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Is hourly labour productivity structurally higher in some major European countries than it is in the United States?

Abstract

Several measurements have shown that hourly labour productivity is currently higher in several continental European countries than it is in the United States. However, the average annual hours worked and/or the employment rate are lower in these countries than in the United States. When the diminishing returns to these two variables are taken into account, we obtain a 'structural' hourly productivity, which is adjusted for differences with regard to the United States in terms of hours worked and employment rates. We then see that the level of the 'structural' hourly productivity is higher in the United States than anywhere else, which suggests that the USA is still setting the technical efficiency frontier.

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1. Introduction

Several measurements[1] have shown that hourly labour productivity, which is defined as the ratio of purchasing power parity-based GDP to aggregate hours worked, is currently higher in several continental European countries than it is in the United States. If this were true, it would mean that these European countries are now setting the technical efficiency frontier and that the social preference to use this outstanding performance for promoting a leisure society is stronger in Europe than it is in the United States. However, we need a better understanding of the reasons behind the European countries' performance in order to assess the robustness of this hypothesis.

Our analysis is a preliminary investigation of macro-economic comparisons of hourly labour productivity levels in the leading industrialised countries. We should stress that international productivity and per capita GDP comparisons are inevitably fragile. Some of the weaker statistical aspects of such comparisons are discussed in the Box below. Therefore, we only deem comparisons to be robust and worthy of comment when they show sizeable differences. An international comparison of per capita GDP and 'observed' hourly productivity is presented in Part 2. It is based on estimates made by other researchers. We present an interpretation of the relative performance of the major European countries with regard to the United States in Part 3. Then, in Part 4, we present a comparison of a recalculated 'structural' hourly productivity levels, which is closer to the reality of technical efficiency.

Box

International comparisons of productivity and GDP statistics inevitably have many fragile elements.

Measurements of such macro-economic variables as employment, hours worked and GDP need to be based on conventions, which have limitations since the conventions may change over time or vary from one country to the next. This means that international comparisons and long-run analyses may be fragile. Recent discussions on international comparisons of per capita GDP in France testify to their fragility and prompt us to consider only sizable differences as robust. Ahmad *et al*. (2003) discuss the fragile elements in detail. What follows are some illustrations of problems involved in measuring GDP and employment.

Two usual examples of GDP measurement elements that are likely to introduce bias into international comparisons can be cited :

- The conversion of GDP into a common monetary unit for the purposes of international comparisons may be based on several different conventions. Thus, differences in the conversion conventions can change the per capita GDP rankings of countries where the figures are close (see Magnien, Tavernier and Thesmar (2002)). This means that rankings of countries based on the level of a per capita GDP indicator should only consider large differences as significant and rankings should not be established for countries where the indicator levels are close ;
- Some national accounts conventions may vary from one country to the next, which can lead to bias in productivity or per capita GDP comparisons. The biggest differences are between European and American conventions. From the European standpoint, differences in conventions generally tend to increase both the level of GDP and the growth rate of GDP in the United States. Three illustrations of such differences can be cited. All three deal with the issue of dividing consumption into final consumption and intermediate consumption (see Cette and Stauss-Kahn (2003) or Lecat (2004)) : (i) the FISIM (financial intermediation services indirectly measured) item is treated as intermediate consumption exclusively in Europe, whereas some of it is counted as household consumption in America and thus included in America's value added and GDP. This difference in conventions appears to increase the United States GDP by some 2 % to 3 % with regard to European conventions ; (ii) spending on military equipment is treated as government intermediate consumption in Europe, whereas the United States counts some of this spending as investment, which increases GDP accordingly ; (iii) the division of business expenditure on software into intermediate consumption and investment favours investment in the United States, thereby increasing its GDP

[1] For example, Schreyer and Pilat (2001), updated by the authors, Eurostat, in its structural indicator database or van Ark and McGuckin (2003).

accordingly compared to European countries (see Lequiller (2000) for a discussion of this aspect). The latter difference in conventions appears to increase the United States' GDP by about ¾ %, compared to France. In more general terms, international comparisons of information and communication technology (ICT) are sometimes complicated by differences in accounting conventions (see Cette, Mairesse and Kocoglu (2000)). The combined effect of these three differences in accounting conventions appears to 'inflate' American GDP by some 2 % to 5 % compared to European standards.

Measurements of employment and hours worked can also be complicated by the lack of standard conventions and changes in conventions. We can cite three examples of such difficulties : (i) aggregate employment includes self-employed and unpaid workers and the proportion of such workers varies over time and from one country to the next. Measuring hours worked for this population is very problematic. This is particularly true of the unpaid family workers included in this population. Unpaid family workers accounted for 4.4 % of aggregate employment in France in 1980, versus 0.7 % in the United States and 10.9 % in Japan. The figures for 2002 were 1.7 %, 0.1 % and 4.8 % respectively[2] ; (ii) in some countries, the measurement of working hours changed over the period. For example, in France, when the statutory work week was reduced to 35 hours, the definition of hours worked was changed by Article 5 of the Act of 13 June 1998 (in compliance with European Directives), which may have affected measurements of hours worked made on the basis of business surveys ; (iii) also in France, the introduction of tax deductions for households' expenditure on domestic help also led to the legitimisation of many previously undeclared jobs (see Audirac, Tanay and Zylberman (1998)). National accounts staff try to account for undeclared work in the GDP estimates, but not in the measurement of employment. Thus, the legitimisation of some previously undeclared jobs could lead to a reduction in apparent labour productivity, all else being equal. Some of the decrease in labour productivity seen in Spain in the mid-nineteen-nineties was probably due to a bias of this type.

We should also point out that productivity comparisons between industries are even more complicated. Two examples can be cited to support this : (i) agency temps are counted as business service workers, even though about half of them work in the manufacturing industry in France. This distorts productivity estimates when output is measured in terms of production. It also distorts productivity estimates when output is measured in terms of value added, because the structure of temporary jobs by skills requirements is very different from the overall structure of jobs in the industries relying heavily on agency temps. This problem is especially acute in France because the use of agency temps is much more common than it is in other industrialised countries (see Gonzalez (2002) on this subject) ; (ii) in some industries, the division of output into volumes and prices can be very difficult if these characteristics are subject to rapid change. This is particularly the case in the information and communications technology industries, where the case of mobile telephony services cited by Magnien (2003) provides a stark illustration.

The review of these measurement problems, and we could cite many others, tells us that we need to be very careful when making international comparisons and that we should only consider large differences as robust.

2. The United States and Europe Rank Differently in Terms of Hourly Labour Productivity and Per Capita GDP Levels.

Labour productivity is a key determinant of the level of per capita GDP. The latter variable can be decomposed entirely as the product of hourly labour productivity, average hours worked, employment rate and the ratio of the working age population to the aggregate population. This simple equation shows that, all else being equal, per capita GDP increases as a function of each of the components, including output per hour worked.

It should be pointed out that per capita GDP cannot be considered as the sole relevant indicator of a country's level of development and living standards. There are many other factors that influence living standards. For example, a drop in GDP resulting from a decrease in productivity growth could actually be associated with an improvement in living standards, if the decrease in productivity produces a more

[2] Data source : OECD (2003a).

comfortable lifestyle or is perceived to do so by the population concerned. This can be the case, for example, if the workweek is shortened.

Various measurements relying on purchasing power parity-based calculations of GDP enable us to make international comparisons of per capita GDP and labour productivity. Differences in these measurements stem from genuine statistical uncertainties and mean that we should focus on observations that seem to be robust. Thus the following, fairly usual, observations can be made (Table 1).

Table 1 : **Per capita GDP and labour productivity in 2002**

Country	**Per capita GDP** As a % of US figure			**Hourly labour productivity** As a % of US figure			**Productivity per employee** As a % of US figure	
	OECD [a]	Eurostat [b]	VA-MG [c]	OECD [d]	Eurostat [e]	VA-MG [f]	OECD [g]	Eurostat [h]
France	77	76.1	72.8	103	106.6	107.8	88	96.4
United States	100	100	100	100	100	100	100	100.0
European Union	73	72.8	71.7	91	88.2	91.6	80	84.0
Japan	74	73.4	73.7	72	67.5	73.1	72	73.6
OECD	75		69.1	81		78.1	78	
Germany	75	72.5	75.0	101	91.7	101.5	80	79.8
Belgium	78	77.5	76.2	111	106.3	112.0	95	99.8
Canada	85		82.6	84	0.0	83.7	82	0.0
Spain	62	62.7	60.1	74	73.6	72.2	73	80.2
Greece	49	51.6	49.3	59	64.2	61.1	63	74.8
Ireland	89	91.3	89.5	103	103.6	105.5	94	104.2
Italy	75	71.5	73.4	105	91.8	97.2	94	89.6
Netherlands	82	81.1	80.2	106	100.2	103.8	78	80.9
Portugal	50	51.6	52.2	51	52.6	52.7	48	54.6
United Kingdom	74	78.2	72.7	79	78.6	81.7	74	80.9

[a], [d] and [g] : ppp 2002 ; [b], [e] and [h] : pps 2002 ; [c] and [f] : ppp 1999.
Sources : [a], [d] and [g] : OECD Schreyer and Pilat (2001), updated by the authors; [b], [e] and [h] : Eurostat, Structural Indicators Database ; [c] and [f] : van Ark and McGuckin (2003).

- The United States appears to be by far the major industrialised country with the highest per capita GDP. The level of per capita GDP, in the European Union as a whole and in each of the four leading countries in the Union, along with Japan, is very much lower (by some 25 to 30 points) than it is in the United States ;
- The countries that seem to have the highest hourly labour productivity are in continental Europe. France appears to perform particularly well, behind Belgium. This observation suggests that the United States is not currently setting the 'technical frontier' and that it is now being set by some of the European countries ;
- The relatively low hourly labour productivity of some European countries, such as Spain, or more particularly Portugal and Greece, means that hourly labour productivity in the European Union as a whole is much lower (by about 10 points) than the average level in the United States. The gaps are even wider in the United Kingdom (approximately 20 points), Canada (15 to 20 points) and Japan (25 to 30 points) ;

In accounting terms, the contrast between hourly labour productivity and per capita GDP that explain the European countries' situation compared to the United States can be attributed to fewer hours

worked and/or a lower employment rate (see Table 2)[3]. For example, most of gap in per capita GDP compared to the United States can be attributed to : (i) fewer average hours worked in the Netherlands, Germany, France and Belgium, which contribute more than 15 points to the gap ; (ii) the lower employment rate in Italy, Greece, Spain, Belgium and France ; (iii) the lower hourly labour productivity in Portugal, Greece, Spain, Japan, the United Kingdom and Canada. The lower number of hours worked may stem from difference in working hours of full time workers or from the proportion of part-time workers, or even a combination of these two factors, as is the case in the Netherlands. In accounting terms, a lower employment rate could be the result of a lower labour force participation rate or a higher unemployment rate. The respective contributions of each of these explanatory factors vary from one country to the next. The gap in hours worked is particularly large in the Netherlands and, to a lesser extent, in Germany, Belgium and France. The gap in the employment rate is large in Italy, Spain and Belgium, and to a lesser extent in France, Germany and Ireland.

Table 2 : **Hours worked and employment rate in 2002**

Country	**Average annual hours worked**[A] In hours	**Part-time employment** [B] As a % of total employment	**Employment rate** As a % of population aged 15-64	**Labour force participation** As a % of population aged 15-64	**Standardised unemployment rate** As a % of labour force
France	1,545	13.7	61.1	68.0	8.7
United States	1,815	13.4	71.9	76.4	5.8
European Union		16.4	64.3	69.8	7.6
Japan	1,809*	25.1	68.2	72.3	5.4
OECD		14.7	65.1	69.9	6.9
Germany	1,444	18.8	65.3	71.5	8.2
Belgium	1,559	17.2	59.7	64.1	7.3
Canada	1,778	18.7	71.5	77.5	7.7
Spain	1,807	7.6	59.5	67.1	11.4
Greece	1,934	5.6	56.9	63.1	9.9
Ireland	1,668	18.1	65.0	67.9	4.4
Italy	1,619	11.9	55.6	61.2	9.0
Netherlands	1,340	33.9	73.2	75.6	2.8
Portugal	1,719	9.6	68.1	72.0	5.1
United Kingdom	1,707	23.0	72.7	76.6	5.1

[A] : 2000, except *: 1999 ; [B] : Part-time employment = less than 30 hours worked per week on average.
Source: OECD (2003b).

Thus, at first glance, the interpretation of these observations could be as follows : (i) hourly labour productivity seems to be higher in several European countries than it is in the United States ; (ii) these countries seem to have 'chosen' shorter working hours and a much lower employment rate than the United States has ; (iii) consequently, per capita GDP is lower in these countries than it is in the United States.

[3] Schreyer and Pilat (2001, p. 168) or OECD (2003c, p. 34) show that the effect of differences in the ratio of working age population to aggregate population is negligible.

3. Hourly labour productivity is influenced by hours worked and the employment rate

The explanation given above in accounting terms would be completely satisfactory, assuming constant returns to hours worked and the employment rate. However, this assumption appears to be very questionable :

- It is often assumed with regard to hours worked that the effects of fatigue and the ensuing diminishing returns to hours worked outweigh the effects of fixed costs, which produce increasing returns to hours worked. Such increasing returns stem, for example, from periods of time included in hours worked that are not directly productive and hard to shorten. Consequently, returns to hours worked are assumed to be diminishing in aggregate ;
- The assumption of constant returns to the employment rate could be accepted if we assume that changes in the employment rate affect all categories of workers with differing productivity levels in the same way. Yet a closer look at the employment rate gap between continental European countries and the United States shows that this hypothesis should be rejected (see Table 3). If we break the working age population down into gender groups and three age groups (young, adults and older), we see that the differences in the employment rates are negligible (except for women in Italy, Spain and Greece) for adult men and women. The biggest differences are in the young age group, with an employment rate gap of about 10 points between the United States and the European Union (and France by itself) and in the older age group, where the gap is approximately 20 points. The productivity of younger and older people who are not in employment can be considered to be lower than that of adults in employment. The gap stems from younger persons' lack of working experience and the loss of human capital incurred by older persons who are not in employment. Older persons still in employment are bound to have maintained or even increased their human capital more than those who are no longer in employment. In continental European countries, the foreseeable increase in the average employment rate will mainly concern these two age groups and this means that the returns to the employment rate will be diminishing.

Table 3 : **Employment rates in 2002 –** As a %

Country	**Population aged 15-64**	**Population aged 15-24**	**Population aged 25-54**			**Population aged 55-64**
	Total	**Total**	**Total**	**Men**	**Women**	**Total**
France	61.1	23.3	78.3	87.0	71.6	34.2
United States	71.9	55.7	79.3	86.6	72.3	59.5
European Union	64.3	40.5	77.1	86.7	67.3	40.6
Japan	68.2	41.0	78.0	92.0	63.9	61.6
OECD	65.1	43.7	75.5	87.0	64.1	49.4
Germany	65.3	45.6	78.7	85.3	71.9	38.4
Belgium	59.7	28.5	76.6	86.2	66.8	25.8
Canada	71.5	57.3	80.2	85.3	75.2	50.4
Spain	59.5	36.6	70.1	85.8	52.8	39.7
Greece	56.9	27.0	71.5	89.0	54.7	39.2
Ireland	65.0	45.3	76.6	87.6	65.6	48.0
Italy	55.6	26.7	70.1	86.0	54.0	28.9
Netherlands	73.2	66.9	81.9	91.2	72.5	41.8
Portugal	68.1	41.9	81.5	89.4	74.0	50.9
United Kingdom	72.7	61.0	80.6	87.2	73.8	53.3

Source: OECD (2003b).

Thus, increasing hours worked and the employment rate in continental European countries would narrow the per capita GDP gap with regard to the United States, but it would also lower the

comparative level of hourly labour productivity. In other words, many European countries' strong hourly productivity performance compared to the United States cannot be attributed solely to good causes. Their performance is boosted by the fact that the average hours worked are much shorter and the fact that employment is strongly concentrated on the most productive segment of the population. The less productive segments, which are younger and older persons in this case, are voluntarily or involuntarily excluded from employment[4].

A recent analysis by Belorgey, Lecat and Maury (2004) proposes a measurement of returns to hours worked and the employment rate. The analysis is based on econometric estimates using the Generalised Method of Moments (GMM) proposed by Arellano and Bond (1991) on a panel of 25 industrial countries over the period from 1992 to 2000. The equations explaining changes in productivity per employee at the macroeconomic level are estimated using an autoregressive term, along with variations in : (i) the ratio of information and communication technology (ICT) production to GDP ; (ii) the ratio of ICT expenditure to GDP ; (iii) the ratio of investment expenditure to GDP ; (iv) the capacity utilization rate ; (v) average annual hours worked per employee and (vi) employment rate of the working age population. The analysis shows that the long-term productivity per employee elasticity is about 0.65 with regard to hours worked and –0.50 with regard to the employment rate. The productivity per employee elasticity of about 0.65 with regard to hours worked corresponds to an hourly labour productivity elasticity of approximately -0.35 with regard to hours worked. This finding is in line with those of earlier analyses[5]. The productivity elasticity of –0.5 with regard to the employment rate shows that the productivity of working-age persons currently out of employment, but who would be the first to be affected by an increase in the employment rate, is on average half that of persons currently in employment.

4. The 'structural' hourly labour productivity level appears to be higher in the United States than it is in the other industrialised countries

On the basis of the estimates of returns to hours worked and the employment rate discussed above, we estimated a 'structural' hourly labour productivity level for each country in comparison to the United States. This 'structural' hourly productivity level is the one that would be observed, according to our calculation assumptions, if the hours worked and the employment rate in each country were the same as in the United States. The results of the calculation are shown in Table 4. The calculation factors in the effects of diminishing returns to hours worked and the employment rate, based on the elasticities discussed above.

In all countries, the level of 'structural' hourly productivity compared to the United States is lower than the level of 'observed' hourly productivity[6]. The higher levels of 'structural' hourly productivity in the United States show that the United States does indeed set the technical frontier for productive efficiency and that the other countries lag behind it to varying degrees. In European countries, shorter hours worked (except in Greece and Spain) and lower employment rates (except in the Netherlands and

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[4] Giuliani (2003) also agrees with this finding. Without going into detail, Wasmer (1999) also assumes that the labour force structure has a positive effect on productivity.

[5] Based on a study conducted by INSEE on microeconomic data, Malinvaud (1973) states that since there are no better indicators than those mentioned above, a coefficient of ½ shall be applied to measure the impact that a reduction in hours worked has on hourly productivity. In view of the lesser effects of fatigue because average hours worked have decreased over recent decades, more recent research now applies a coefficient of 1/3 or ¼ (see Cette and Gubian (1997)).

[6] Cette (2004) shows that only Norway posts a higher level of 'structural' hourly productivity than the United States. However, Norway is a small country with a very specific economic structure linked to its wealth of oil resources, which have the effect of raising its capital intensity level and labour productivity compared to other industrialised countries.

the United Kingdom) boost relative 'observed' hourly productivity significantly. The impact appears to be around 10 points for the European Union as a whole, with 4.5 points contributed by hours worked and 5.5 points by the employment rate. The impact in France is 13 points, with 5.5 points contributed by hours worked and 7.5 points contributed by the employment rate.

Table 4 : **Observed and 'structural' hourly productivity in 2002 -** As a % of US

Country	**Observed hourly productivity** As a % of US figure			**Effect (in %) of the gap with the United States …**		**Structural hourly productivity** As a % of US figure		
	OECD [a]	Eurostat [b]	VA-MG [c]	…in hours worked [d]	…in the employment rate [e]	[f] = [a]-[d]-[e]	[g] = [b]-[d]-[e]	[h] = [c]-[d]-[e]
France	103	106.6	107.8	5.2	7.5	90.3	93.9	95.1
United States	100	100.0	100.0	0.0	0.0	100.0	100.0	100.0
European Union	91	88.2	91.6	4.4	5.3	81.3	78.5	81.9
Japan	72	67.5	73.1	0.1	2.6	69.3	64.8	70.4
OECD**	81	0.0	78.1		4.7	76.3		73.4
Germany	101	91.7	101.5	7.2	4.6	89.3	80.0	89.8
Belgium	111	106.3	112.0	4.9	8.5	97.6	92.8	98.6
Canada	84	0.0	83.7	0.7	0.3	83.0		82.7
Spain	74	73.6	72.2	0.2	8.6	65.2	64.9	63.4
Greece	59	64.2	61.1	-2.3	10.4	50.9	56.1	53.0
Ireland	103	103.6	105.5	2.8	4.8	95.4	96.0	97.9
Italy	105	91.8	97.2	3.8	11.3	89.9	76.7	82.1
Netherlands	106	100.2	103.8	9.2	-0.9	97.7	91.9	95.5
Portugal	51	52.6	52.7	1.9	2.6	46.5	48.2	48.2
United Kingdom	79	78.6	81.7	2.1	-0.6	77.5	77.0	80.2

[a] : ppp 2002 ; [b] : pps 2002 ; [c] : ppp 1999.
Sources : [a]: OECD, Schreyer and Pilat (2001), updated by the authors ; [b] : Eurostat, Structural Indicators Database ; [c] : van Ark and McGuckin (2003) ; [d] : calculated by applying a coefficient of –0,35 to the gap with the United States in the number of hours worked ; [e] : calculated by applying a coefficient of –0,5 to the gap with the United States in the employment rate. The origin of these two coefficients is explained in the text.
** : For the OECD, only the effect of the gap in the employment rate is taken into account, given that the number of hours worked is not calculated for this group of countries.

This measurement of the relative 'structural' hourly productivity levels changes the interpretation of the gaps between many countries' per capita GDP and that of the United States. This is particularly true for the continental European countries. The lower level of per capita GDP in continental European countries stems from a combination of lower 'structural' hourly productivity levels, shorter hours worked and a lower employment rate. Thus, lower 'structural' hourly productivity accounts for 5 to 10 points in the gap of approximately 25 % between France's per capita GDP and that of the United States, and 15 to 20 points in the 25 % gap for the European Union as a whole. The rest of the gap stems from shorter hours worked and lower employment rates.

5. Conclusion

Following the Second World War, the growth of hourly labour productivity was faster in France and Japan than it was in the United States. However, the roles were reversed in the nineteen-nineties. This happened before France and Japan had fully caught up to the United States, since this analysis shows that 'structural' hourly labour productivity appears to be higher in the United States than it is in the other industrialised countries. This development has widened the already wide gap between economic

living standards as measured by per capita GDP and is making Europe increasingly poor compared to the United States.

Much research has been done into the reasons why labour productivity growth accelerated in the United States and slowed down elsewhere in the nineteen-nineties. Along with many other analyses, the review published by the OECD (2003d) shows that ICT seems to have played a large role in the divergence between productivity growth trends. The various analyses based on an accounting approach to growth all come up with very similar findings for all countries. The more rapid production and diffusion of ICT in the United States appears to explain the faster productivity growth seen in the nineteen-nineties (see for example Oliner and Sichel (2002), Jorgenson, Ho and Stiroh (2002) or Jorgenson (2003)). The slower labour productivity growth observed in other industrialised countries over the same period can mainly be attributed to a slowdown in the substitution of non-ICT capital or labour (see for example Jorgenson (2003) or Cette, Mairesse and Kocoglu (2002, 2004) for France).

The observations discussed above naturally raise two questions :

- Why are Europe and France behind the United States in the diffusion of ICT ? Much research into this question has produced findings of uncertain statistical robustness (see the summary of this research in OECD (2003c and 2003d)). It suggests that the gap in Europe and Japan may be due in part to tighter regulation of goods and labour markets and a working age population that is less well educated on average (see Gust and Marquez (2002)). Making the best use of ICT calls for certain forms of flexibility and a more highly-skilled labour force than is required for other technologies ;
- To what extent has the slower substitution of non-ITC capital for labour been influenced by economic policies ? Continental European countries appear to have deployed various policies in the nineteen-nineties to 'make growth produce more jobs'. This is very hard to analyse, since the measures implemented were often complex. In France, research has shown that such policy measures (including lower payroll contributions and a shorter working week) account for about half of the slowdown observed (see Cette (2004)). The other half still needs to be explained…

References

- **N. Ahmad, F. Lequiller, P. Marianna, D. Pilat, P. Schreyer and A. Wölfl (2003) :** "Comparing labour productivity growth in the OECD area – The role of measurement", OECD, STD/NAES(2003)25, 29 September ;
- **M. Arellano and S. Bond (1991) :** "Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations", Review of Economic Studies, n° 58 ;
- **B. van Ark and R. McGuckin (2003) :** "Productivity, Employment and Income in the World's Economies", mimeo, Conference Board ;
- **P.-A. Audirac, A. Tanay and S. Zylberman (1998) :** "L'évolution du poids des services et des emplois familiaux en France", Annex B to Report No 12, "Emplois de proximité" by the CAE ;
- **N. Belorgey, R. Lecat and T. Maury (2004) :** "Déterminants de la productivité apparente du travail", Banque de France Bulletin, January ;
- **G. Cette (2004) :** "Productivité et croissance : diagnostic macro-économique et lecture historique", in "Productivité et croissance", Report by the *Conseil d'Analyse Economique*, No. 48 ;
- **G. Cette and A. Gubian (1997) :** "La réduction de la durée du travail : les évaluations convergent-elles ?", in P. Cahuc and P. Granier (eds) : "La réduction du temps de travail : une solution pour l'emploi ?", Economica ;
- **G. Cette, J. Mairesse and Y. Kocoglu (2000) :** "La mesure de l'investissement en technologies de l'information et de la communication : Quelques considérations méthodologiques", Economie et Statistique, No. 339-340 ;
- **G. Cette, J. Mairesse and Y. Kocoglu (2002) :** "Croissance économique et diffusion des TIC : le cas de la France sur longue période (1980-2000)", Revue Française d'Economie, Vol. XVI, No. 3, January. This assessment has been updated in the following study by the same authors : "L'effet de la diffusion des TIC sur la productivité par employé en France", Banque de France Bulletin, No. 121, January 2004 ;
- **G. Cette, J. Mairesse and Y. Kocoglu (2004) :** "Les effets de la diffusion des TIC sur la croissance potentielle", Revue d'Economie Politique, Vol. 114, January-February ;

- **C.-A. Giuliani (2003) :** "D'où viennent les écarts de richesse par habitant entre les Etats-Unis, la zone Euro, la France et le Japon", Direction de la Prévision, Analyses Economiques, No. 9, 12 September ;
- **L. Gonzalez (2002) :** "L'incidence du recours à l'interim sur la mesure de la productivité du travail des branches industrielles", Economie et Statistique, No. 357-358 ;
- **C. Gust and J. Marquez (2002) :** "International Comparisons of Productivity Growth: The Role of Information Technology and Regulation Practices", mimeo, Board of Governors of the Federal Reserve System, International Finance Discussion Papers, No. 727, May ;
- **D. Jorgenson (2003) :** "Information technology and the G7 Economies", mimeo, September ;
- **D. Jorgenson, M. S. Ho and K. Stiroh (2002) :** "Projecting Productivity Growth: Lessons from the US Growth Resurgence", Federal Reserve Bank of Atlanta Economic Review, Third Quarter ;
- **R. Lecat (2004) :** "Productivité du travail des grands pays industrialisés: la fin du rattrapage des Etats-Unis ?", Banque de France Bulletin, January ;
- **F. Lequiller (2000) :** "La nouvelle économie et la mesure de la croissance", Economie et Statistique, No. 339-340, 2000 – 9/10 ;
- **F. Magnien (2003) :** "Mesurer l'évolution des prix des services de téléphonie mobile : une entreprise difficile", Economie et Statistique No. 362 ;
- **F. Magnien, J.-L. Tavernier and D. Thesmar (2002) :** "Les statistiques internationales de PIB par habitant en standard de pouvoir d'achat : une analyse des résultats", Economie et Statistique, No. 354 ;
- **E. Malinvaud (1973) :** "Une explication de la productivité horaire du travail", Economie et Statistique, No. 48, September ;
- **OECD (2003a) :** "Economic Outlook", December ;
- **OECD (2003b) :** "Employment Outlook", June ;
- **OECD (2003c) :** "The Sources of Economic Growth in OECD countries" ;
- **OECD (2003d) :** "ICT and Economic Growth" ;
- **S. Oliner and D. Sichel (2002) :** "Information Technology and Productivity : Where Are We Now and Where Are We Going ?", Federal Reserve Bank of Atlanta Economic Review, Third Quarter ;
- **P. Schreyer and D. Pilat (2001) :** "Mesurer la productivité", OECD Economic Studies, No. 33, 2001/2 ;
- **E. Wasmer (1999) :** "Changements de composition de la force de travail. Implications pour les salaires et le chômage", Economie et Prévisions, No. 138-139, 1999/2-3.