

Is the recent fall in the mark-up ratio temporary?

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The mark-up ratio is defined here as the complement of the share of wage costs in value added⁽¹⁾. It gives information regarding firms' financial situations and profitability and can be interpreted as that share of the wealth created during the production process that serves for the remuneration of the capital factor of production. In France, for the past decade, it has fluctuated narrowly between 39% and 41%. By the end of 2002, the mark-up ratio for non financial corporated and unincorporated enterprises had fallen by 1.1 of a point in two years, to 39.1%. In the first place, this fall is to be related to the slowdown of gains in labour productivity, which has benefited less than in the late 1990s from technical progress and investment, but has also fallen under the impact of the economic slowdown. However, the decline in the mark-up ratio in 2001-2002 was cushioned by wage moderation: according to the Mésange macro-economic model, the decline would have been 1.5 of a point greater in the absence of wage moderation. The mark-up ratio is expected to rise by 0.4 of a point in 2003, mainly because of the fall in the oil price.

For the past decade the mark-up ratio has fluctuated narrowly between 39% and 41%

The wealth created during the production process serves to remunerate the factors of production, labour and capital, in the form of wages and profits, before any redistribution. The mark-up ratio is defined here as the ratio of the gross operating surplus to value added and can be interpreted as the share allocated to the capital factor. In this definition, the remuneration of capital has to be understood in the broad sense because the gross operating surplus includes the income accruing to the entrepreneur, but also the financial charges borne by the firm (constituting the remuneration of the capital of other creditors of the firm) and inventory changes.

It is an economic measure making it possible to illustrate certain interactions between the market for labour and the market for goods. It depends on several elements simultaneously: the organisation of production, the incorporation of technical progress, the modalities of remuneration of labour and capi-

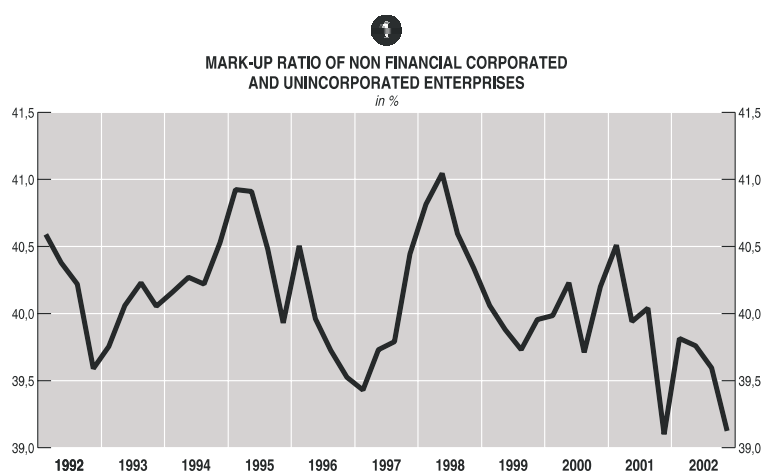
tal, taxation, and the reaction of the economy to shocks such as changes in the oil price.

For the past decade, the mark-up ratio of non financial corporated and unincorporated enterprises has fluctuated narrowly between 39% and 41% (cf. Graph 1). In the recent past, several tendencies have been superimposed, making it difficult to comprehend these evolutions. Generally speaking, the mark-up ratio moves in a pro-cyclical manner. This is because, in the event of a shock, most of the adjustment is borne by the gross operating surplus, with changes in the total wage bill (numbers employed and wages) taking time to come through. At the time of the slowdown in 2001 and 2002 there was indeed a decline of 1.1 of a point in the mark-up ratio (between Q4 2000 and Q4 2002).

Since the end of the 1990s, exogenous shocks have been superimposed on this cyclical component.

(1) In addition to the share of wage costs, the share of net taxes on production is subtracted.

The mark-up ratio is also sometimes named gross margin ratio.



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For example, the rise in the price of raw materials made a negative contribution to variations in the mark-up ratio in 1999 and 2000. The impact of the reduction in working hours (RTT) is a more complex matter, since it brings in the impact of RTT on labour productivity and on its cost, including employers' contributions.

An accounting breakdown of variations in the mark-up ratio makes it possible to measure these effects in a highly descriptive manner (*cf. Box*).

The contribution of the ratio between consumer prices and the price of value added partly reflects variations in the oil price

When import prices rise, notably the price of oil, consumer prices rise faster than those of value added. The contribution of the ratio between consumer prices and the price of value added partly reflects variations in the oil price, being negative on average in 1999 and 2000 (*cf. Graph 2*), at a time when the oil price expressed in euros rose strongly ⁽²⁾.

The reduction in employers' contributions and the wage moderation have limited the negative contribution of labour costs

The growth rate for the real hourly wage cost was positive throughout the period, with the exception of Q1 2002 ⁽³⁾, this being the reflection of taking trend productivity gains into account in wage formation. Its contribution to the variations in the mark-up ratio is then negative. On the other hand, the reduction in employers' contributions that accompanied the introduction of RTT made a positive contribution to variations in the mark-up ratio, as did earlier reductions. The growth rate in earnings excluding employers' contributions was greater than that of labour costs between 1994 and 2001, with the difference amounting to as

Accounting breakdown of the variations in the mark-up ratio

From an accounting standpoint, the mark-up ratio can be broken down as a function of labour productivity and real wage costs. In order to take into account the impact of the expansion of part-time working in the 1990s and of the RTT since 1996, labour is measured in numbers of hours and wages in hourly terms. The breakdown can be refined by distinguishing within the wage cost the purchasing power of the wage (nominal cost of labour deflated by consumer prices) and the differential between consumer prices and the price of value added.

$$TM = 1 - \frac{W_h L_h}{P_{va} Y} = 1 - \frac{W_h}{P_c} \frac{L_h}{Y} \frac{P_c}{P_{va}} \quad (1)$$

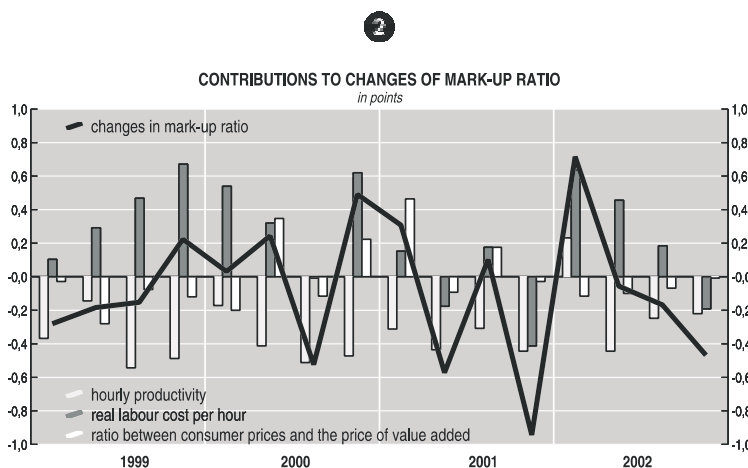
where TM denotes the mark up ratio, $\frac{W_h}{P_c}$ denotes the purchasing power of the hourly wage, $\frac{Y}{L_h}$ the apparent hourly labour productivity (ratio of value added to the volume of hours worked) ⁽²⁾ and $\frac{P_c}{P_{va}}$ the ratio between consumer prices and the price of value added. In order to simplify presentation, time subscripts are not attached to the variables and, by default, a variable is represented as being as of date t .

The variation in the mark-up ratio ΔTM can then be written as a function of the growth rate of these three elements:

$$\Delta TM = (1 - TM)_{t-1} [-(\dot{W}_h - \dot{P}_c) + (\dot{Y} - \dot{L}_h) - (\dot{P}_c - \dot{P}_{va})]$$

where the sign $\dot{\cdot}$ denotes the growth rate of the respective variables.

Hence, when labour productivity rises faster than real wage costs, the mark-up ratio increases, in other words the share of wages in value added declines. ■



How to read the graph:

Changes in the mark-up ratio are equal to the sum of contributions of hourly productivity, ratio between consumer prices and the price of value added and the purchasing power of the hourly wage. The contribution of the net taxes on production is small and therefore is not shown.

(2) The price rose from 8.5 euros per barrel in December 1998 to 28.5 euros in December 2000, after peaking at 37.8 euros in November 2000.

(3) In Q1 2002, the hourly wage cost was rising less fast than consumer prices, meaning that the growth rate for the real hourly wage cost was negative (-0.4%).

much as 0.7 of a point of growth in 2000. Following the period of cuts in the rate of contribution, once stability had been regained, the impact on the variations in the mark-up ratio cancelled out and only the impact on the level was left.

The wage moderation linked to the introduction of RTT also made a positive contribution to variations in the mark-up ratio, as will be seen with the help of a macro-econometric model described in the final section of this special report.

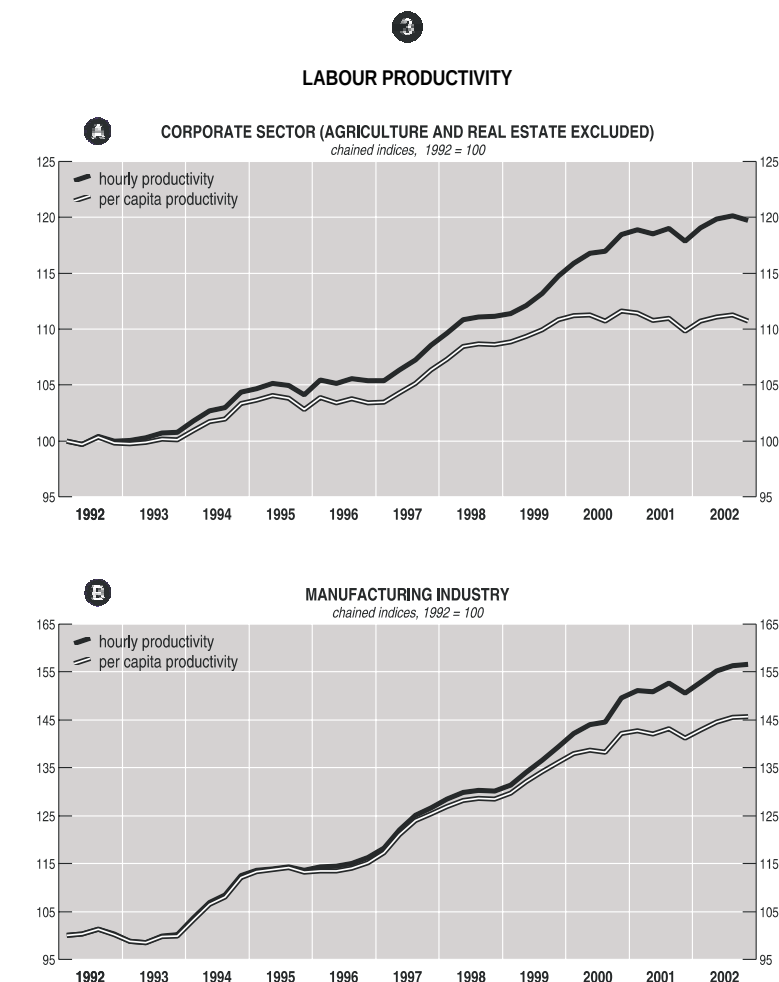
The contribution of labour productivity is pro-cyclical and modified by the development of part-time working, by the reduction in working hours and by the skills structure of the labour force

Evolutions in labour productivity, and hence its contribution to variations in the mark-up ratio, have gone through three phases (cf. Graph 3A):

- from 1992 to 1996: moderate growth
- from 1997 to 2000: transition to firmer growth
- from 2001 on: a distinct downturn.

These phases differ, depending on the branch concerned: in manufacturing, growth in labour productivity was both more rapid and smoother during the period (cf. Graph 3B).

Recent evolutions in labour productivity, in particular, its slowdown at aggregate level in relation to its long-term trend in the mid-1990s, remain difficult to explain. Productivity depends on the adjustment of the workforce to production, on the number of hours worked, on the skills structure of the workforce, on the degree of capital intensity and on total factor productivity gains.



In order to evaluate the impact of the first two of these elements, hourly productivity is broken down as a function of the number of workers, the «full-time rate» (ratio of the apparent number of hours worked to the average number of hours for full-time working) and the weekly number of hours worked:

$$\frac{Y}{L_h} = \frac{Y}{L_p T_p D_h} \quad (1)$$

which gives:

$$\dot{Y} - \dot{L}_h = (\dot{Y} - \dot{L}_p) - \dot{T}_p - \dot{D}_h$$

where L_p denotes employment measured as the number of physical persons, T_p the «full-time rate» and D_h the average working hours for full-time working.

- Since the size of the workforce adjusts only after a certain time-lag to variations in output, growth in labour productivity

follows a cyclical pattern, rising in upswing phases, stabilising when the level of activity is at its height and the workforce has been adjusted, and falling in downswing phases.

This productivity cycle is clearly visible for the recent past (cf. Table 1A, left-hand section). After rising strongly in the upswing (1997-2000), hourly productivity fell in 2001 in the whole of the economy, mainly under the impact of the continuing rise in recruitment (substantial in 2000 and 2001) at a time when activity was slowing down. Job creation was less dynamic in 2002 and labour productivity per head returned to positive growth, especially as the duration of full-time working, on which it depends in a positive manner, fell less rapidly than in the previous years.

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- The average number of hours worked has been falling since the beginning of the 1990s, initially because of the development of part-time working and later because of the introduction of RTT. This explains why growth in hourly productivity was more rapid than in productivity per head (*cf. Graph 3*).

Over the period 1992-1996, the development of part-time working (meaning a fall in the full-time rate) was the predominant phenomenon affecting the number of hours worked (*cf. Table 1A, left-hand section*). It accounted for more than a third of the evolution in hourly productivity, the contribution from the total number of hours worked being virtually nil. It was mainly services that were concerned. In manufacturing, the contribution of the development of part-time working to variations in productivity was only half what it was for the economy as a whole (*cf. Table 1b, left-hand section*).

Between 1997 and 2002, on the other hand, taking all non financial corporated and unincorporated enterprises, the decline in

the average working hours for full time working was responsible for nearly one half of the variation in labour productivity, whereas the impact of the increase in the rate of part-time time working became negligible. It would seem that the development of jobs involving a 35-hour week took over from the rise in part-time working from 1997 on. RTT affected manufacturing in the same way as the rest of the economy, except in 2001, when the decline in full-time hours worked was more marked.

- Evolutions in labour productivity in each branch can also be related to those in the skills structure of the labour force, so that:

$$\dot{Y} - \dot{L}_h = \dot{Y} - \beta_{q(t-1)} \dot{L}_h^q - (1 - \beta_{q(t-1)}) \dot{L}_h^{nq}$$

where L_h^q denotes the hourly volume of skilled labour, L_h^{nq} the hourly volume of unskilled labour and β_q the share of skilled workers in total hours

worked. Evolutions in labour productivity for all branches together are computed by aggregation in the line of the methodology exposed in box 2.

Taking all branches together, it can be seen that towards the end of the 1990s there was a relative decrease in the contribution of unskilled labour to the growth in hourly productivity compared with that of skilled labour (*cf. Table 1A, right-hand section*). This phenomenon is more relevant in the case of manufacturing activities (*cf. Table 1B, right-hand section*). This can be compared with the evolution in the relative cost of unskilled labour, which benefited in particular from the cuts in employers' contributions.

The acceleration in labour productivity towards the end of 1990s is mainly due to total factor productivity

Apart from cyclicalities and average hours worked, labour productivity depends positively on the stock of capital per employee (capital inten-

Table 1: Accounting breakdown of the variations in the hourly productivity

A - Non financial corporated and unincorporated enterprises (agriculture and real estate excluded)

(mean of quarterly contributions, in %)

	Hourly productivity growth rate	Contributions: hours worked			Contributions: hourly productivity by skills	
		Per capita productivity	Full-time rate	Weekly number of hours worked	Hourly volume of unskilled labour	Hourly volume of skilled labour
1992-1996	0.27	0.18	0.08	0.02	0.08	0.20
1997-2002	0.53	0.28	-0.01	0.25	0.07	0.46
1997-2000	0.73	0.48	-0.01	0.27	0.10	0.64
2001	-0.13	-0.40	0.02	0.25	0.00	-0.13
2002	0.39	0.20	0.00	0.19	0.04	0.34

B - Manufacturing industry

(mean of quarterly contributions, in %)

	Hourly productivity growth rate	Contributions: hours worked			Contributions: hourly productivity by skills	
		Per capita productivity	Full-time rate	Weekly number of hours worked	Hourly volume of unskilled labour	Hourly volume of skilled labour
1992-1996	0.79	0.74	0.04	0.01	0.29	0.51
1997-2002	1.24	0.98	0.01	0.25	0.15	1.09
1997-2000	1.57	1.32	0.00	0.25	0.22	1.36
2001	0.18	-0.19	0.05	0.32	-0.17	0.35
2002	0.98	0.79	0.00	0.19	0.20	0.78

How to read the table:

The growth rate of the hourly productivity is equal to the sum of the contributions of productivity per capita, full-time rate and weekly number of hours worked. It is also equal to the sum of the contributions of hourly productivity by skills.

sity) and on total factor productivity (TFP). TFP measures the combined influences of technical progress, returns to scale and improved utilisation of factors of production⁽⁴⁾. It is defined as the ratio between the volume of output and the aggregate volume of the factors of production applied in the process. The measurement of the respective influence of capital intensity and TFP depends on the shape of the production function that is chosen.

On the assumptions of pure and perfect competition and unit returns to scale, the share of the respective factors in production is equal to their share of the remuneration. Taking the simple case of two factors of production, namely capital and labour:

$$\dot{Y} - \dot{L}_h = \dot{TFP} + \alpha_{t-1}(\dot{K} - \dot{L}_h)$$

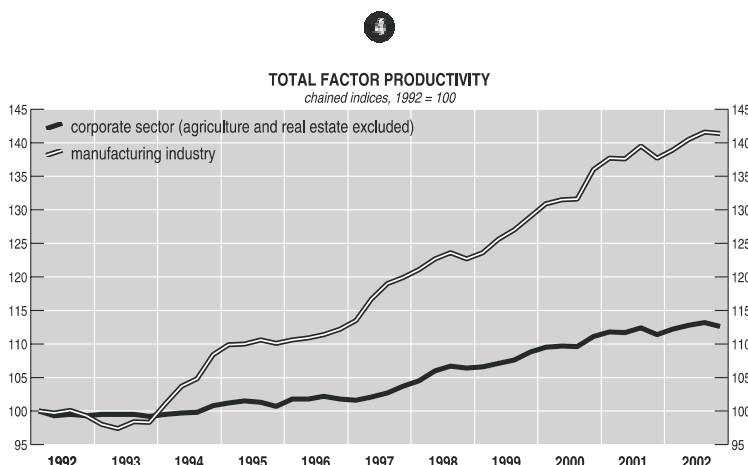
where Y denotes output in volume, K capital in volume and α the share of the remuneration of capital in value added, in other words the mark-up ratio. In order to simplify presentation, variables are not given time subscripts: by default, a variable is shown as of date t .

The evolution of hourly labour productivity breaks down into the growth rate of TFP and that of capital intensity weighted by the share of capital in value added.

In the more general case of n factors of production, TFP is defined as the residual of the growth rate of production from which is deducted the accumulation of factors of production, hence the frequently-used name of Solow residual, after the Nobel prize-winner for economics who defined this methodology in 1957:

$$\dot{TFP} = \dot{Y} - \sum_{i=1}^n \alpha_{i(t-1)} \dot{X}_i$$

(4) This may stem from an increase in the intensity of their utilisation or from their reallocation as a function of the evolution in relative prices.



where X_t denotes the various factors of production and $\alpha_{i(t-1)}$ the share of factor X_i in remuneration at the previous date.

The acceleration in labour productivity towards the end of the 1990s was mainly due to TFP (cf. Graph 4). The acceleration in its growth rate does not necessarily reflect increased technical progress, but can stem from better utilisation of the factors of production already in place, capital and labour. The intensity of their utilisation in fact varies during the cycle. In the case of labour, the productivity cycle has already been mentioned. Adjustment delays are even longer in the case of the stock of capital.

An adjustment is made to part of this cyclical component by taking the capacity utilisation rate (CUR) into account in measuring the volume of capital. The CUR is measured for manufacturing industry on the basis of questions regarding the intensity of utilisation of installed productive capacity. The labour factor of production is therefore not concerned. For want of a better measure, this rate is also used for non-manufacturing branches (cf. Box 3).

In 2001, the decline in labour productivity was due both to the stabilisation of TFP and to the fall in investment, which reduced capital intensity (cf. Table 2A). The decline in capital intensity reflects the deterioration in French business

leaders' expectations, at a time of economic slowdown in France's principal trading partners. In 2002, the contribution from capital intensity turned positive again.

The fact that productivity gains were higher in manufacturing industry is explained by greater contributions both from TFP and from capital intensity (cf. Table 2B).

The wage moderation linked to the reduction in working hours seems to have limited the decline in the mark-up ratio in 2001 and 2002

The accounting approach adopted until now makes it possible to study in detail the determinants of the mark-up ratio. In this way, it was possible to highlight the influence of the ratio between consumer prices and the price of value added, the cost of labour, the hours worked, the skills structure of the labour force, capital intensity and TFP. However, while it provides a fairly refined description of the past, the interest of using this accounting approach for forecasting purposes remains limited.

Econometric instruments make it possible, on the other hand, to quantify the impact of each determinant, even though the aim of arriving at an instrument that is easily usable for forecasting purposes means restricting the degree of

Table 2: Contributions of TFP and capital intensity to productivity

A - Non financial corporated and unincorporated enterprises (agriculture and real estate excluded)

(mean of quarterly contributions, in %)

	Hourly productivity growth rate	Contributions			
		TFP	Capital intensity		
			Total capital	NICT capital	Non-NICT capital
1992-1996	0.27	0.10	0.18	0.02	0.16
1997-2002	0.53	0.42	0.11	0.04	0.07
1997-2000	0.73	0.55	0.19	0.05	0.14
2001	-0.13	0.05	-0.17	0.03	-0.20
2002	0.39	0.28	0.11	0.03	0.08

B - Manufacturing industry

(mean of quarterly contributions, in %)

	Hourly productivity growth rate	Contributions			
		TFP	Capital intensity		
			Total capital	NICT capital	Non-NICT capital
1992-1996	0.79	0.61	0.19	0.01	0.18
1997-2002	1.24	0.96	0.28	0.03	0.25
1997-2000	1.57	1.20	0.37	0.03	0.34
2001	0.18	0.30	-0.12	0.02	-0.14
2002	0.98	0.68	0.30	0.02	0.28

disaggregation of the explanatory variables. The value of the mark-up ratio is determined by the interactions between the labour market and the market for goods. This depends on several factors simultaneously: the modalities of the remuneration of labour and capital, of price-setting, the incorporation of technical progress, etc.

The use of a macro-econometric model of the French economy (the Mésange model) (cf. Box 4), makes it possible to adopt a structural approach and to juxtapose for comparison the forecasts obtained from the equations that determine prices, wages and workforces in order to deduce the evolutions in the mark-up ratio.

Between 2001 and 2002, the mark-up ratio for non financial corporated and unincorporated enterprises fell by 1.1 of a point, from 40.2% in Q4 2000 to 39.1% in Q4 2002. This fall was related to the cyclical slowdown, which was accompanied by a decline in the investment growth rate and in TFP.

The model leads to an overestimation of wages in 2001 and 2002, which in turn means an overestimation of purchasing power and household consumption, and hence of the demand for the goods produced by firms. The Mésange model is Keynesian in the short term, with production determined by demand. As a consequence, the overestimation of demand contributes to that of gross domestic product (GDP), for which the forecast derived from the model is 2.7% for 2001 (as against an out-turn of 2.1%) and 1.8% in 2002, as against 1.2%. Since the adjustment of workforces to variations in activity takes place after a time lag, the model overestimates labour productivity.

The overestimations of wages and of productivity have opposing consequences as regards variations in the mark-up ratio. It is the first of

BOX 1: THE CONTRIBUTION OF CAPITAL OF THE NEW INFORMATION AND COMMUNICATION TECHNOLOGIES TYPE TO LABOUR PRODUCTIVITY HAS BEEN LOW AND STABLE SINCE 1992

Within capital, capital of the New Information and Communication Technologies (NICT) type has been singled out, in other words capital in the form of IT equipment, software and communication equipment. Its contribution is less than 0.05% a year and was stable in the 1990s (cf. Table 2A). There are two main reasons for the small size of this contribution. First, the volume of NICT-type capital, and hence its share in the remuneration, remains small by comparison with non-NICT capital. Second, the measurement of even this volume is problematical. This is because NICT-type goods are frequently replaced, making it difficult to calculate a constant-quality price index and hence distinguish between volume and price changes. The so-called hedonic-price method constitutes one way of dealing with this difficulty. This consists of an econometric evaluation, using market data, of the price of certain features of computers such as memory size or clock speed. Thanks to the rapid technical progress achieved in the NICT sector, the price index obtained falls faster than that of the goods themselves. This means

that the use of hedonic prices in the case of NICT goods gives a breakdown between volume and prices that is more in favour of volumes than the traditional methods. French national accounts use hedonic prices for personal computers and lightweight printers only. It can be assumed that the volume growth rate for other goods of the NICT type (in this case software and communication equipment) is underestimated, and hence that their contribution to variations in labour productivity is also underestimated.

The contribution of the accumulation of NICT capital is smaller in manufacturing industry than in the economy as a whole (cf. Table 2B). It is in fact the service branches that have invested most heavily in computers, software and communication equipment. Manufacturing industry may well have invested in other NICT-type goods that cannot be identified because they are not recorded as such in the balance sheet. This is particularly true of machine tools, which often rely heavily on electronic components. ■

these effects that wins out: in 2001-2002 the Mésange model would have predicted a fall that was 1.5 of a point greater than the actual out-turn, in other words a mark-up ratio of 37.6% in Q4 2002. This means that in the absence of wage moderation the fall in the mark-up ratio would have been greater than was actually observed. We shall now review the contributions of the principal equations participating in the determination of the mark-up ratio in the model: wages, workforces and prices.

The model's equation for wages is of the Wage Setting (WS) type, being in the tradition of wage bargaining models, in that in the long term wages depend on the level of the employment rate, which measures the bargaining power of the workers on the labour market. It is assumed that wage claims take into account trend gains in labour productivity, with the result that real wages are in the long term indexed in a unitary manner on labour productivity. In the short term this indexation is imperfect: on the one hand, the adjustment of wages takes place after a time-lag and, on the other, economic agents err in their expectations.

In 2001 and 2002, the residual of the wages equation is systematically negative — and high. Even allowing for the observed evolution in its determinants (including the cuts in employers' contributions) the forecast leads to a growth rate for nominal wages that is 0.2% per quarter higher than the observed rate. The observed wage moderation seems partly attributable to the introduction of RTT, in the absence of which the fall in the mark-up ratio would have been intensified, since according to the model it would reach 37% in Q4 2002, instead of the 39.1% observed.

The impact of RTT is also visible in the residuals for the workforce equations. The model distinguishes between manufacturing industry and other market-sector

branches. Employment is adjusted on the basis of a long-term target depending on TFP and real wages.

In 1999 and 2000, the model seriously underestimates the growth rate in total employment in the non-manufacturing branches, by an average of 0.5% per quarter. Given that employment is measured in full-time equivalents and not in numbers of hours worked, the faster growth in employment observed is probably explained by the introduction of RTT. In manufacturing industry, on the other hand, the observed figure is close to the simulation and no particular impact from RTT is discernible.

In 2001 and 2002, by contrast, the model overestimates the employment growth rate, by an average of 0.3% in the non-manufacturing branches and 0.2% in manufacturing. This is linked to the inertia that is present in the model's employment equations. According to this modelling, a period of rapid employment growth in the past, as in 1999 and 2000, exerts a positive influence on the growth rate of employment for several quarters

thereafter. The influence of this overestimation of employment on the variations in the mark-up ratio is limited, explaining a fall of just 0.1 of a point in relation to the out-turn.

The error-corrected price equations are of the Price Setting (PS) type: the target producer prices correspond to the application of a constant margin to the unit production cost. For 2001 and 2002, if one takes as the values of the explanatory variables, especially wages, their observed values, there is no notable difference between the prices predicted by the model and the observed prices.

Taking the assumptions regarding interest rates and France's international environment used in the main note, the model arrives for 2003 at a forecast that is close to those published in the Note. The mark-up ratio is predicted to stand at 39.5% in Q4 2003, while the main note shows 39.4% (*cf. Section on corporate results, available in French only*). ■

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BOX 2: AN ALTERNATIVE MEASURE OF PRODUCTIVITY

For calculations relating to labour productivity and TFP, use is made of a method of distinguishing between volume and price movements based on Törnqvist indices. These differ from the Laspeyres indices adopted by French national accounts. They are, however, used by the American Bureau of Economic Analysis (BEA) and Bureau of Labor Statistics (BLS).

In the case of a basket of N goods characterised by their volume and their prices (q_{it}, p_{it}), Divisia (1926) has shown that continuous-time evolutions in aggregate prices and volumes (q_t, p_t) are equal to:

$$\frac{\dot{p}_t}{p_t} = \sum_{i=1}^N \frac{q_{it} \dot{p}_{it}}{q_t p_t} \quad \text{and} \quad \frac{\dot{q}_t}{q_t} = \sum_{i=1}^N \frac{p_{it} \dot{q}_{it}}{p_t q_t}$$

The volume growth rate can be re-written as follows:

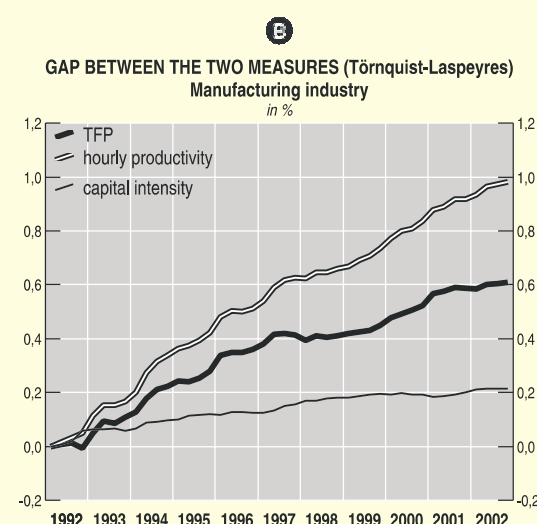
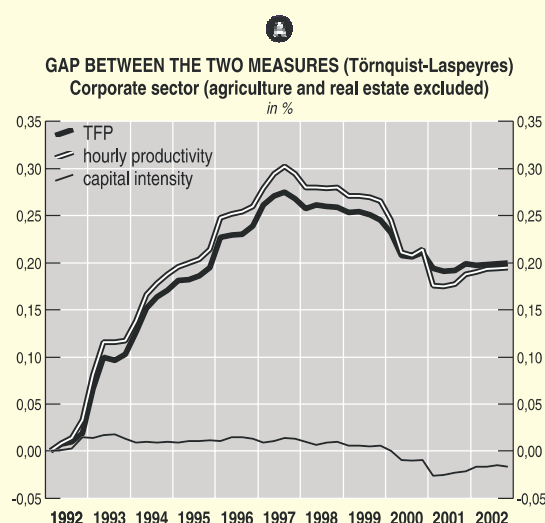
$$\frac{\dot{q}_t}{q_t} = \sum_{i=1}^N \frac{p_{it} \dot{q}_{it}}{p_t q_t} = \sum_{i=1}^N \frac{p_{it} q_{it}}{p_t q_t} \frac{\dot{q}_{it}}{q_{it}} = \sum_{i=1}^N \alpha_{it} \frac{\dot{q}_{it}}{q_{it}}$$

where α_{it} is the share of good i in the total value.

This formula describing the evolution of the aggregate volume of a basket of goods can also be used to describe the evolution of the volume of output as a function of production factors in the framework of pure and perfect competition.

In the case of discrete-time measurement, the problem arises of the choice of the weighting date. The possibilities in this respect include weightings based on the respective shares at the past date, at the current date, or the arithmetic mean of the shares at the present and past dates.

The first of these calculations corresponds to a Laspeyres index, weighting the evolutions in volume using the prices obtaining at the past date. The second corresponds to a Paasche index in which evolutions in volume are weighted using current prices. Finally, the third, intermediate between the other two, introduces the Törnqvist indices. If relative prices are distorted over time and if goods are substitutable, a good whose relative price falls will find its volume rising more strongly than the others. The result of this is that a Laspeyres index using weightings prior to this fall will have a tendency to over-



time the evolution in volume, whereas a Paasche-type index weighting the evolution in volume using the new prices will have a tendency to underestimate it.

Table A : Difference between the Törnqvist and Laspeyres volume growth rates, cumulated over the period

(mean of quarterly gaps, en %)

	Non financial corporated and unincorporated enterprises (agriculture and real estate excluded)				Manufacturing industry			
	Value added	Aggregate labour and capital	Labour	Capital	Value added	Aggregate labour and capital	Labour	Capital
1992-1996	0.41	0.17	0.16	0.16	0.60	0.28	0.16	0.40
1997-2002	0.18	0.24	0.26	0.16	0.35	0.24	0.17	0.28
1997-2000	0.13	0.18	0.20	0.11	0.25	0.18	0.13	0.20
2001	0.04	0.05	0.06	0.03	0.08	0.04	0.03	0.05
2002	0.01	0.01	0.01	0.02	0.02	0.02	0.00	0.03

BOX 2: AN ALTERNATIVE MEASURE OF PRODUCTIVITY

Intuitively, the actual evolution in volume must lie somewhere between these two estimates. It can be shown that the Törnqvist indices are correct for a quadratic utility function or production function, which takes better account of the substitution effects between goods due to evolutions in relative prices than does a Cobb-Douglas function, for example.

The calculation of TFP can also be refined by introducing Törnqvist indices for chaining the indices for value added, employment and capital. These calculations have been carried out for all non financial corporated and unincorporated enterprises excluding agriculture and real estate, and for the manufacturing branch. The analysis of the dif-

ferences between the aggregation methods requires a calculation at the least aggregated level and this explains the use of 36-level series for value added, employment and capital.

The results are presented as the difference between the Törnqvist and Laspeyres indices.

The Laspeyres indices underestimate the evolutions in volume, principally in the case of value added (*cf. Table A*). In the case of manufacturing industry, the differences in the measurement are much greater than for the economy as a whole, because of the wider variations in relative prices, notably between consumer goods, capital goods and intermediate goods. ■

BOX 3: THE DATA USED

The coverage adopted is that of non financial corporated and unincorporated enterprises. Financial activities are not taken into account, as the measure of value added in that case is based on a specific definition.

For the calculation of labour productivity and total factor productivity (TFP), agriculture has also been excluded (because of the very high proportion of self-employed workers), as has real estate (difficult to compare with the other branches because of the very high capital intensity).

The data relating to value added, the number of workers and capital are taken from the national accounts. For the calculation of the mark-up ratio, series are used that distinguish 7 sectors including non financial corporated and unincorporated enterprises. In order to refine the analysis, the calculations relating to labour productivity and total factor productivity are made at the most aggregated level possible, i.e. level F of the branch classification (36 branches).

For the hours worked (full-time working and hours) use is made of the French Employment Survey, distinguishing between 36 branches.

The employment data

Self-employed workers

For the calculations relating to the contribution of labour productivity to the mark-up ratio (or the contributions from production, from weekly hours worked, from the skills structure, from TFP or from capital intensity), the work of self-employed workers is taken into account. In the national accounts, their remuneration is not distinguished from the gross operating surplus of their enterprises. In order to calculate the share of the remuneration of labour,

including that of the self-employed, this is reconstituted by attributing to them the hourly wage of skilled workers in the branch.

The skills structure of the labour force and the hours worked

The breakdown of the labour force according to two skills levels, as well as the average duration of full-time working are calculated for each branch at level F of the classification (36 branches) with the help of the Employment Survey from 1992 to 2001. The unskilled category is defined as the unskilled workers and, among the white-collar workers, service agents (52), distribution workers (55) and service personnel (56), using the classification of occupational categories. On the basis of this definition, the unskilled account for 17% of the total wage bill.

The Employment Survey provides for each skills level the numbers working full-time or part-time and the number of hours worked per week. This means that for each skills level and for each branch, four series can be compiled: number of full-time workers, number of part-time workers and the respective durations of the average working week, full time and part time.

Accordingly, it is possible to calculate the average working week (denoted by $T_p D_h$ in equation (1)) by skills level and by branch⁽¹⁾:

$$T_p D_h = (1 - P_p) D_h + P_p D_p$$

where P_p is the proportion of part-time workers (ratio of the numbers of persons working part-time to the total numbers of persons), D_h the average working week for a full-time worker and D_p the average working week for a part-time worker.

BOX 3: THE DATA USED

Capital

For capital, use is made of the capital account series in the national accounts. These distinguish 11 types of goods, including IT capital, communication equipment and software for goods of the New Information and Communication Technologies (NICT) type.

The series for gross fixed capital formation and for the capital stock are placed on a quarterly basis by using the series in the quarterly accounts. In order to incorporate into the calculations the stock of capital actually used in the production process, an adjustment is made for the position in the economic cycle by multiplying the capital series by the capacity utilisation rate (CUR). (These data are available for the manufacturing branches (consumer goods, cars, capital goods, intermediate goods)). For

branches in services, for want of a better indicator, the stock of capital is adjusted taking the CUR series for the overall manufacturing branch.

The calculations are carried out on the basis of growth rates at the least aggregated level (by branch and by skills level or type of capital). Aggregation is carried out in the initial stage using a Laspeyres index, in other words one that uses weightings based on value shares at the past date (see box 2). The growth rates aggregated in this way are then chained starting with Q1 1992 = 100. ■

(1) The national accounts calculate the part-time coefficient in the same way but use the ACEMO surveys for the proportion of part-time workers. In our work we have given preference to homogeneity of sources by using only the Employment Survey. Generally speaking, the declarations (by the employees) in the Employment Survey concerning hours worked provide larger figures than the declarations by the employers in the ACEMO survey.

BOX 4: THE MÉSANGE MACRO-ECONOMETRIC MODEL

The model used here is the Mésange model, developed by the Finance Ministry's Direction de la prévision with the collaboration of INSEE. Based on the quarterly national accounts published according to the European System of Accounts (ESA 95), it comprises roughly 450 accounting equations and some 40 error-corrected econometric equations describing economic agents' principal types of economic behaviour: purchasing decisions on the part of households, corporate investment, stock formation, price setting, etc. Most of the equations are estimated for the period 1978-1999 and the forecasts made by the model assume that agents' behaviour is in conformity with the average for this period.

Employment is measured as the number of full-time equivalents. This means that the figures for the volume of employment take account of the expansion of part-time working but not of the decline in the working week. Similarly, the wage figures used in the model are on a full-time-equivalent basis.

The model contains certain endogenous variables that can be predicted and some exogenous variables. For the endogenous variables, use is made for forecasting purposes of the information available at the starting date of the forecast, meaning that the forecasts for 2001-2002

are based on the quarterly accounting data up to Q4 2000 and those relating to 2003 on the information available today. The exogenous variables relate to the international environment (exchange rate, export prices of France's principal partners, oil price and demand in French export markets), interest rates and economic policy variables such as public expenditure or tax rates. For the forecasts for 2001 and 2002, use is made of the currently available time series for these variables. The forecasts for 2003 require assumptions to be made for the two latest quarters.

In order to examine the extent to which behaviour differs from past trends, an inversion of the model is carried out. The observed variables that depend on an econometric equation then become exogenous and the residuals of the corresponding equations become endogenous. They show the difference between the explained variable and what it would have been, given its determinants, had there been no change in behaviour.

For each equation, it is possible to quantify the impact of this difference on the variations in the mark-up ratio. For example, to measure the impact of the wage restraint in 2001 and 2002 all the variables depending on an economic equation except for wages are made exogenous. ■