INSTITUT NATIONAL DE LA STATISTIQUE ET DES ÉTUDES ÉCONOMIQUES

Série des documents de travail
de la Direction des Etudes et Synthèses Économiques

G 2001 / 01

The new economy and the measurement of GDP growth

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FEBRUARY 2001

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Abstract

In connection with a surge in the "new economy" that is statistically difficult to measure, doubts have been cast both on European growth and its comparability with that of the United States. This article explores measurement problems in the French case. The data at current prices seem to be reliable, but information by product is becoming increasingly difficult to establish. Contrary to widely held belief, the differences in the application of the famous "hedonic methods" have only a small impact on the French data. On the other hand, there seems to be a difference in the treatment of data between France and the United States, or rather between several European countries and the United States, regarding the distinction between final consumption and intermediate consumption of IT products. The United States national accounts record more gross fixed capital formation in software, ceteris paribus, and this automatically produces a higher measure of GDP in recent years. The difference may be the result of different industrial processes, but it cannot be ruled out that it may be merely the result of applying a different statistical convention. In that case, one might then speak of a comparability bias. The method most widely used in Europe -- and which therefore preserves intra-European comparability -- maintains consistency with the results of private accounting, whereas the American method diverges from it. The use of "net domestic product" instead of the usual "gross domestic product" improves comparability with the United States. Taking net domestic product reduces the growth differential between France and the United States in 1999 by half a point.

Keywords : national accounts, new economy, GDP, international comparison, information and communication technologies

Résumé

Dans le contexte de l'essor d'une « nouvelle économie » statistiquement difficile à mesurer, un doute a été jeté à la fois sur la croissance en Europe et sur sa comparabilité avec celle des Etats-Unis. Dans cet article, on explore les problèmes de mesure en France. Les données à prix courants apparaissent fiables, même si l'information par type de produit devient de plus en plus délicate à établir. Contrairement à une idée bien établie, les différences dans la mise en application des fameuses « méthodes hédoniques » ont un impact faible sur données françaises. Par contre, il y a une différence de traitement entre la France et les Etats-Unis, ou plutôt entre plusieurs pays européens et les Etats-Unis, sur le partage entre dépenses finales et dépenses intermédiaires en produits informatiques. Les Etats-Unis comptabilisent plus de formation brute de capital fixe en logiciels, toutes choses égales par ailleurs, ce qui entraîne une croissance mesurée du PIB mécaniquement plus forte sur les dernières années. Cet écart pourrait résulter de processus industriels différents, mais on ne peut exclure qu'il ne provienne que de l'application d'une convention statistique différente. Dans ce cas, on pourrait parler d'un biais de comparabilité. La méthode utilisée majoritairement en Europe, et qui préserve donc la comparabilité intra-européenne, maintient une cohérence avec les résultats de la comptabilité privée, tandis que la méthode américaine s'en éloigne. L'utilisation du « produit intérieur net » au lieu de l'habituel « produit intérieur brut » améliore la comparabilité avec les Etats-Unis. A l'aune du produit intérieur net, le différentiel de croissance entre la France et les Etats-Unis est réduit d'un demi point en 1999.

Mots clés : comptes nationaux, nouvelle économie, PIB, technologies de l'information et de la communication, comparaison internationale

Classification JEL : E30, O47, O57

Many economists are convinced that the "new economy" is part of the explanation for the extremely firm, lasting and non-inflationary growth posted by the American economy in the 1990s. The focus of the debate later shifted to Europe. Were we too going to benefit from a "new economy" boom? This article is not intended to reply to this question, which is dealt with, for example, in [10, 11, 34, 37]. Instead, it is intended to throw light on a "debate within the debate", concerning possible inadequacies in the *measurement* of the new economy and the impact of these inadequacies on the *measurement* of overall growth.

This debate over *measurement* is neither recent nor confined to France. It has in fact been an underlying feature of all studies of growth and productivity. In the United States, it dates back at least to the 1980s and was implicitly rekindled in the 1990s by the conclusions of the Boskin Commission, which criticised the overestimation of inflation [7]. Overestimation of a price rise automatically means underestimation of growth. And this debate has re-surfaced in recent years in the United States, through the work on the demise of the Solow paradox[1] [12, 17, 19, and 20].

This debate has now reached Europe. Economists in France [40] and the United Kingdom [42, 43] have expressed the view, widely taken up in the press, that there is a substantial bias in the measurement of growth. Figures have been mentioned of an underestimate amounting to 0.4 or 0.5% a year, and even as much as 0.9% a year. As both the ECB and the Bank of England have monetary policies that are decided in the light of absolute thresholds (inflation of below 2%) and as financial analysts compare growth in America and Europe in their trading of currencies, the debate is not simply intellectual.

There is a strong element of international comparison. If there is a bias, is it larger or smaller in Europe than in the United States? Is it more important in some European countries than others? This particularly interesting development [15, 18] involves very rigorous international comparisons, which in some cases go beyond the scope of this article. INSEE is preparing for the middle of 2001 a far-reaching comparison between the French and American data which will take matters further in this direction.

Even so, this article is able to provide certain initial elements of a reply. In the first part, the aims of the study will be set out and certain definitions recalled. The second part will examine the hypothesis of measurement inadequacies liable to affect the **current-price data** in the national accounts. The conclusion of this section will be that there is little reason for thinking that we incorrectly measure overall data at current prices because of the new economy, except in a few particular cases. On the other hand, the breakdown by type of product is becoming increasingly difficult to capture. In a third part, this examination will be extended to the difficult problem of the separation of current-price changes between **volume and price**. This will involve tackling the famous question of the use of hedonic methods in the calculation of price indices. The discussion in the fourth part will deal with the split between **final consumption and intermediate consumption**. This question, less familiar than that of the hedonic method, will turn out to have major implications for the comparability of our data with those of the United States. In the following part, the most awaited but the most delicate, there will be a review of the inadequacies described in the first three parts with an attempt at quantification and, in most cases, a discussion showing comparison with the United States. A final part will set out conclusions on the progress to be made at several levels: use of the Net Domestic Product concept, improvement in international measurement conventions, and investment in statistics. The whole presentation will be illustrated by data drawn from the mobile telephone market, the aspect of the Information and Communication Technology (ITC) sectors[2] that has recorded the most spectacular explosion in recent years. The aptitude

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[1] This was expressed in the following formula: "you can see the computer age everywhere these days except in the productivity statistics". Until recent years, the statistics in the United States in fact showed no increase in productivity linked to the widespread use of computers.

[2] In this article, the terms "new economy" and "ITC" will be used more or less interchangeably, in relation to the ITC producer sectors and the impact of ITC on the user sectors.

of statistics to provide an adequate measurement of the market for this new product is an important test.

I. Aims and definitions

The recent report from the French National Council for Statistical Information (CNIS) on the statistical observation of the ITC [36] highlights the dilemma inherent in the construction of statistical series, which, as the report states, implies "*a stable environment*". Unfortunately from this standpoint, an economy progresses by creating instability: arrival/disappearance of products, of markets, of firms, mergers, take-overs, changes in regulations, etc. The ITC products and the new economy are the most blatant recent examples: start-ups, the extraordinary boom in mobile telephones, the explosion of video games, of the internet, of satellite television, etc. All this is unstable and particularly difficult to measure, being made up of new products and above all of new services, these being traditionally the most difficult to quantify. Should one therefore give up the attempt to construct appropriate statistical series?

The answer is no and INSEE is indeed engaged in constructing such series, including for the ITC. However, it would be useless to deny that the statistician is ill at ease in this context since his procedures are based on the stability of the units used (classifications, weightings, constant samples, etc.) and his reactions are (sometimes judiciously) slow and his resources limited. This contradiction is perfectly illustrated by the example of the consumer price index, which is widely used in national accounts. To calculate a good price index, it is *necessary* to compare the prices of *identical products* at different times, whereas, *in practice,* we have a multitude of products that are frequently changing. To take an example from the IT sector, price records show that between December of one year and December of the next, there was not a single PC reported as identical in the price data basket. On the contrary, most of the price records for PCs reported two changes in the year, sometimes three or more. This meant that the "turnover" in the price records exceeded 300% [2]. But the challenge to the statisticians is precisely to find a method of continuing to compare these data and of deriving time-series for year-on-year changes even -- perhaps above all -- in these unstable situations. The question of a possible bias in the measurement of growth linked to the explosion of the new economy is therefore entirely relevant.

Let us start by defining these "ITC". All the authors try to refer to a common international definition emanating from the OECD. But the subject is strewn with pitfalls because information does not always exist in each country for each item of the classification used and it may be necessary in practice to use a definition different from the one initially intended. As a result, the ITC reports or files produced by the Direction Générale de l'Industrie [5], by INSEE [4] and the Conseil de l'Analyse Economique [11] show figures for the ITC share of American GDP ranging from 4.4% to practically twice as much (8.2%), with an intermediate figure of 6.7%. The first figure is for 1995 and the other two for 1998. However, these differences are mainly of coverage. For the lower figure in the range, IT services were excluded from the comparison; the higher figure pertains to a broader definition, including audio-visual activities. The estimates for France are closer to each other, ranging from 4.4% to 5.0% according to the same sources. But this should not conceal the fact that it remains highly delicate, even in the French case, to assess the importance of this sector, notably because of an increasing difficulty in classifying activities of firms under the headings of a classification that has trouble keeping up with technical innovation.

The definition of ITC that is most frequently used is that provided in the form of a list of activities according to the European classification (see below). These cover three branches: IT, including the production of computers and software; telecommunications, including networks and hence the internet; and finally, electronics. An alternative definition, broadened to so-called "content" activities, has been proposed by Rouquette [35].

NAF[3]	TES [4]	General branch	
30	GE31	Information technology	Office machinery and computers
31.3	HF61B	Telecommunications	Insulated wires and cables
32.1	GF62	Electronics	Electronic components
32.2	GE33	Telecommunications	Broadcasting and transmission equipment
32.3	GC45	Electronics	Equipment for the reception, recording or reproduction of sound or images
33.2	GE35	Electronics	Measurement and control instruments
33.3	GE35	Electronics	Industrial process control equipment
51.6G	Part of GJ20	Information technology	Wholesaling of office machinery and computers
71.3[E]	HN31D	Information technology	Rental of office machinery and computers
64.2	GN12	Telecommunications	Telecommunications
72	GN21	Information technology	Computer-related activity (i.e. software)

This extensive definition of ITC is in keeping with the aim of our study. However, the question posed goes beyond the inadequacies of the measurement of the production of ITC products *themselves* and extends to a wide range of related phenomena. Measurement problems can be seen to affect all activities, however banal, that use ITC. This study will therefore have to be made much more general and cover non-ITC branches, such as the banking system, for example.

Conversely, the study will not try to examine the precision with which it is possible to measure the share of ITC in the economy; in other words, problems of sectoral classification are left aside. The reader is referred on this subject to the CNIS report mentioned earlier, which explains the difficulties faced by statisticians and firms in the new economy in classifying these activities in the framework of the present classification. Nor will it dwell on certain related phenomena in the new economy, such as stock options (which in fact have no impact on the measurement of GDP).

Finally, the study will remain within the limits of the commonly accepted international conventions for national accounts. The measurement of GDP is inevitably conventional and this highlights the importance of conventions that are stable (for the purposes of comparison over time) and international (for the purposes of comparison between countries -- see box).

[3] The French adaptation of the European classification.
[4] Classification used for the French national accounts.

The definitions used in the international national accounts system

If there is a bias in growth, it can only be measured in relation to a benchmark concept of GDP, defined by the international national accounts system. In this system, GDP is equal to total "final" domestic expenditure plus exports minus imports. It does not include "intermediate" consumption -- hence one of the measurement difficulties: it is necessary to distinguish "final" and "intermediate" consumption by economic agents. In the case of households there is no conceptual problem: all consumption by households that does not form part of any activities they may have as unincorporated enterprises or property owners are entirely "final" by convention and hence included in GDP. There remains, however, a statistical problem when turnover data makes no distinction between business customers and household customers. A concrete example of this will be given in this article relating to mobile telephones. Expenditure by firms, for its part, has to be carefully divided between "intermediate consumption" (which is not included in GDP) and investment, known as "gross fixed capital formation" (which is). General government is a specific case, with all its expenditure included in GDP since its production (estimated as the sum of the costs, including intermediate consumption) is entirely made up of final uses. Errors in allocation between final and intermediate expenditure in this case have only a limited impact on GDP, via the consumption of fixed capital.

There has been much debate among national accounts statisticians and economists regarding the allocation of spending by firms and, a fortiori, the notion of "fixed capital". Originally, only expenditure on goods with a life of more than one year counted as fixed capital. No service could be treated as capital. Since this definition was not sufficiently precise to distinguish the portion of small-scale equipment constituting everyday consumption, the European Union's ESA 95 system introduced a threshold: an item of expenditure must cost more than 500 euros to be counted as fixed capital, items below this amount being intermediate consumption. However, this left untouched the question of intangible investment.

Given the increasing importance of "intangible" investment in the productive process, the SNA 93 world system and its European version, the ESA 95 (corresponding to "base 95" in the French national accounts), broadened the coverage of fixed capital to some of these intangible investments. For example, purchases or creation of software, spending on oil exploration or on original artistic or literary works are now included in GFCF, whose definition is now very close to the conventions used in private accounting in measuring additions to fixed capital, although it seems that these conventions are not always respected. On the other hand, despite strong pressure from French national accounts statisticians within the international working group [32], R&D spending remains excluded [5].

The definition of fixed capital we shall be using in this article is the one just described. Contrary to what has been said by [40], R&D expenditure is excluded from the international national accounts system and this is true for all countries, including the United States. If GDP were to contain the R&D spending and if this spending were to grow faster than the rest of the economy, GDP would grow that much faster. But this would be just as true for the United States as for France and even, according to figures quoted by [16], would probably be much truer of the United States than of France.

[5] In fact, the incorporation of software in GFCF means implicitly that internal R&D spending by software firms is included in GDP.

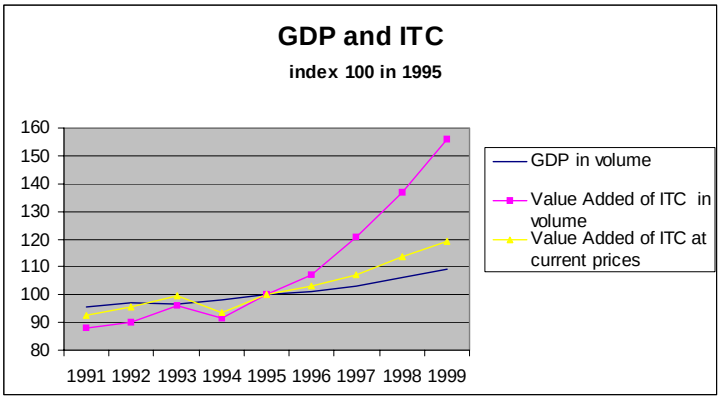
II. Reliability of data at current prices

INSEE's arrangements for the statistical monitoring of the activity of firms is a three-storey edifice (see diagram in appendix). On the first storey one finds the infra-annual data, those which come out the most rapidly and which are used for the quarterly national accounts. These mainly consist of the monthly turnover indices calculated on the basis of the declarations to the central tax authority for the collection of VAT (the so-called CA3 indices). The second storey consists of the annual enterprise surveys (EAE) and the initial results from a sample of tax data. The third storey consists of the results of processing the exhaustive tax declarations from firms (the "intermediate enterprise system" (SIE)).

The most comprehensive source for assessing GDP is constituted by this third storey. The tax declarations made by firms are processed during year Y+2, and then compared with the EAE (see below) and incorporated in INSEE's SUSE database, which contains 2.5 million firms and is used for the calculation of the definitive version of the national accounts published in April of year Y+3, with the help of the SIE. The quality of this source is based on a compulsory tax declaration using a common accounting framework (the " Plan Comptable Général"), which makes it the most exhaustive source for the overall activity of firms, covering all sectors, both industry and services. Only the financial sectors are not covered, but information on these is supplied by statistics from the Banking Commission and the supervisory authority for the insurance sector, which INSEE processes in co-ordination with the Banque de France.

The national accounts statisticians carry out an adjustment to this data in order to take account of possible absences, in this case that of the small firms that are not yet, for various administrative reasons, recorded by the central tax authority[6]. To make this adjustment, a comparison is made between the number of firms with fewer than 20 employees registered in the SIRENE administrative directory and in the SIE, by sector of activity. This directory provides a complete census (since this is a statutory obligation) of firms, even unincorporated. When the number of firms in the SIRENE directory, previously corrected for non-reported exits, is substantially higher, the overall turnover for the sector is adjusted on the assumption that the missing firms have the same average turnover as the small firms that are present. This base and this adjustment procedure should mean that the so-called "definitive" national accounts, i.e. those published in Y+3, are exempt from any underestimation of the overall turnover and activity of small firms, such as the start-ups (see box). Via these exhaustive statistics, there has indeed been a measure of the explosion of ITC recorded in the annual national accounts (see graph 1). As is now clear to all, the value added for the ITC is growing much faster in volume than the same series at current prices, because of the fall in unit prices.

Graph 1



[6] This is not a correction for under-declaration or "fraud", but absence due to delays or special cases. The national accounts also make a correction for fraud but at a later stage.

Start-ups, intellectual property and the national accounts

Much is heard these days about ITC start-ups, even though the market has become much less flourishing since the downturn in the NASDAQ in Q2 2000. One former start-up, Microsoft, whose staff numbers have been multiplied by nine in ten years, is the most dazzling success story. One might even say that Bill Gates is the real creator of the new economy, since without PCs and without Windows, the internet economy would not exist. This should not lead one, however, to forget [5] that it is the long-established firms (IBM, HP, DEC, Bull) that remain the heavyweights in the sector in terms of staff numbers and hence of activity.

However, there are many more anecdotes (often circulating on the stock markets) than there are statistics concerning the start-up phenomenon. One of the rare figures comes from Israel [9]. Israel has in fact seen a boom in these activities, which can be assimilated to an export of R&D. Israeli start-ups create an ITC service or software, before the firm and the software are sold to a large investor, usually American. The Israeli Statistical Institute estimates the activity of these units as amounting to 2% of GDP, although at the same time stressing the measurement problems involved. As explained below, one initially has to estimate their output for own account on the basis of cost, since they sell nothing for at least two years, the time taken to carry out the R&D on the software. In most cases, the sale of the software then takes place at the same time as that of the firm itself.

Intellectual property is playing an increasing role in the "digital economy" because of its intangible nature. One of the consequences (and one of the difficulties, for the producers) of this intellectual property is that, while its creation is costly, its physical deterioration in use is nil. And the cost of reproducing it perfectly is also virtually nil. Hence the importance of the parallel economy associated with the illegal -- but nevertheless very simple -- reproduction of highly complex software, not to mention the free distribution at world level, unknown to its creators, of databases, especially of music.

This state of affairs is nothing new. The reproduction of musical scores by such "old economy" methods as hand copying posed the same type of problem. Similarly, the relations between a novelist and his publisher are identical to those between a software creator and his publisher. Only the scale of the phenomenon is new. How is all this handled in the national accounts? We shall take the example of a piece of software but the same type of problem had already been posed as far back as 1986 in the case of more traditional "cultural goods" [26].

In the national accounts, the professional creator of a piece of software (or a game) produces an intangible fixed asset, classified in the asset classification under AN.1122, “software”. His activity is classified under HN21B, "software", in the classification of activities and products. Until such time as it is sold, the value of this output is estimated on the basis of its production cost. If the production of the software is spread over several accounting periods, it will be "stocked" between these periods in the form of work in progress. Once its production is complete, and pending its sale, it is an investment (or stocked in the form of a finished product). Its subsequent exploitation can then take several forms.

When the creator is also the publisher -- a very common situation -- he will himself sell the reproductions of the software, to be clearly distinguished from the sale of the original, dealt with below. In the case of the sale of reproductions, the volume of assets of the publisher/creator will be unaffected. Given the low cost of reproduction, the (very high) price of the original bears no relation to the (very low) price of its reproduction. The depreciation schedules for the two types of product, the original and the reproduction, are indeed relatively independent of each other.

For his part, the purchaser of the reproduction will incorporate it in his capital (in the case of a firm and professional software) or in his consumption (if the purchaser is a household). In the case of a firm, this purchase will therefore generate gross fixed capital formation. In the case of game software, it will be final consumption by the household sector. This sale is not entirely comparable to that of another good. In this case, the purchaser is not entitled to re-sell the software once it has been installed, since the intellectual property remains with the producer[7]. All he has bought is its reproduction. There are therefore two quite distinct

[7] Households do not always observe this rule.

products: the original and its reproduction. It would in fact have been clearer to distinguish two headings in the product classification of the national accounts [8].

In some cases, the creator is not the publisher. He will then go on to sell the original to a publisher. In this case, the creator makes a disinvestment (negative GFCF) and the publisher makes a corresponding investment. This is what happens when a large firm buys out a start-up: it buys the start-up's intangible assets (software) and incorporates them in its own assets. If the creator continues to exploit the original and the editor pays royalties on each reproduction sold, this will then be considered as rental (and classified as intermediate consumption) and not as GFCF[9].

This will also be the case if the future sees the development of "online rental of software" to the eventual user. Instead of being classified as GFCF, the cost of rental of the software will be treated as intermediate consumption (IC) by the hiring firm, under a heading (software rental), which does not exist as yet but which deserves to be provided for, starting now[10]. While this can be justified by the implicit difference in the duration of the contract (the purchase of an exploitation licence is valid for several years while rental is invoiced on the basis of annual or infra-annual rents), it is easy to appreciate the particular unreliability of the distinction made between GFCF and IC for the software, inasmuch as the contracts between publishers and the customers are going to be increasingly flexible. This means that the notion of "net domestic product" is better suited than that of "gross domestic product" in measuring overall growth (see the last part of the article).

Conversely, it is important to note the existence of a fixed underlying principle that lends consistency to these various treatments in the national accounts. All flows linked to payments of licences or royalties on "produced" assets, such as software or literary works, are treated as the production of a service (in the form of GFCF, final consumption or intermediate consumption and also possibly exports or imports) and never as income from property, this being reserved for licences and royalties on land and deposits, both classified among the "non-produced" assets[11]. In principle, the basic statistics, the company accounts and the declarations for the balance of payments regarding exports and imports of services should reflect these definitions, so that all royalties or revenue from licences (including imported software) are recorded as sales of software services.

[8] Speaking of reproductions, it should be remembered that the physical medium used for the software -- hard disk, CD-ROM, diskette, paper, etc. -- has no importance in theory. Regardless of the medium, these are all simply "exploitation licences". In practice, the problem is that there is no distinction between the software and its medium in the basic statistics.

[9] Similarly, royalties paid by a publisher to the author, for example in the form of a percentage of the sales of each book, are treated in the national accounts as rent.

[10] Either as a sub-item under the "software" heading, or as a sub-item under the heading "rental without operator".

[11] A novelty in 2000 is that the licences for so-called 3G mobile telephones are also regarded as "non-produced" assets. Their handling in the national accounts does not affect GDP.

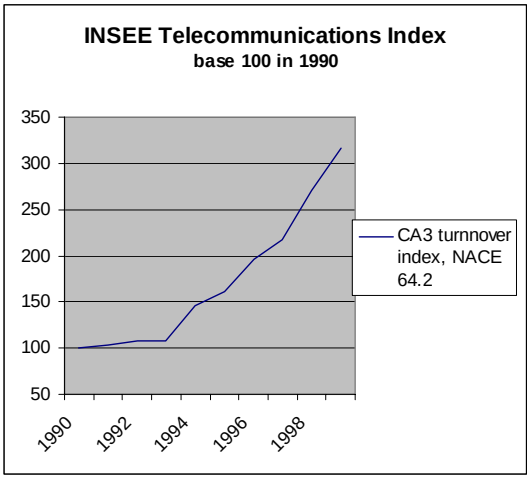
The infra-annual statistics are available earlier but make a less good job of capturing the activity of the small firms. However, the monthly turnover indices compiled by INSEE and widely used in the national accounts pending the exhaustive statistics are based on very comprehensive declarations for administrative purposes. Almost all the firms subject to tax under the so-called "real normal" regime, in other words 550,000 firms representing 96% of the total turnover, fill in every month a VAT declaration (CA3) which shows their turnover. Only the very small firms, subject to the so-called "simplified" tax regime, or those whose turnover does not exceed 5 million francs, merely make an annual declaration (CA12). From this population, INSEE draws a sample of 50,000 industrial firms and 72,000 service firms, from which it builds this indicator. But it is true that it can be affected by an underestimation of enterprise creations since INSEE only takes into account firms in the sample for which they have usable data for both the current month and the same month of the previous year. However, this bias is not one-way, with overestimation also possibly occurring if surviving firms take over the business of disappearing firms that do not form part of the sample. A new procedure taking better account of enterprise demography is now being introduced.

These indices measure the overall turnover of firms and therefore make no distinction between products if the firm has a number of different activities. In French statisticians' jargon, the data are said to be "sectoral" data, by opposition to "branch" data. However, it is interesting to measure the explosion of the telecommunications market (NAF 64.2), one of the ITC spearheads, using this index (see graph 2). What with mobile telephones, the internet and growth in communications, the turnover measured by this INSEE index was multiplied by more than 3 in ten years, despite the fall in prices. This spectacular result confirms the idea that France, and more particularly Europe, is taking the lead in the mobiles market, whereas the United States now has leeway to make up in this important technological field (handsets, 3G software). A comparison with the data that has recently started to be collected by the Autorité de Régulation des Télécommunications (ART) shows that the INSEE index moved the faster in 1999, since it covers operators other than those falling under ART. For the year 1999, the INSEE "telecommunications" index rose by 17%, whereas the market for fixed and mobile telephones for firms licensed with ART rose by 13%. However part of this 17% rise in the INSEE index is to be attributed to telecommunications sectors other than mobile telephones and also probably to an incorrect classification of certain firms. The borderline between "telecommunications" and IT is becoming more and more tenuous. This is one example of the fact that the overall figures are properly measured but that it is not always easy to break them down between products.

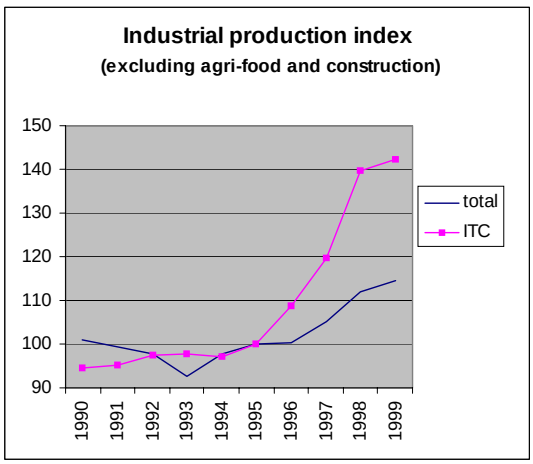
Another indicator that is rapidly available albeit not at current prices, the monthly industrial production index (IPI)[12], also covers ITC branches producing equipment. Unlike the turnover indices, this is calculated "in volume", measuring either the *quantities* produced or delivered or the *deflated* invoices, i.e. adjusted for price changes. This indicator is therefore affected by the difficulties of separating volume and price changes that will be dealt with in the following section. For IT equipment, the IPI, since the introduction of base 95 in 2000, has measured the output of PCs and more generally of PC-related equipment, which had previously not been included. The output of electronic components is captured through the invoices deflated by an appropriate index. The IPI also satisfactorily measures the explosion of the production of mobile telephone handsets using deflated invoices. On other hand, the production of large-scale IT equipment remains excluded from this measure because of the lack of an appropriate price index. Graph 3 shows the IPI for ITC compared with the overall index, making it possible to appreciate the explosion of ITC products made by industry since 1995, which have been a driving force behind the overall index for manufactures, even though it did not entirely escape the slowdown in economic activity in 1999.

[12] Part (15% of the weighting) is nevertheless collected quarterly. Its monthly value is then initially estimated and then re-calibrated on the quarterly figure.

Graph 2



Graph 3



Given the absence of certain branches from the coverage of the IPI, the quarterly national accounts tend rather to use the turnover indices than the IPI to measure the production of ITC goods. In the case of ITC services they use the turnover figures exclusively. Given the reliability of these statistics, in the final analysis, there is nothing to say that the overall activity of the ITC sector is incorrectly captured in the current-price production statistics in the national accounts. As indicated previously, the turnover indices are very exhaustive, although possibly underestimating the impact of start-ups. Revisions occurring between the initial estimates and the so-called "semi-definitive" and "definitive" figures are therefore possible, but not appreciably more so than for other branches.

On the other hand, the breakdown by type of product of sales by producer firms and, as a consequence, the detailed content of investment in ITC products are less well measured. It is thanks to the second storey in the edifice of statistical monitoring of firms that this breakdown is carried out. This storey comprises the annual enterprise surveys (EAE), which in fact cover all the ITC sectors and are processed during the second half of year Y+1. The EAE make it possible to collect the initial accounting data from firms (200,000 firms are interrogated) and provide benchmark information on the breakdown of the turnover and workforce numbers by branch and, albeit incompletely, on investments in ITC fixed capital. These surveys are comprehensive for firms with more than 20 employees in industry, 30 in services and 15 in distribution and are on a sample basis for the small firms. However, they are not used directly by the national accounts statisticians to evaluate activity in year Y since at the time this is calculated (i.e. in January of Y+2), an even more complete source is available, emanating from the tax authorities and comprising 500,000 firms.

The national accounts nevertheless rely on the EAE for the branch structure. It is the EAE that provide the breakdown of sales and workforces by branch as well as certain indications -- increasingly rare, unfortunately -- on investment by type of product. The information regarding additions to fixed capital in the form of software, IT equipment or telecommunications equipment, essential notably to distinguish between final expenditure and intermediate consumption, are incomplete or non-existent because of the desire to limit the statistical burden on firms. This makes the separation between final expenditure and intermediate expenditure unreliable (see below).

How does this three-storey edifice stand up to the e-commerce wave? First, the scale of B2C (Business to Consumer) e-commerce, the form that counts for the measurement of GDP, is still very marginal. The same cannot be said of B2B (Business to Business), which seems set to expand considerably (see box), but does not enter the calculation of GDP, being intermediate consumption. Although it is measured in the national accounts, the problem of its measurement does not fall within the scope of the discussion in this article. Next, if problems are encountered in identifying the size of the e-commerce sector, because of the difficulty for firms to choose the right category for themselves in the current classification, this does not mean that sales via the internet are excluded from the official statistics. The turnover involved, including exports, will be declared by firms (in particular in their CA3 declarations) in exactly the same way as for the traditional mail-order circuits, even though they may not appear under the correct product heading. In France there is nothing new about this phenomenon, since the Minitel videotext network can be assimilated to e-commerce.

Nevertheless, there remains one loophole, namely transborder transactions. Online purchases of software and music in MP 3 format from foreign traders are not captured by the customs statistics. Similarly, online purchases of merchandise sent by post from abroad (notably books and musical CDs) are not recorded by Customs, inasmuch as the amounts involved are below the threshold for declaration. Even so, these flows are not entirely excluded from the statistics. The "tourism" heading of the balance of payments and the national accounts record purchases made abroad using payment cards. Whether the purchase was actually made abroad or sitting in front of one’s PC makes no difference. The transaction will be recorded even though it will not be possible later to identify the nature of the product that was bought.

It is however surprising to find that in both the French and American national accounts the imports and exports of software are very small in relation to production. In the case of France, imports of software are estimated to be around 7 billion francs and exports 6 billion (figures for 1998), compared with production of 240 billion. The corresponding figures for the United States are, respectively, 0.5 billion dollars, 4 billion and 254 billion (figures for 1996)[13]. Since much of this consists of local services (services between or within firms), it is normal that the foreign trade ratios should be smaller than for merchandise. However, on digging deeper, it becomes apparent that a large part of the software is classified either in the statistics for the merchandise in which they are loaded (like the CD-ROM or the IT equipment in which they are incorporated), or in the "tourism" heading as indicated above, and not as software. As in other cases, this would seem to be a problem of classification rather than an omission. However, there remains an uncertainty regarding the recording of software downloaded directly via the internet from abroad (or from France) by a French or foreign subsidiary responsible for marketing it. Strictly speaking, it would be necessary to impute an export or an import of an original piece of software, and this is not done.

[13] The mystery deepens when one finds that, according to OECD statistics, the world's leading exporter of software is Ireland! The country's rapid growth and the fact that Microsoft Europe is based there are certainly contributory factors, but not totally convincing as explanations.

E-commerce statistics

INSEE does not as yet produce official statistics regarding e-commerce. In the case of B2C, the figure usually quoted is of the order of a few billion francs, roughly the annual turnover for a single hypermarket. Even though these figures are somewhat distorted in France in that the Minitel has to be considered as e-commerce, this remains negligible in macroeconomic terms.

One reason is that, until now, the large retailers have not yet become involved in this market, except on a trial basis, partly because of the heavy logistic costs, which have tended to rise in recent years. For the pessimists, B2C will therefore remain simply a more modern form of mail order, with all that market's limitations. It is nevertheless becoming significant in two broad sectors: tourism and air transport and on-line IT goods, books and records. This indicates that the internet is enabling mail order to be extended to non-traditional markets. Some have even detected a gender factor: men buy very little from ”paper” mail-order catalogues but are heavily involved in the internet. However that may be, the internet is bringing long-distance selling to new markets, namely purchases of intangible goods (hotel rooms) or ones that require very little logistic investment (small parcels, delivered by the Post Office).

On the other hand, all the experts agree that B2B (Business to Business) has undergone and will continue to undergo a much more important expansion. An explosion is in sight, illustrated by the investment made in "market places" (sites of a more or less open nature for commercial dealings between firms, often multinational). Competition, standardisation and zero-inventory should generate significant economies in purchasing costs, which would then be passed on to consumers in the form of price falls. The most optimistic observers believe that B2B will thus have a significant impact on growth over the next five years. If this takes place, the indirect impact on consumption will be measured in the national accounts. But in the meantime, since B2B covers intermediate consumption, measuring it has no direct impact on the measurement of global growth but only on the allocation of GDP among branches.

The official statistical agencies in the United States have not as yet obtained comprehensive direct data regarding e-commerce, any more than their French opposite numbers. The first American surveys dealt only with the retail sector, whereas the principal traders, even for B2C, are not classified in this sector. Other surveys are now being launched. Meanwhile, the data used emanate from private or academic research. In many cases they are presented in the form of shares of GDP. On this point, the BEA [24] points out that the impressive sums mentioned in some studies have to be put in perspective since they contain a large amount of IC and double counting. For example, reference has been made to a figure for e-commerce turnover in the United States in 1998 of 330 billion dollars, or 3.5% of GDP. However, when one applies the normal ratios of value added to turnover to these figures, the actual contribution of e-commerce to GDP is halved.

Finally, in an “outhouse” to our three-storey edifice of business statistics, there are certain figures relating specifically to the markets of the public-sector enterprises. These, which for a long time were not subject to competition and were imbued with a "public service" mentality, were prepared to supply INSEE directly with their main aggregates as well as detailed figures from the analytical accounts. However, deregulation means that this statistical source is drying up, since this information has become of strategic importance vis-à-vis competitors who themselves refuse to supply the corresponding data. This is creating adjustment difficulties for the statisticians. The case of mobile telephones, the ITC product with the most rapid growth in recent years, is one example.

Consumption calculations in the national accounts for the "telephone services" item were therefore for a long time based on statistics from France Telecom, because the history of the telephone market was largely indistinguishable from that of the former monopoly. It was assumed that household expenditure at current prices tracked the turnover of France Telecom, adjusted in the light of information regarding the distribution between households and the corporate sector, also supplied by France Telecom. The delay in introducing a system of observation covering all the operators, licensed or otherwise, made the first evaluations, made in the early part of 2000, of the evolution of turnover in

the telephone sector (fixed plus mobile) in 1999 a somewhat delicate exercise. In the provisional accounts, the evolution in household consumption was estimated to be +7.9%.

The telephone market, at current prices: comparison between the INSEE and ART figures

.	1998 (FFR million)	1999 (FFR million)	99/98 (en %)
Household consumption (provisional national-accounts estimate, at current prices)	75373	81296	+7.9
Turnover, fixed plus mobile, households and firms (excl. tax, in million francs, source ART)	122627	138739	+13.1

However, the figures subsequently compiled by ART regarding the whole of the licensed-operator market, households and firms combined, showed an increase of 13.1%, including firms' intermediate consumption. As it is likely that the distribution between IC and household consumption was distorted in favour of households in 1999 (see below), it is now estimated that the initial evaluation of the rise in household consumption at current prices was an underestimate. This will be corrected in the revised accounts. As for consumption in volume terms, measurement is even trickier because of the difficulties of distinguishing between movements in volume and prices in the absence of an appropriate price index for mobile telephones.

III. The distinction between volume and price movements

Calculation of growth requires that evolutions in current prices be separated between movements in prices (up or down) and movements in volume. When one speaks of growth, it is the movement in volume that is referred to. The distinction between volume and price movements relies on the quality of the price indices. If the price index overestimates inflation, then *by construction* the volume index will underestimate growth, although the reasoning is not quite as simple as this in reality [27]. Not only that, it is then necessary to "aggregate" these volume indices to arrive at GDP (see box).

Aggregation at constant prices

Another difficulty -- not as important -- in measuring growth in volume terms lies in what the national accounts statisticians call "aggregation". GDP is the sum of the value added in all the branches. To make this summation it is therefore necessary to add together cabbages, tonnes of steel, cars, etc. For this purpose, the statisticians put a value on each quantity using a price that reflects its relative utility, and add together these values expressed in francs (soon in euros). Then, to prevent inflation distorting the measurement of growth, they take these prices as fixed, so that the same price structure is applied to different periods -- hence the expression "constant prices".

This technique has a shortcoming. When a given product's relative price falls very rapidly or when the quantities sold rise sharply, as has been the case for computers since the beginning of the 1980s, the use of a fixed price structure dating from a previous year leads to an overestimation of the recent growth. This is because what has been done amounts to weighting the quantities sold today by the ancient year's high relative price, whereas, if the quantities are rising sharply today, this is precisely because their relative price has fallen. INSEE corrects for this overestimation bias by calculating the annual accounts at the prices of the preceding year, chained [3]. The quarterly accounts are still calculated on a fixed base (1995), but this is renewed every five years and the (upward) bias for the current year is negligible.

There is a difference to be noted between the French and American aggregation methods. The American statisticians use Fisher volume indices, while the French use chained Laspeyres volume indices. According to [37], if France were to use similar Fisher indices, French annual growth would be reduced by a little less than one-tenth of a point.

The national accounts make considerable use of the consumer price index (CPI) and the producer price index (PPI) calculated by INSEE. These indices compare, using a representative sample of products, the prices of one period with those of the preceding period. This comparison clearly only makes sense if the product is strictly the same. This is often true, but there are products that are constantly changing, such as computers and most ITC products. It is common knowledge that a given computer model remains on the market only a few months.

Directly comparing the prices of two different computers would be just as erroneous as evaluating household consumption of computers on the basis of the number of units sold, which would imply counting just the "box" and not the power of the instrument. Moreover, if this were done on the basis of INSEE's permanent survey of household living conditions, one would obtain an increase in household consumption much lower than the one recorded in the national accounts. Between 1997 and 2000, the number of units sold to households, according to this survey, rose from 650,000 a year to 1,170,000, an increase of 80%. However, the national accounts put the volume rise between 1997 and 1999 at more than twice as much (there are no figures as yet for 2000).

One solution for the recording of prices is to take only those computers which are strictly comparable (the method known as "splicing" in English), which amounts to using the price of a new model only at the time of the second period it is present on the market. However, given the frequency of appearances and disappearances of computer models, this seems unsatisfactory, as part of the price change occurs at the time of the

appearance of the new model. Another method has been used to assess the price of a new computer at the time of its appearance. This method, known as "hedonic"[14], consists of making an econometric evaluation, on the basis of market data, of the price of certain characteristics (clock speed, size of memory, size of hard disk, brand, etc.)[15]. By then applying the results to the characteristics of the new computer, a price differential is estimated by comparison with the older models, at the time it comes on the market. This differential can in theory be either negative or positive. In practice, most studies made regarding computers have shown that, thanks to competition and technical improvements, the differential is negative, therefore leading to a steep a fall in the price indices[16].

Widely used in the United States, but rarely in Europe, the hedonic method has been applied by INSEE in France since the beginning of the 1990s for the producer prices of two products, PCs and desktop printers. The first French study of PCs, carried out on data for the period 1988 to 1991, had shown that the difference between a price index using the "splicing" method and a price index using the hedonic method, was around -4% a year. This difference has been tending to widen, and has now reached an annual rate of -8%. For information, the present (hedonic) producer price index for PCs, with 1995 as 100, was 20 in December 1999, meaning a fall of 80% in five years. As for the corresponding consumer price index, which uses the "splicing" method, this is around 35 (still with 1995 as 100), giving a fall of 65% in five years. The difference between the two indices is partly due to the non-utilisation of the hedonic method for the second index, which covers household consumption of computers, an item that is still small in the overall resource-use balance for the product. There may be other explanatory factors.

In INSEE, the use of the hedonic method has remained confined to the producer prices of PCs and printers and to two "varieties"[17] with a relatively small weight in the CPI. This restriction is due to technical reasons (the method is not fully capable of being generalised) but essentially to the cost of implementation, although some economists contest the method itself (see box). On the other hand, it is much more widely used in the United States in the two statistical agencies concerned (the Bureau of Labor Statistics and the Bureau of Economic Analysis). Today, hedonic methods are used in the United States for all computers (and no longer only PCs), for all peripherals, for a substantial part of software[18] (the so-called "pre-packaged" software. extrapolated to other segments of the software market) and also for electronic components. As long ago as 1995, A.Wykoff [44] was stressing the major implications of this difference in method for international comparisons of productivity.

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[14] The word comes from the fact that the chosen characteristics have to have "utility" for the consumer. In fact, the hedonic method, like the prose of Molière's "Bourgeois Gentilhomme", is used unwittingly in a number of very simple cases: when, in comparing the price of a two-litre can of motor oil with the price of a one-litre can of the same category, one divides the price of the first can by two to obtain the price of a litre, one is applying the hedonic method without realising it. This illustration is much cruder than the methods actually used, since these take into account the prices observed on the market. If observation of the price of cans of oil of different capacity showed that the relationship between price and quantity was not linear, the price might not necessarily be divided by two, perhaps by more, perhaps by less. The complication for sophisticated products stems from the number of characteristics, hence the need for econometric methods. This is why some prefer in fact to use the term "econometric method" or "characteristics method".

[15] It should be noted that the hedonic method, even so, does not manage to compare all the new PCs. For example, the inclusion of innovations like DVDs cannot be taken into account. In other words, even the hedonic method is impotent to deal with genuine new products.

[16] A French study in 1997 [8] failed to confirm this general result for the period 1991-1995. But this period had been marked by a drastic modification in the constructors' rebate policy and this may have affected the results. A separate French study [2] dealing with washing-up machines nevertheless confirmed that the direction is not always negative for all products.

[17] The name given to the most detailed product identification in the CPI.

[18] There is no system for the direct observation of prices of software in France. The software deflator used in the French national accounts is the index of labour costs in the IT services sector. Such an index, adjusted for the reduction in hours worked, is suited to "made-to-measure" IT services or services internal to firms. It is less suitable in the case of standard software sold ready for use. The price of software in the French national accounts has in fact been rising, whereas the price of software in the American national accounts has been falling, although not nearly as much as the prices of equipment.

The hedonic method disputed

Some economists believe that the hedonic method overestimates price falls. It is true that these have been particularly large in the case of computers, reaching 25% a year in the United States. D.Baker [1] points out, for example, that the assumption of a 15% improvement a year in the quality of an office PC used by firms would imply the profit generated by this computer being at least 15% higher from one year to another, which he regards as unlikely. And yet, firms regularly replace their stock of computers with ever-more-efficient ones.

Other arguments are put forward, including some that make the point that the users do not in fact take advantage of the power of the new machines and that they have improvements "imposed" on them that bear no relation to utility. However, if there is competition on the market for PCs and if the appropriate demand exists, there should be a manufacturer offering computers without these improvements and hence at a lower price. In that case nothing would be "imposed" on anyone. It has to be remembered in this connection that the hedonic method is based on actual observation of prices, allotting to each characteristic of the computer a share in a price differential that is observed on the market. If a characteristic contributes little or nothing to the price differential observed on the market, it will have a zero or negligible weighting in the determination of the quality effect, unless there is an erroneous specification of the model.

However, others assert that the difficulty lies precisely in the specification of the model. Not taking into account certain characteristics could bias the coefficients applied to these characteristics. For example, McCarthy [29] points out that there is no "software" factor applied to PCs in the hedonic model. But the computer needs software in order to work, and a very substantial part of the progress in the power of hardware is used to meet the needs of software that is becoming increasingly complex -- although not necessarily more useful. This means that it is necessary to measure the whole “package” and not merely the hardware elements.

Triplett [41] puts forward two types of reply to this argument. First, just as the consumer price for the use of a car is measured by a weighted index of evolutions in the price of the car and of the petrol, the index of use of computers can be measured by a weighted index of evolutions in the prices of the hardware and the software. And prices of software decline much more slowly than prices of hardware. A price index for the use of computers will therefore move much more slowly than the price index for the hardware, but this does not call into question the fall in the price of the hardware as such.

Secondly, it is true that the hedonic models for hardware do not take account of software loaded into the computers. However, for Triplett, this error would not mean an upward correction in the adjusted price but rather a downward correction, as it is probable that the incorporated software becomes more efficient over time, even if not to a very great extent. Taking it into account would therefore mean reducing still further the adjusted price of a new model. All things considered, for Triplett, the question is not so much that the hedonic method is bad in itself, but rather that it has been applied only to computers. In other words, if the method had been applied also to other goods, would that not have led to falls in their prices as well? In that case, the restriction of the method to computers would mean a distortion in the measured evolution of relative prices.

The reader is referred to [25] for still more recent arguments in defence of hedonic indices in the United States.

Comparison between the price indices for GFCF in the United States and in France for hardware and software over the period 1995-1998 confirms the existence of a significant difference, resulting in an annual trend differential of -10% on the hardware (-24% compared with -16%) and -4% on the software (-2.1% as against +1.7%) for the years 1995 to 1998. The difference is probably greater for those European countries that do not apply the hedonic method at all.

Price indices for hardware and software

	Value of the index in 1998 (1995 = 100)	Average annual increase 1995- 1998
France: GFCF in computers and other IT equipment (HE31b)	58.6	-16%
USA: Computers and peripheral equipment	43.3	-24%
Above index adjusted for the dollar	*51.9*	*-19%*
France: GFCF in software (GN21)	105.2	+1.7 %
USA: Software	93.6	-2.1%

But the difference is too large to be explained solely by the more extensive use of hedonic methods in the United States than in France. It is important to note that the dollar has appreciated substantially over this period (6% a year on average in 1995-1998) and a substantial part of the French GFCF is imported from the dollar zone. To illustrate this, the row in italics in the above table shows the American index for IT hardware adjusted for the dollar exchange rate. Instead of a fall of 24% a year, the hardware index falls by only 19% a year and comes distinctly closer to the French index. It is therefore normal that the prices of French GFCF should fall more slowly than in the United States. All in all, however, as we shall see later, the impact of the difference on growth remains limited.

But there are other ITC products for which the statistical recording of prices is still inadequate. This is the case, for example, of mobile telephones, a sector where the construction of a price index is particularly delicate[19]. Pending the specific index that INSEE is now compiling, the national account statisticians have been using the price index for "telephone services" in the CPI to calculate, by deflation, the volume of household consumption of mobile telephony. But this index still covers only fixed telephony (excluding the internet). On an annual average basis, it rose by 0.3% between 1998 and 1999, a reasonable evolution in the case of fixed telephony, but far off target for mobiles, a sector in which the average price per minute is thought to have fallen by 28.8%. It is true that 1999 is probably the year in which the divergence between the evolution in the prices of fixed and mobile telephony was most marked.

Underestimation on this scale of the fall in the price of mobile telephony would automatically mean a significant underestimation of the growth of consumption in volume terms, if one accepts this as being measured by minutes of consumption (see box). The other telecommunications sectors are perhaps in the same situation[20]. In the United States [24], it has been shown that if the traditional price indices were replaced by price indices showing declines that are compatible with the huge progress made in transmission capacity, this would increase measured overall growth by roughly 0.1% a year.

[19] Not only are the subscription systems, including the price of the handsets, very complex, but consumers readily change operators.

[20] Recording of the market and the price of communication on the internet is going to become essential. Volumes are going to soar (France is lagging behind the other European countries) while the price should fall substantially.

Price indices and average price

The analysis of the bias relating to the price of mobile telephony is heavily dependent on the statistics for minutes of consumption and hence, as a corollary, on the average price per minute. The average price is equal to the turnover divided by the number of minutes. The use of the overall average price is disputable because it mixes everything together: the price changes, the changes in consumer behaviour, differences in quality of service. It is possible that a genuine index for the price of mobile telephony would not register a fall of 28.8% in 1999, as this could stem, for example, from a substitution of lower-cost off-peak use for the dearer peak periods. However, seen from another angle, the average price is particularly well suited for periods of fierce competition, since it takes into account the market share gains by the operators with the most competitive prices. This has typically been the case for mobile telephony in recent years and it was the case for air traffic in the first half of the 1990s, when the national accounts had deliberately chosen passenger-kilometres (in other words an average price) as this seemed more meaningful than the volume obtained by deflation using the CPI.

In fact, the principal difficulty for the price indices is perhaps not to be found where one would expect it, i.e. among the ITC products themselves, but among the services making use of ITC products. The price of services and their quality are particularly difficult to capture [30]. Several economists have pointed out that it was strange that there were little or no measured productivity gains to be found for certain service sectors that are large users of ITC investment. Fortunately, much of this falls in the domain of inter-enterprise relations (B2B, accounting) and so is intermediate consumption, leaving the measurement of overall growth unaffected. Only the distribution between branches is concerned.

But this still leaves the sectors that sell directly to households and even here, for services as banal as insurance or financial services, the measurement of price indices is no easy matter. And these are the sectors in which substantial ITC investment has been made in recent years, improving the convenience enjoyed by the consumer. The most recent services of this kind are for the stock market or online consultation (see box on free internet access).

Free internet access

In certain activities, like banking services or stock-market transactions, the price of online transactions is much smaller than through the traditional circuits. Certain banking sector consultants are saying that the internet will revolutionise the market since the banking "product", which has now become virtually “paperless”, is ideally suited to it. However, looking beyond these services, we see on the internet an increasing number of services that are “free” (apart from the telephone communication) because they are financed by advertising. For the purposes of the national accounts, a product with an apparent price of zero does not count. For example, the "consumption" of television in France is equal to the amount of the licence plus any subscriptions to coded, cable or satellite channels. There is no household consumption recorded for the traditional channels that are free because financed by advertising, even though viewing figures in hours would show that they have a substantial part of the cake. As for the channels financed partly by the licence and partly by advertising, these are treated as if only the "part" financed by the licence was household consumption.

It is the firms that advertise on the television channels that are the "consumers" of the channels, in the form of intermediate consumption not included in GDP. The expansion of free services on the internet, financed by advertising, will be treated in the same manner. It will increase neither household consumption nor GDP but will mean a shift in the added value of firms purchasing the advertising banners towards the branch producing the online services. On the other hand, if this phenomenon tends to diminish the consumption of traditional paid services, this will reduce GDP, everything else remaining equal. For example, if an encyclopaedia is put online and if this leads to a fall in sales of "hard copy" encyclopaedias, GDP will decline. Fortunately, there is no such thing as an "everything else remaining equal" situation: the economy made on the free service will be shifted onto a different product.

And what about piracy? Everyone knows that PCs (there were almost 8 million in the hands of French households at the beginning of 2000) are loaded with pirated software and the record collections of young people contain numerous CDs that have been copied in violation of the law. These products have mostly been obtained free of charge or at a very low price. Their "production" is limited to a transfer or a "burn". The national accounts do not record these flows, which are internal to the household sector. These problems are not new, although their scale may have increased with the new technologies.

Observation of the series for consumption in volume terms and the productivity of the financial sectors hangs a question mark over the estimation of deflators used, which may have been overestimated[21]. The figures show a stagnation in household consumption in volume in the sector since 1990, as well as in labour productivity (see graph 4). This result could stem [28] from an underestimate of the increase in the quality of services rendered, especially in the banking sector through the introduction of electronic banking transactions, electronic "counters", etc. The volume of the newly-created services is not measured but the cost of creating these services is.

Finally, more than 20% of the total effective household consumption involves state-provided services such as education or healthcare, for which the calculation of price indices is also difficult. How can one calculate the price and volume of hospital services financed out of global budgets? The national account statisticians hesitate between taking a volume indicator (such as the number of days spent in hospital) and deflation using a cost index (for example, an index of remuneration). The index of days spent in hospital is no longer usable inasmuch as the improvement in surgical techniques is reducing the number of days a patient is hospitalised. This would give a false impression of a decline in hospital services. As a result, the statisticians have fallen back in recent years on deflation through a price index reflecting the increase in the price of the principal

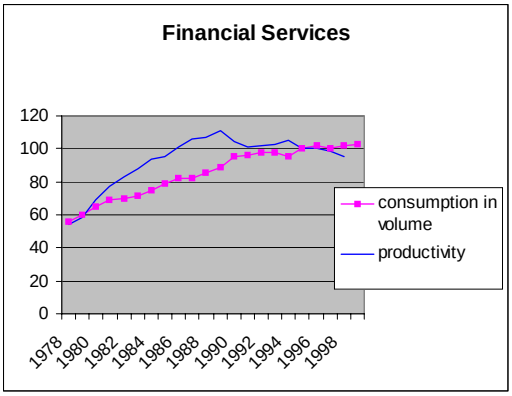
[21] As regards productivity, there is no denying, either, that the denominator (the volume of work) is difficult to measure with precision, especially in terms of duration and quality.

input, namely the increase in the index (i.e. excluding GVT[22]) of remuneration. But this method is also criticised for not totally taking into account the improvement in the productivity of doctors and hospital workers. Only the so-called "GVT" increase in the total wage bill is counted as an increase in volume. Studies are now being made aimed at using an index based on the number of hospital stays (and no longer the number of days) weighted by highly detailed costs for individual types of illness.

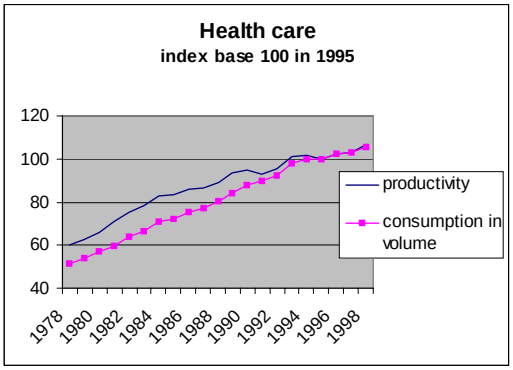
Despite all these difficulties, the national accounts data regarding state-provided services fail to confirm that labour productivity is incorrectly taken into account. The growth in the apparent productivity of labour in the healthcare services in the national accounts was 80% in 20 years (as against only 10% for education), i.e. 3% a year. It is true that it has slowed down substantially in recent years (see graph 5), falling from an annual growth rate of 4% in the period 1978 to 1988 to 1% in 1988-1998. And yet the sector has recently benefited from several technological revolutions closely linked to ITC products (microsurgery, medical imaging, etc.). In this field, too, international comparisons would be necessary to verify the convergence of methods.

With the emergence of e-commerce, the possible sources of measurement difficulties have to be extended to what has been called the "outlet bias" [27]. If the price of a product sold to households over the internet were to turn out to be systematically lower than in the traditional distribution circuits, the substitution of one for the other should lead to the recording of a fall in prices which the traditional price indices have difficulty in taking into account. However, for the moment, the B2C marketing circuit is for the moment generating very small turnover figures, except in certain sectors. Only if these circuits acquire substantial market share, as was the case for the super- and hypermarkets in the 1980s and 1990s, will the problem become statistically significant. At the time, the "purchasing-circuit bias" was put at 0.1% a year [27]. The internet still has a long way to go before reaching such a figure.

Graph 4



Graph 5



[22] GVT: glissement-vieillesse-technicité. This expression essentially means changes in individual remuneration for length of service, additional qualifications, etc.

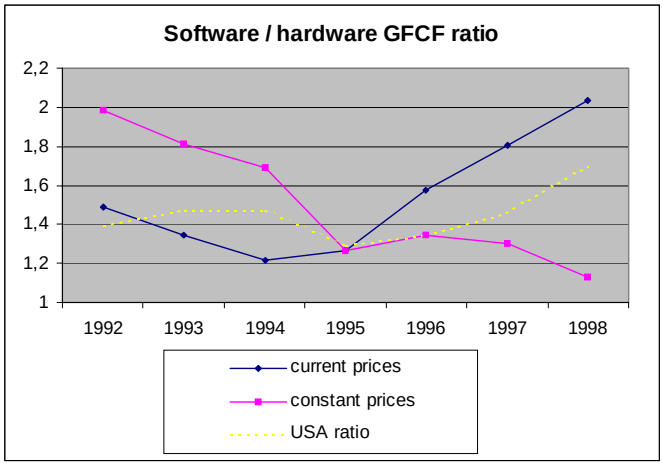
IV. The breakdown between final expenditure and intermediate consumption

As we have seen, the measurement of GDP is partly determined by the breakdown of expenditure between "final expenditure" and "intermediate consumption". The borderline between a current expense and an investment is not always clear-cut, especially when efforts are being made not to overburden firms with questions on the breakdown of the intermediate consumption and the nature of their additions to fixed capital. Even if there is reason to think that the firms themselves underestimate their investment in IT equipment and software, it is important not to stray too far from the conventions applied for private accounting [30].

As a result, the estimates of software GFCF for France in base 95 were based on firms' accounting data. However, the exercise was made very delicate by the quality of these data. In practice, only the annual survey of industry seemed to give reasonable results regarding the value of "intangible investment in software". The national accounts therefore took this source, adding a flat-rate estimate of GFCF in software produced for own use, in other words corresponding to expenditure on the software produced by "in-house" programmers. For the service sectors, the annual surveys do not yet give reliable results regarding the "investment in software" variable. The level of GFCF in software for the base year 1995 was therefore estimated from a one-off survey as being 10% of the sum total of the accounting items "other intangible additions to fixed capital" and "invested production", except for the IT and software sectors, for which the totality of these items is taken, and for the small firms, for which the percentage applied was 14% instead of 10%. This resulted in an evaluation of a little over 20 billion francs for GFCF in software by non-financial firms. Another one-off study estimated that purchases of software from IT service companies (SSII) by general government and banks and insurance companies were 40% and 35% respectively of those of the other firms. As a result, these ratios were applied to the 20 billion previously calculated to arrive at French GFCF for general government and the financial sector, giving an estimated total for the GFCF in software for the year 1995 of 36 billion francs.

It is interesting to see what ratio between GFCF in software and GFCF in equipment is arrived at by this very indirect method, since software is an expenditure that is closely linked to equipment. Graph 6 shows that for the year 1995 the ratio is roughly 1.3, close to that used in the American national accounts. As in the United States, the ratio has been rising in recent years. However, the heavy expenditure on software linked to the year 2000 or to the euro could hardly have had an impact as early as 1998. What we have is probably a price effect, with the price of equipment falling much faster than that of software. The same ratio calculated on a volume basis has in fact shown a tendency to decline.

Graph 6



But is the breakdown in France between GFCF and IC for *equipment* better than that for *software?* As in the case of software, the EAE do not make it possible to obtain relevant information on additions to fixed investment in IT equipment, so that the CNIS report on the ITC [36] makes the improvement of this information one of its prime recommendations. An analysis of the new base 95 has shown that GFCF in equipment may have been underestimated by 10 billion francs in 1992. The fact that, as in the case of software, firms do not feel obliged to declare this expenditure in the form of additions to fixed capital because of the rapid turnover, is an argument in the same direction

A different approach is to compare the breakdown of domestic resources (output plus imports minus exports) between GFCF and IC in France and in the United States. In France, resources in the form of IT services (including production of standard software and software for own account) were estimated to be 252 billion francs in 1998, 178 billion being IC and 62 billion GFCF, the rest being purchases by households. The intermediate consumption (advisory services, repairs and maintenance of software or production of software incorporated in equipment) was therefore put at three times the activity for the creation of new software added to fixed capital. In the United States, the resource consisting of "IT services" for the year 1996 is put at 253 billion dollars (including production for own account), 117 billion being IC and 126 billion being investment, the rest being for other uses (households). GFCF is therefore substantially larger than IC. The breakdown between intermediate and final uses is therefore very different in the two countries.

This difference may be explained by differences between European and United States industrial processes. But it appears in fact to be a more prosaic matter of different statistical conventions. The OECD is currently analysing this question and it will be necessary to wait for its conclusions. Nor is the difference peculiar to France: the GFCF/IC ratios for IT services in the Netherlands, the United Kingdom and Italy are much closer to the French than to the American (see graph 7), with Germany somewhere in the middle. What we have therefore is most probably a difference between the methods used by various European countries and those used by the United States. In France, as we have seen, the starting point is the amount of the additions to fixed capital declared by firms, and then using an approach via the demand side -- as had in fact been advocated by a Eurostat working group. This makes it possible to avoid the double counting inherent in statistics of sales and the fact that part of the software is already incorporated in the equipment. It also makes it possible to remain close to the recording of corporate earnings as shown in companies' books, although, at the same time, it is affected by uncertainty over the quality of the responses from firms. In the United States, on the contrary, the national accounts statisticians have chosen a supply-side method, by classifying the totality of the sales by the IT services companies falling under the "pre-packaged software" and "computer programming" as GFCF.

In the one case, therefore, priority is given to consistency with company accounts, while on the other, starting from the idea that firms do not allocate all the software to fixed capital, the inverse convention has been adopted. When is the activity of the IT department of such a firm an addition to fixed capital? When is it a current expense? It has to be admitted that the breakdown is partly conventional in nature. However, departing from the recording carried out by the firms' accountants has the disadvantage of arriving at profit ratios in the national accounts that differ substantially from those in the private accounts. Counting all software as investment amounts to increasing substantially the current profit ratio derived from the private accounts. Moreover, recording as GFCF the totality of sales could lead to double counting, notably as a result of sub-contracting. In any case, it would have been desirable to adopt the same conventions on both sides of the Atlantic[23].

[23] This debate has been very well presented by Daalgaard [14], who, as early as 1999, showed the implications of this choice for GDP. His own country, Denmark, is one of the European countries that has chosen a supply-side approach and hence naturally arrives at a ratio as high as that of United States.

Another uncertainty has been raised by an OECD survey of national accounts statisticians in its 29 member countries showing that there was no convergence in the handling of the high expenditure linked to the Y2K bug [39]. Some seem to have treated it as IC (as a "repair"), others more as GFCF (on the grounds of its being an indispensable expenditure to keep capital equipment in use for a longer period). In France, the expenditure was split between GFCF and IC pro rata to the breakdown in the base year.

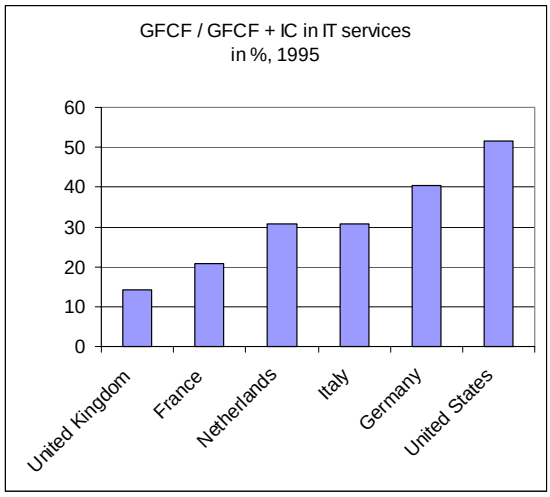
Finally, the same difference as for the software exists for the breakdown between GFCF and IC for equipment in France and the United States. In France in 1998, it was considered that 58% of the non-exported resources consisted of parts or equipment built into other products (aircraft and ships, for example) and only 31% of equipment directly added to fixed capital. The figures from the American accounts for the year 1996 show almost exactly the reverse: 55% of equipment being directly added to fixed capital and 35% consisting of intermediate consumption.

In the end, unless these different conventions can be justified, they can generate serious differences in the statistical measurement of growth. With investment of both equipment and software increasing very rapidly in volume terms, significant differences in the level of the breakdown between GFCF and IC are going to have a substantial impact on the comparability of the growth figures. This impact will be quantified in the following part.

The problem of the breakdown between final expenditure and intermediate consumption is not confined to IT products. The breakdown between the household and corporate sector of the telephone market is another tricky point in the calculation of the national accounts, as the public statistics provided by the ART make no distinction between these two markets. Even if they were available, these figures would be difficult to interpret because they would make no distinction between the consumer and the self-employed entrepreneur. Moreover, many households buy mobile phones for themselves and subsequently obtain the reimbursement of the "professional" calls from their employers. This reimbursement is completely ignored in surveys of operators. However, the greatest uncertainty for the measurement of growth involves the evolution of this breakdown. For lack of data, the national accounts statisticians have adopted a fixed scale from one year to another in their calculations on this point.

Graph 7 : share of GFCF for IT services

The GFCF / (GFCF +IC) ratio is very high for the United States by comparison with European countries



V. Can the impact on overall growth be quantified?

We have identified for main categories of problem in the measurement of the impact of ITC on growth:

(1) uncertainty over the decline in prices of computers and software,

(2) questions regarding the split between GFCF and IC for computer services and computer equipment,

(3) incorrect assessment of the market for mobile telephony and the price falls in this sector,

(4) underestimation of productivity gains in financial services.

In order to be able to talk of "bias" in each of these fields, one would have to have an idea of the *true* values. And we do not have these true values for software and equipment. However, we can at least reply to the question: “if we were to use the American ratios and indices or if the Americans were to use ours, what difference would this make to the respective growth figures?”. We can then have a basis for comparison of the relative biases affecting French and American growth.

For mobile telephony, the situation is different, since we can compare the figures from our own calculations with the latest statistics published by ART, which can be considered as representing the true value. For financial services, no true value is known and one has to be content with adjusting the tendency in present consumption by extrapolating past consumption.

The prices of computers and software

It is possible to make a simulation consisting of adjusting the price indices for computers and software in the French accounts using the American indices and measuring the impact of this adjustment. As the American price indices have been falling faster, the impact will necessarily be positive. But there will be two moderating factors. First, INSEE also uses the hedonic method, although less extensively, and this narrows the differences. Second, much of the equipment invested in France is imported. An increase in the measurement of GFCF in volume terms (having a positive impact on GDP) will therefore be offset by an increase in the measurement of the volume of imports (having a negative effect on GDP)[24].

Strictly speaking, the simulation has to be based, not on the utilisation of the American indices themselves (because of the dollar effect), but on the French price indices for investment in the national accounts adjusted for the additional price fall due to the wider utilisation of hedonic methods in the United States. For all software, American sources [33] indicate a "hedonic method" effect of roughly -2% a year. For the equipment, we do not have product-by-product information regarding the differences between the "splicing" and "hedonic" methods for the United States. In France, for PCs, the difference is -8% a year. In a very comprehensive study using the same type of simulation, P.Schreyer [38] puts it at -10%. But since this adjustment can only be applied in France to the non-PC portion of investment in computers, it is reasonable to take only half this difference, i.e. around -5% a year.

In order to calculate the impact of this difference on GDP, the starting point is the "final uses, net of imports" approach to GDP which can then be broken down into two parts:

(1) final net uses of imports of computers and software (i.e. GFCF plus exports minus imports of computers and software),

[24] In the extreme case, in a country with no production of IT equipment and importing it all, the impact of such a simulation would be nil.

(2) the remaining final net uses of imports[25].

The first component is re-evaluated using the price indices adjusted for a downward tendency of 5% a year for computers and 2% a year for the software. GDP is then recalculated incorporating this re-evaluated component, to which is added the other (unchanged) component.

On the basis of this simple calculation, it can be shown that, contrary to widely held belief, the utilisation of the adjusted indices instead of the French price indices for computers and software has only a limited effect of roughly +0.04% a year on annual growth between 1995 and 1998. A similar limited result (+0.1%) is also arrived at, on different assumptions, by P.Schreyer [38] in his simulation for France. As for the United States, Landefelt and Grimm [25] have recently examined the impact of methods to adjust for computer quality in measuring growth. According to their calculations, if the present price index were replaced by an index taking absolutely no account of quality changes, it would grow 25% less fast and growth would be cut by 0.25 of a point per year. However, according to them, such an index taking no account of quality improvements is not reasonable and as soon as elements taking quality into account are introduced, even using traditional methods, the difference declines enormously.

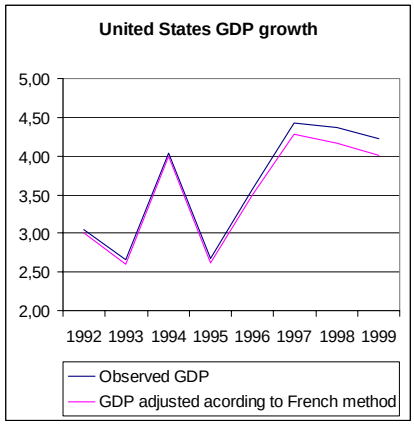
The split between GFCF and IC for software and IT equipment

As in the case of prices, an attempt can the made to simulate what growth would have been with a different split between GFCF and IC. The first simulation will relate to what growth in the United States would have been if our American colleagues had adopted the French split between GFCF and IC for software instead of their own. Using the French ratio then amounts to dividing the level of GFCF in software in the United States by 2.5 (and increasing IC correspondingly).

Given that this produces a sharp drop in the contribution of GFCF in software, which is itself rising very fast in volume, the impact on American GDP growth of this simulation is considerable, amounting to a cut of 0.2 of a point in annual growth in 1998. Moreover, the impact has been rising, from -0.05 in 1995 to -0.2 in 1998 (see graph 8). If one then includes in the same simulation IT equipment and not just software, the adjustment takes on another tenth of a point, widening to -0.3 in 1998. If one then makes the "mirror" simulation, in other words applying American ratios to French data, the result is this time a rise, slightly smaller in absolute terms since the size and growth of the sectors are still smaller than in the United States, although rising from 0.1% annually in 1995 to 0.2% annually in 1998. However, adjustment of this kind also leads to a change of half one-tenth of a point in the price effect calculated in the previous paragraph. This means that the cumulative impact on French GDP would be additional growth of around 0.3 of a point in 1998.

Graph 8

United States GDP for 1998 is adjusted downwards by 0.4 of a point when French conventions are used



[25] The utilisation of final net uses of imports makes it possible to exclude intermediate imports and consumption from this calculation.

The data in our possession for Italy, the Netherlands, the United Kingdom and Germany show that the measurement of growth in these countries would also be affected in the same direction as for France, since their split between GFCF and IC for software lies between those of France and of the United States. However, simulations using data from other European countries would give smaller results than the French simulation, the latter not being capable of extrapolation without modification to euro-zone data. Moreover, if there were to be a downturn in the United States, leading to a sharp fall in GFCF in hardware and software, the comparability bias would become negative instead of positive. Instead of saying that American growth is overestimated, it would then be necessary to say that it is underestimated, still in relation to French growth.

Mobile telephony

The initial evaluations in the national accounts regarding the telephone market in 1999 were decidedly shaky. As we have seen, the rise in turnover is thought to have been underestimated by 5%. Moreover, the apparent fall in the average prices for mobile telephony was not taken into account, which, as a corollary, meant under estimation in the volume statistics. Household consumption was estimated to rise by 7.5% in volume whereas the unadjusted statistic for minutes of consumption (fixed plus mobile) rose by 14%, according to the latest figures from ART.

The telephone market in volume terms: comparison between INSEE and ART figures

.	1998	1999	99/98 (%)
Household consumption (national-accounts estimate, volume, million 1998 francs)	75373	81025	+7.5
Minutes of consumption (millions, ART statistics)	139822	159388[26]	+14.0
ART turnover in volume (using minutes of consumption re-weighted as between fixed and mobile, calculated at constant 1998 prices, million 1998 francs)	122627	157284	+28.3

And even this increase is an underestimate, because it uses the same weighting for a minute of fixed connection and for a minute of mobile connection, whereas the average price of a minute of mobile connection in 1998 was three times that of a minute of fixed connection. If the minutes are re-weighted with these relative prices, as is traditionally done in the national accounts for calculations at constant prices, the increase in the volume of consumption comes out at 28.3% (the figure shown in the last row of the table), much more than the estimated figure arrived at in the initial evaluation of the volume of consumption by households in the national accounts. This calculation is open to discussion (see box), but it remains true that the increase in the volume of consumption of telephone services by households was probably much nearer 20% than 7.5% in 1999.

[26] The possibility that the ART figures might include the explosion of inter-operator trade since the ending of the monopoly has also been explored. This trade represents consumption internal to the sector and not final consumption. However, after verification, it turns out that the ART figures do indeed relate only to final consumers. Inter-connection between operators is the subject of a separate study.

Average prices and price indices

The indicator of the number of minutes of consumption (fixed plus mobile) showed a rise of 14%. The volume indicator at 1998 prices showed an increase of twice as much, 28.3%. This very substantial difference deserves further attention. The fact is that the indicator of minutes adds together minutes of fixed and mobile phones at very different prices. If these prices are different, it means that a minute of fixed connection does not correspond to the same service as a minute of mobile connection. It is therefore not possible to add these quantities together, any more than it is possible to add a Mercedes and a small Fiat to arrive at a volume of two cars. They have to be weighted by their prices and this is what has been done in the table to arrive at 28.3%.

However, the same remark applies within the fixed telephony. It is not possible to add together minutes of local calls and minutes of long-distance calls. The case of the time spent connected to the internet is interesting in this respect. As these are local-call minutes with special discounts, they are at a low average price (0.214 francs), only a third of the average price of a minute of fixed telephone connection. It is therefore necessary, in order to calculate a volume index for the national accounts, to treat them separately. If this is done, the volume indicator at 1998 prices for all telephone services rises by 24.8% and not 28.3%. Another solution would be to calculate a volume indicator for mobile telephony by simulating the existence, as in the case of fixed telephony, of a subscription and a price per minute instead of just a flat rate per minute. Taking a weighting of one-third for the subscription and two-thirds for the minutes, and using as volume indicator for the subscription the number of mobile telephone subscribers, one obtains a "volume" of mobile telephony for the year 1999 that shows a rise of 104%, instead of the 115% based on minutes alone.

This discussion shows that nothing can replace a price index. INSEE calculates an index for fixed telephony, which showed an annual-average rise of 0.3% between 1998 and 1999. If one uses the INSEE price index to deflate turnover for fixed telephony (excluding the internet) and to derive a volume at 1998 prices, and then adds this to the volumes of mobile and internet connection calculated using the change in minutes of consumption, the evolution arrived at is 25.6%.

But the price indices have other surprises up their sleeve. Taking the volume indicator at 1998 prices in the table and comparing it with the evolution in turnover, it is possible to measure the corresponding implicit price index, equal to 138739/157284 = -11.8%. This is a Paasche price index, in conformity with the techniques used in national accounts. However if one now calculates a Laspeyres price index, this gives -8.3%, a significantly smaller change than for the Paasche index. When turnover is deflated using this index, the volume increase comes out at only 23.3% instead of 28.3%! In such a case as this, the index specialists would opt for a Fisher index, i.e. the geometric mean of the Paasche and the Laspeyres indices. In this case, the price index would show -10.1% and an evolution in volume closer to 25.8%. In all cases, the measures exceed 20%, reflecting the explosion of mobile telephones and the fall in their prices.

This means that there was a very significant underestimation of the growth in household consumption of telecommunications services between 1998 and 1999 at the time of the first evaluations in the national accounts. The difference between an evolution of 7.5% and one of 20% in terms of GDP at 1998 prices amounts in fact to around 10 billion 1998 francs, or more than 0.1% of the 1998 GDP. This underestimation will be corrected in the revised accounts for 1999. From 2000 on, the availability of statistics from ART will make it possible to prevent a repetition of this phenomenon.

Financial services

The average annual growth rate for household consumption of financial services has slowed down considerably in recent years, from 4.6% a year in the period 1978-1990 to 0.8% a year in 1990-1999, a fall of almost 4%. Part of this fall could be due to incorrect allowance for improvements in the quality of financial services, following the ITC investment made in the sector.

However, the weighting of consumption of financial services in GDP is small, given that only household consumption of invoiced services (commissions, safe-deposit rental, etc.) is included. Consumption by firms or consumption by households of services corresponding to financial intermediation is not included in GDP[27]. In total, it corresponds to only 3.4% of spending on consumption and 1.9% of GDP. An error of two points in the annual growth rate of the volume of consumption would therefore have an impact of no more than 0.04% on the annual GDP growth rate. This evaluation is compatible with recent estimates by the United States Bureau of Economic Analysis of the difference introduced into the measurement of American growth through the use of a new price index to evaluate production of bank services [25].

[27] The consumption by households of services in the form of financial intermediation is to be included in GDP at the time of the next base change for national accounts, in line with European directives.

VI. What conclusions can be drawn?

This analysis indicates that comparability between growth in France and the United States leaves much to be desired, with the difference amounting to around 0.3 of a point, mainly as a result of a different treatment of the split between GFCF and IC for ITC. Nor can it be entirely ruled out that this difference may be justified by differences in industrial processes. If this is shown not to be true and even if quantitative results for this type of simulation for other European countries are not yet available, it can be stated that the comparability bias works in the same direction for most European countries. There is no simple solution to the problem. On the one hand, the European countries have managed to minimise their differences regarding methods, in particular by basing themselves on recommendations from Eurostat. As regards intra-European comparability, therefore, the essential has been preserved. On the other hand, the United States has chosen a method which diverges from these conventions. More thorough transatlantic international co-ordination would therefore be needed to resolve the problem.

In the meantime, this result should give fresh impetus to studies regarding the growth of Net Domestic Product, a little used measurement instrument but one that is better suited for studies of growth (see box). Among other things, this alternative national accounting measure has the advantage of at least partly obviating the problem of the split between GFCF and IC, the supreme weak point highlighted in this article. Comparison of volume growth using NDP rather than GDP makes it possible to avoid this major pitfall.

Net domestic product (NDP)

"GDP" has become so familiar that no one pays much attention to the word "gross" that forms part of the name of the concept. The domestic product is "gross" since this measure does not deduct from the wealth created the economic cost resulting from the depreciation of fixed capital during the period of production. The depreciation is known as "consumption of fixed capital" (CFC) in the national accounts.

In the measurement of growth in "NDP" (Net Domestic Product), by contrast, consumption of fixed capital is deducted. This seems logical. Not only, as in GDP, should the proper measure of the wealth created during a period be net of the intermediate consumption destroyed during the period, but also of the cost of the capital used up. As Denison, quoted by [6], has said, "insofar as a large output is a proper goal of society and objective of policy, it is net product that measures the degree of success in achieving this goal. Gross product is larger by the value of capital consumption. There is no reason to wish to maximize capital consumption […] that there is to maximize the quantity of any other intermediate product used up in production […]".

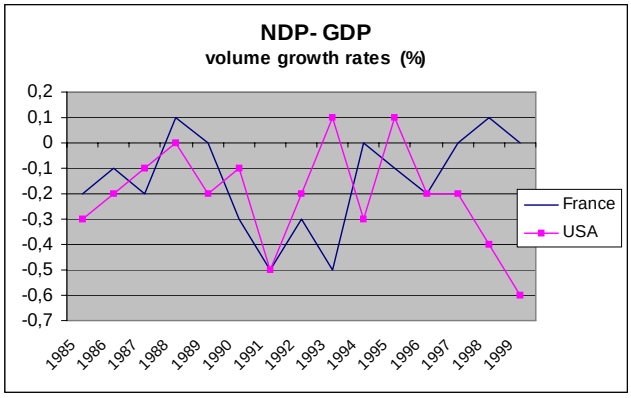
The other usual accounting aggregates such as operating surplus, saving, national income (the new name of the former "national product") each have their own "gross" version, widely used, and a "net" version, much less so. This is a pity, because the net operating surplus is the concept that comes closest to corporate profit after depreciation.

Why are the net figures spurned in this way? According to [6], it dates back to the period of the war when there was no longer economic obsolescence, de facto. Later, the stranglehold on economic thought exerted by a very short-term Keynesianism led to the abandonment of these measures. But the fact is probably that, since the estimation of the consumption of fixed capital was not based on any direct observation, there was less confidence in the results. And yet the interest of using NDP is manifest in our case, since it partly resolves the thorny problem of the split between GFCF and IC.

Let us initially take the American NDP. Graph 9 shows the *differential* between the growth rates of NDP in volume and GDP in volume for the United States since 1985. It will be seen that since 1996 NDP has tended to grow less fast than GDP, the difference

amounting to a shortfall of 0.6 of a point of growth in 1999. This should not come as a surprise. The fact is that in the past ten years the expansion in investment in the United States has mainly taken the form of computers and software. GFCF in computers was multiplied by a factor of 15 at constant prices between 1990 and 1999 and GFCF in software by four (again at constant prices), whereas investment in other goods (traditional capital goods, buildings) rose by only 50%. The share of computers and software in total United States GFCF has risen from 10% to 17%.

Graph 9



But the rate of economic obsolescence of computers and software is high. The American national accounts statisticians put it at 30% a year. As against that, the average rates of depreciation of other industrial equipment and industrial and office buildings are around 15% and 2%, respectively. This implies that current United States growth is taking place with an average rate of obsolescence of capital that is much higher than before. A rapid calculation of the change between 1990 and 1999 in the average rate of depreciation of capital, taking the three types -- computers and software (a rate of 0.30), other industrial capital goods (0.15) and buildings and offices (0.02) -- weighted by the share of each type in 1990 and in 1999, shows an increase of 1.8% in this rate in the United States, with the average rate of depreciation rising from 10.2% to 12.1%. When related to a corporate capital stock of 16,722 billion dollars at end-1996, this gives additional depreciation of 300 billion dollars, equivalent to almost 0.4 of a point of United States GDP in 1997.

Another way of explaining this approach would be to say that in theory one has to take into account in evaluating growth the "service lives" of the equipment produced. If production today is rising strongly but is concentrated on capital goods with a short service life, it will not be of the same "quality" as before. Expressed in "service life", it would not increase as much. The evolution in NDP would be fairly parallel to an evolution expressed in terms of "service life". Hence there would be a better measure using the net indicator of obsolescence (in the NDP) than using the gross indicator (GDP), which takes no account of this change in the average service life of the equipment produced.

In France, the calculation of the consumption of fixed capital is carried out using methods and conventions that are fairly similar to those used by our American colleagues. In particular, the rates of depreciation by type of product are similar. On the other hand, the smaller share allotted to GFCF in hardware and software in the French national accounts helps to arrive at a NDP/GDP differential that is smaller than in the American case, as can be seen on the same graph. This is particularly true of the more recent period.

All in all, a direct comparison of the growth differential between France and the United States using two alternative instruments, GDP and NDP, confirms (see graph 9) that the growth differential in the recent period narrows by roughly half a point when measured using NDP instead of GDP.

The graph is also, however, a timely reminder that the overall growth differential between France and the United States (measured by GDP) over the period 1995-1999 amounted to 1.9% a year. The United States has posted annual growth of 4.1% since 1995,

compared with 2.2% for France in the same period. A narrowing of 0.5 of a point in the differential deserves to be highlighted, but it does not mean that the fundamental analysis of this differential has to be called into question.

Should these conclusions rekindle the debate over the French short-term economic situation? We think not. The key inadequacies in the measurement of the new technology sectors and their diffusion concern trends, not short-term movements, despite the fact that GFCF is pro-cyclical. Then do the conclusions affect the forecast of tax revenue? Not from a practical point of view, since what are involved are, on the one hand, a problem of the split between GFCF and IC, neither of which is subject to VAT, and, on the other, the split between volume and prices and since VAT is based on current-price values, any error regarding volume is offset by an error in the opposite direction affecting prices.

This makes no difference to INSEE's determination to improve the national accounts in future in co-ordination with our European and North American partners. A survey is to be carried out under the aegis of the OECD on the methods for evaluating GFCF in software in the various countries. A detailed programme of bilateral comparison with the United States has already been launched. As regards France, the recommendations of the report of the CNIS group on the new statistical surveys are about to be implemented. A price index for household consumption in mobile telephony is due to appear; the EAE are all due to include questions regarding investment in IT equipment, software and telecommunications; new infra- annual surveys should make it possible to follow more closely the development of the markets for the publication of video games, electronic publication or online consultation of databases; finally, the classification is likely to be adjusted fairly soon, without waiting for the structural revision of the NAF planned for 2007. These recommendations are fairly similar to those made for the American statistical system [21]. The next national accounts base, the so-called 2000 base, due to be introduced in 2004, will be the occasion for the incorporation of all these new results in the national accounts figures.

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Appendix: Diagram

The three storey building of business statistics used in the French National Accounts