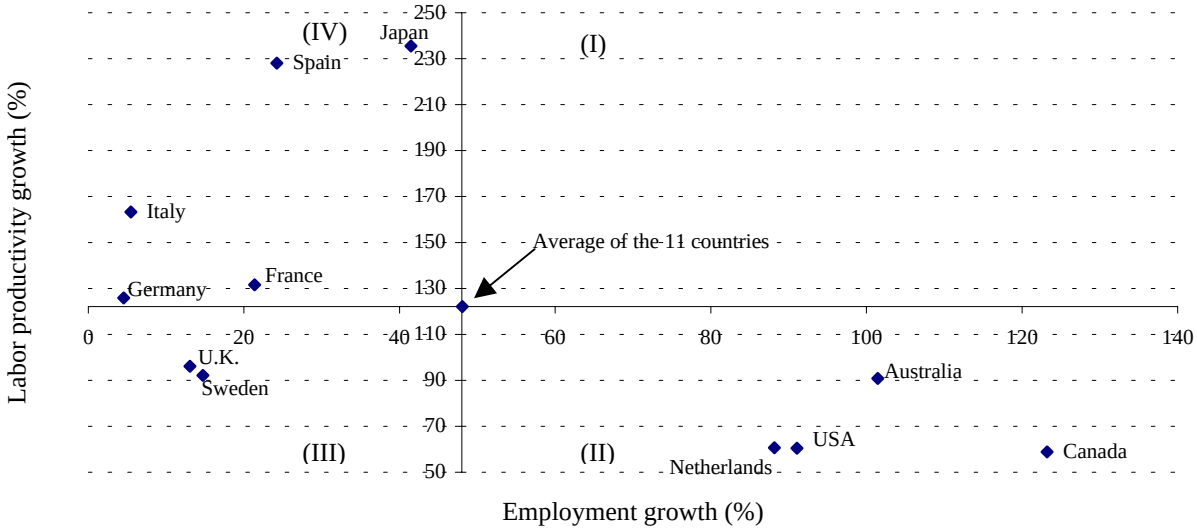
In this last section we will focus on the behavior of employment and productivity in a set of OECD countries with the purpose of generating a taxonomy of countries based on the combined evolution of both variables. In order to be able to work with longer time series, in this section we will use data on labor productivity per worker defined as GDP/employment, instead of labor productivity per hour (GDP/total hours of work).

In figures 10 and 11 we can see the position held by a group of OECD countries in two different periods of time, 1965-2000 (figure 8), and 1973-2000 (figure 9), in

terms of their labor productivity growth and employment growth. In this occasion the axes, that intersect at the average values of productivity growth and employment growth, define four different quadrants: (a) in quadrant I we would have those countries with higher than average employment and labor productivity growth; (b) quadrant II is reserved for those countries with higher than average employment growth but lower productivity growth; (c) quadrant III hosts those countries with both lower employment and productivity growth; (d) last, quadrant IV is reserved for those countries with higher than average productivity growth but lower employment growth.

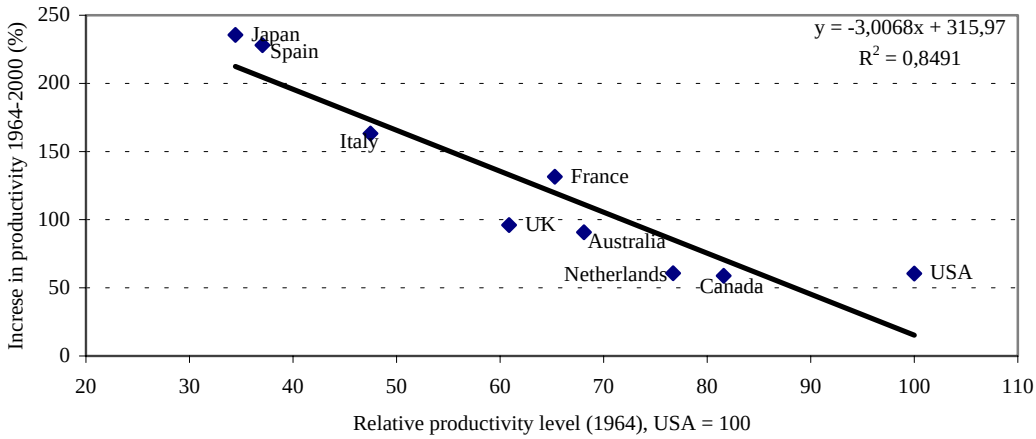
In figure 10, corresponding to the 35 years period going from 1965-2000, the sample is limited to the countries of the G-7 plus Australia, The Netherlands, Spain and Sweden. As we can see, none of the countries have a better than average performance in terms of both, employment and productivity, so quadrant (I) is empty. Not surprisingly, the USA is in quadrant (II), along with Canada, Australia and The Netherlands. In this last case the position is explained by the low average working time of the Dutch workers. Quadrant (III) is reserved for two very different countries, UK and Sweden, that nevertheless in this occasion share their underperformance in terms of employment and productivity. Last, France, Germany, Italy, Spain and Japan show a lower than average net employment growth but a higher that average rate of productivity growth. This is specially true for Spain and Japan, with a rate of productivity growth for the whole period almost twice the average. This higher than average increase in productivity shows the existence of a catch up effect, as both countries had at the beginning of the period a level of productivity considerably lower than the average. In figure 11, the relative productivity in the base year (1964) for the set of countries of figure 10 is plotted against the growth in productivity 1964-2000, confirming the existence of a process of convergence in productivity. Based on the data contained in figure 8 we could conclude that there seem to be a negative relation between employment and productivity performance. Only in a context of extremely high GDP growth (or reduction of working time) will high productivity growth be compatible with high employment growth.

Figure 10. Labour productivity and employment growth.
G-7, Australia, The Netherlands, Spain and Sweden (1964-2000)




(*) Germany = 1965-997. Source: Author's analysis on GGDC data.

Figure 11. Productivity level in 1964 and productivity increase 1964-2000 for a set of countries

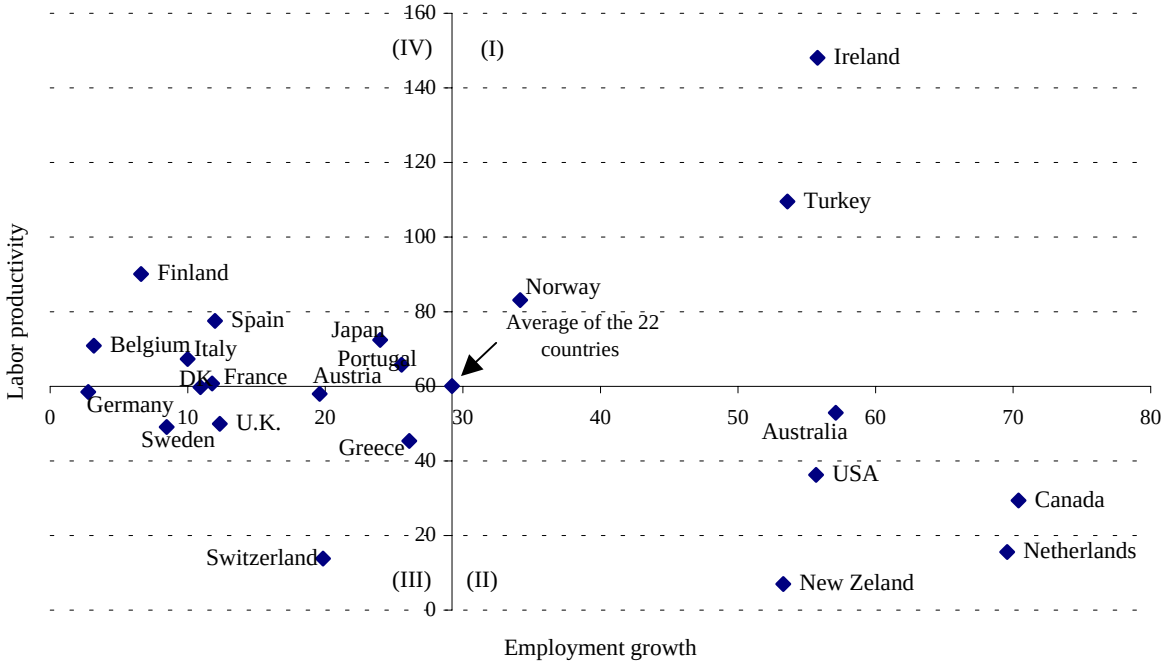



Source: Author's analysis on GGDC data.

The increase in the number of countries from 11 to 22 and the limitation of the period of analysis to the years 1973-2000 (figure 12) generates one major change in the results. Now we have three countries, Ireland, Turkey and Norway in quadrant (I) with both higher than average employment and productivity growth. Nevertheless, the rest of

the picture remains practically unchanged. Quadrant (II) now includes the other country from down under. Quadrant (III) now welcomes Switzerland and Greece, while Germany, Denmark, Austria and France show a rate of productivity growth around the average and lower than average employment growth. Last, Spain, Japan and Italy remain in quadrant (IV), although the two last countries have in this occasion a much less impressive productivity performance. These countries now share the quadrant with Portugal, Belgium and Finland.

Figure 12. Labor productivity and employment growth for 22 countries (1973-2000)




(*) Germany = 1965-997. Source: Author's analysis on GGDC data.

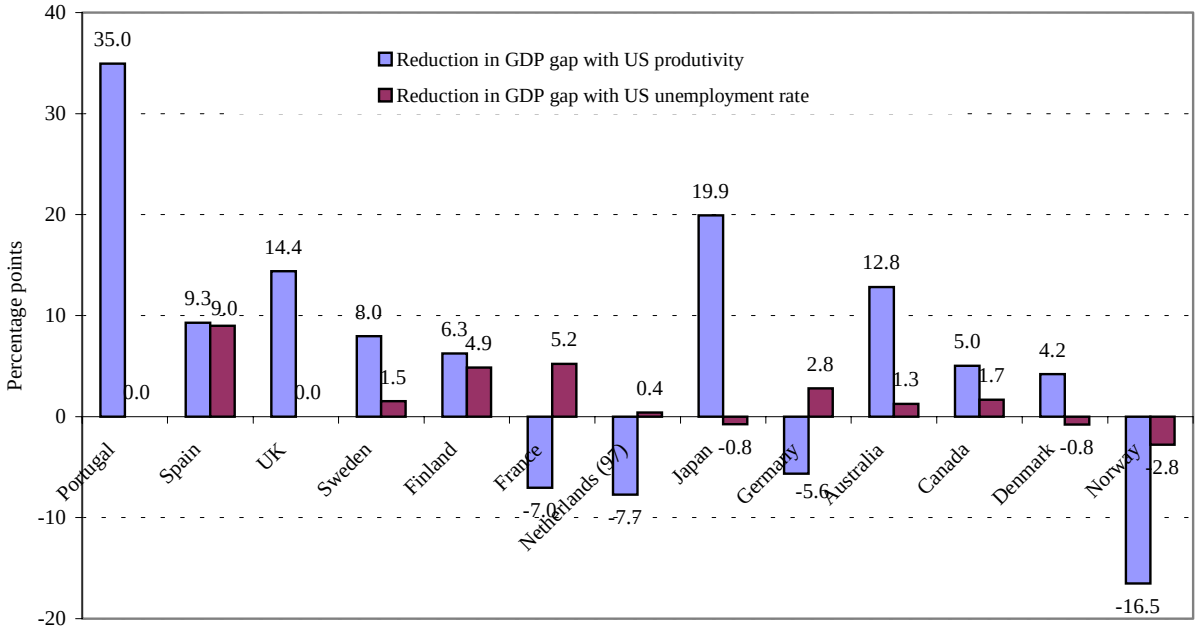
## 6. Comparing experiences: summary and conclusion.

We started this paper posing the question of whether the unemployment rate could be used as a measure of economic efficiency of a given country. Using a time series analysis and decomposing GDP per capita growth, our chosen measure of economic efficiency, we saw how the determinant of GDP per capita growth in the long run, with small variation among countries, was labor productivity growth. Later on, when evaluating the behavior of employment and productivity growth for a group of

OECD countries we grouped the countries of our sample in four different categories according to their performance in terms of employment and productivity in relation with the average performance of the group. These results pointed to the existence, with few exceptions (Norway, Turkey and Ireland for the period 1973-2000), of a negative relation between productivity and employment, as if those countries with higher GDP growth had difficulties in generating the necessary GDP growth so as to allow for a parallel high employment growth.

The major role played by productivity growth in explaining GDP growth doesn't mean that the rest of the variables involved in the determination of GDP per capita don't play any role whatsoever in its evolution, or in explaining the differences of GDP per capita between countries. In figure 13, we can see the change (expressed in percentage points) of the difference in GDP per capita between each country and the USA under the assumption that every country had the same hourly labor productivity as the US.

Figure 13. Reduction of GDP per capita gap with the US, assuming US hour labor prodictivity and US unemployment rate.




(*) A negative value means an increase in the GDP p.c. gap.

Source: Author's analysis on GGDC data.

For example, in Portugal the elimination of the existing productivity gap between Portugal and the US would reduce the GDP per capita differential by 35

percentage points (that is, from almost 15,000 $ to 4,358 $). In fact, as we can see, productivity differentials play a major role (around half or more of the existing difference in GDP per capita explained by difference in labor productivity per hour) in explaining GDP differentials between the countries of the sample in only about a third of the countries considered (Japan, Portugal, Australia the United Kingdom and Norway, this last time in its favor). In the rest of the countries, productivity differentials play a secondary role, explaining less than a third of the difference in GDP per capita. In the case of France, Netherlands and Germany, having US hourly productivity level would lead to an increase in the existing GDP gap between these countries and the US of 7, 7.7 and 5.6 percentage points respectively. In the rest of the countries considered, the equalization of productivity would have a positive impact on their GDP per capita, reducing the existing gap from 1/5 to 1/3 depending of the cases.

From figure 12 we can also see that with the exception of Spain and Finland, countries, especially the former, with an abnormal level of unemployment, in the rest of the countries the unemployment rate *per se* plays a secondary role in explaining the gap in GDP per capita with the US. In France and Germany, having the American unemployment rate would also reduce the GDP p.c. gap (5 and 3 percentage points respectively), although in this occasion, the negative impact of a lower unemployment rate on the relative level of GDP p.c. is fully compensated by higher productivity per hour.

But this secondary role played by the unemployment rate in explaining the gap GDP p.c. should not lead us to conclude that the existing gap is not related with the utilization of labor. Nothing further from the truth. When we add the role of all the elements related with the utilization of labor (hours, activity rate, unemployment rate and demographic structure) only in Japan and Portugal, these, considered together, play a marginal role. In Austria and the UK labor utilization share the responsibility of explaining the existing the GDP per capita gap with the US equally with productivity. For the rest, labor utilization explains from 70 % of the gap –Sweden- to more than 100 % -France, Netherlands, Germany and Norway- meaning thus that there is a gap in GDP p.c. even when productivity per hour is higher than in the US.

This result highlights the importance of labor utilization as a determinant of relative GDP per capita, but only when by labor utilization we mean more than the rate of unemployment. As we have seen, in a context of equal output per hour, hours, force participation rate or the demographic structure itself play a bigger role in explaining differences in GDP per capita than the rate of unemployment. As conclusion, any analysis of economic "efficiency" should take into consideration labor productivity first, and then complement the information on employment by using, along with the unemployment rate, the force participation rate and hours of work. Obviously, specially but not only, when using hours of work as a complementary information, we run with the risk of considering "inefficient" choices made by individuals and society about the distribution of their time between market work, leisure and other activities. The same problem, although less conspicuous, arises when dealing with labor force participation rates, as, among other things, the force participation rate reflects a choice between market and non-market production.

Before concluding it is worth commenting on the inverse relation between employment growth and productivity growth found in figure 10 and 11. Obviously, from equation (3), and assuming a *caeteris paribus* universe, the behavior of employment and productivity are clearly inverse related. But, as we saw in section 3 there are multiple ways in which changes in productivity can lead to higher growth of demand, making compatible both objectives. Still, a lower aggregate productivity rate of growth doesn't mean, necessarily, lower productivity growth across all economic activities. The aggregate productivity is constructed as the weighted sum of the productivity of the different sectors of economic activity. It is widely known that different sectors of activity have also different productivity levels according to the technology employed, so the differences in productivity growth can be explained as a result of different productivity growth in each sector of activity or, alternatively, as the result of different rates of growth of the different sectors of the economy. If this is the case, the identification of lower productivity growth with a lower degree of dynamism or "efficiency" of the economy as a whole would be, at least, questionable, as it could be just the reflection of a different choice between sectors. A high rate of growth of low tech sectors, with very low capital-labor ratio and low use of human capital, would drag the rate of aggregate productivity growth of the economy increasing at the same time the rate of growth of employment.

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