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Wage Formation in France: Sectoral Aspects

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NO. 3: WAGE FORMATION IN FRANCE: sectoral aspects

by

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This study concerns wage formation at sectoral level in France. Such an analysis has a threefold purpose:

- to show the wage-formation mechanisms in each sector, or in groups of sectors which are homogenous as regards the average wage level;

- to explain the fluctuations in inter-sector wage dispersion, especially by reference to the cyclical situation and the trends of inflation, and to ascertain whether there is any feedback from wage dispersion or cyclical divergence between sectors to wage trends for the economy as a whole;

- to identify any wage-emulation processes as between one sector and another and to detect any sector or group of sectors leading the way in this respect.

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Wage formation in France: sectoral aspects

Introduction

1. The purpose of this paper is to examine the processes of wage formation in France sector by sector, to identify the reasons for fluctuations in sectoral wage differentials and ascertain whether wage emulation exists. In France no information is available quarterly on sector wages with breakdowns by sex or according to a number of other characteristics(1), so it was not possible to make use of a number of studies done in other countries on the degree of wage dispersion, such as those of Bouteiller (1971), Pollan (1977), Tachibanaki (1974), and all the studies on the much-researched relationship between wage level and membership of a trade union. Here it would be appropriate to mention the studies by Ashenfelter and Johnson (1972), Boskin (1972), Diewert (1974), Rosen (1970); Throop (1968) and Ashenfelter, Johnson and Pencavel (1972), who estimate simultaneous equation systems for wage, prices and degree of unionisation; Pencavel (1974) - in whose study the effect of the degree of unionisation on wage is weighted by sex and skill level; Schmidt and Strauss (1976), who use a very neat model to find that income has a positive influence on the probability of trade union membership but that the reverse is not true; Flanagan (1976), who shows that employees who are members of trade unions wish to maintain a target wage-differential with non-union members; Lee (1978); Duncan and Stafford (1980), who estimate three equations as to wage, degree of unionisation and working conditions; Mellow (1981), who measures wage differentials not as between union-members and non-members but for one employee throughout his life, alternately as a union-member and as a non-member; Svejnar (1981) for the case of Germany. There is no published work in France dealing with this problem of the effect of trade union membership on wages, probably because the institutional circumstances are such that there is very little likelihood of achieving any results.

2. Research in France has sought mainly to identify "leader" sectors and the wage spill-over channels from them. A number of studies have enabled these sectors to be identified as capital goods, intermediate goods, or energy /see Boyer (1978), Boyer-Mistral (1978), Basle-Mazier-Vidal (1980), Gaspard-Lecuyer (1980)/.

3. The findings set out here concern, first of all, differences in wage formation between one sector and another or between one group of wage-homogeneous sectors and another. The equations specified for this stage will be conventional, reflecting indexation mechanisms, trends in administered wages

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(1) Such as degree of unionisation, percentage of immigrant workers, average age, length of service, degree of concentration of sectors.

and labour market disequilibria, as in the manner of Holt (1970). This equation structure is the one used in the French macro-economic models /see DMS (1978), METRIC (1981)/, here it will be supplemented not only by variables common to the whole economy but also by sector-specific variables. Wage-dispersion between sectors will be considered not in terms of extent, as in the studies mentioned earlier, but in terms of its cyclical fluctuations, as in the manner of Perry (1978), so enabling the broadening or narrowing of wage differentials to be related to the rate of inflation or to the cyclical situation. Dispersion itself may have an effect on wage formation. Lastly, spill-over mechanisms will be given particular attention and will be approached in different ways, according to whether the spill-over can be traced to the situation in a specific context (employment or productivity) for a leader sector or whether it is less easy to pinpoint, i.e. where one sector can be identified as influencing another, without it being possible to trace that influence to a characteristic in the leader sector. Where a sector or group of sectors act as wage-leaders, the overall functioning of the labour market cannot be depicted by a single Phillips curve. In the sectoral breakdown adopted, the economy is divided into thirteen sectors:

- agriculture;
- agro-food industries;
- energy;
- intermediate goods;
- capital goods;
- motor vehicles;
- consumer non-durables;
- consumer durables;
- building;
- transport and telecommunications;
- services;
- insurance and financial institutions;
- the distributive trades.

At this level of disaggregation, there are quarterly statistics by sector on hourly wage-rates, numbers in dependent employment, hours worked, output, value added, etc., for the years 1963-1980, all seasonally adjusted. In all the equations estimated for this paper, the second, third and fourth quarters of 1968 have been left out of the sample, as has the first quarter of 1969; this, allowing for price lags, makes it possible to exclude the disruptive effects, real or statistical, of the strikes in May (1968) and the Grenelle wage agreements.

I. Wage formation in each sector

4. In this first part, the possibility that wage rises may be transmitted from one sector to another is disregarded. If the wage rate changes in a sector, this is taken as owing either to a change in a general variable relative to the economy as a whole (consumer prices, unemployment, etc.) or to a change in a variable specific to the sector (productivity, employment, etc.).

(a) The determinants of wage increases

General determinants

5. The variables used are conventional. They are:

- the private consumption deflator; it was not possible to use as determinants any direct measurement of households' price expectations(1), or changes in rates of social security contributions and changes in tax pressure on employees or employers(2), no quarterly measurements by sector being available;

- an indicator of labour market disequilibrium, which is either log (D/O) where D represents outstanding job applications and O, unfilled vacancies, or $\frac{1}{TU}$, where TU is the unemployment rate. The log (D/O) specification has been conventional in France since the work of Deruelle (1975);

- the rate of growth in the real minimum wage (SMIC) weighted where appropriate by the ratio of the SMIC to the wage rate for the sector, in order to differentiate spill-over effects from SMIC increases;

- growth rate of real wages in the major national enterprises (GENs) (firms nationalised before 1981), which are concentrated in the sectors of energy (EDF), transport (SNCF, RATP, Air France) and telecommunications (PTT).

To take account of possible seasonal effects, such as bunching of pay rounds or the seasonality of real SMIC increases, variables for individual quarters are included with the above variables(3).

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(1) Various studies have shown that they were very well represented by recent price trends, although this is not the case for business price expectations.

(2) Various OECD Secretariat studies (1981) show that these changes have little influence, if any, on the formation of hourly wage rates.

(3) To be rigorous, if pay rounds are not spread evenly over the year, a coefficient must be introduced for each quarter and for each explanatory variable [see Black and Kelejian (1972)].

Sectoral determinants

6. The attempt has been made to relate the trend of hourly wage-rates in each sector to the characteristics of that sector, particularly:

- labour productivity in the sector, with a greater or lesser degree of smoothing;
- changes in hours worked, with differentiation between the underlying trend for hours worked and cyclical fluctuations. This is because if the wage is negotiated in terms of a monthly or weekly figure, or if employees demand and receive compensation for shorter hours in the form of a rise in the hourly wage, the underlying decrease in work hours induces an increase in the hourly wage rate (the coefficient is therefore negative in the equation). A cyclical rise in hours worked, on the other hand, implies a rise in the average hourly wage rate on account of the increase in overtime work(1);
- the value added deflator for the sector. If firms (or employees) wish to maintain their share of value added, wages must be indexed-linked not to the private consumption deflator, but to the value added deflator(2).

(b) Specification and results

7. The equation in its most general form is written:

$$(1)\quad \mathring{W} = a_0 + a_1 Tr1 + a_2 Tr2 + a_e Tr3 + a_4 \mathring{P} + a_5 \mathring{P}_{-1} + a_6 \mathring{P}_{-2} + a_7 \mathring{P}_{-3}$$
$$+ a_8 \log (D/O) \text{ or } a_8 \left[\frac{1}{TU}\right] + a_9 \mathring{GENR} + a_{10} \mathring{GENR}_{-1} + a_{11} \mathring{GENR}_{-2}$$
$$+ a_{12} \mathring{SMICR} \text{ or } a_{12} \left[SMICR \frac{SMIC}{W}\right] + a_{13} \mathring{PROD} + a_{14} \mathring{H}$$
$$+ a_{15} \frac{\Delta(H - H)}{H}$$

$a_4, a_5, a_6, a_7 > 0$ $a_8 < 0$ (> 0) $a_9, a_{10}, a_{11}, a_{12},$

$a_{13} > 0$ $a_{14} < 0$ $a_{15} > 0$

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(1) This is therefore a departure from the model proposed by Grossman (1974), who suggests that hours worked should not be included explicitly, but instead that account should be taken of the fact that cyclical variations in this factor cause a lag to occur between measured unemployment and the gap between labour supply and demand.

(2) In fact this substitution has impaired the quality of equations in every case, and the corresponding results will not be shown. In these circumstances, there was no point in including the rate of margin (profits/output) in the equations, since it is derived directly from the value added deflator and from labour productivity which have both been tested [see Kuh (1967)].

where W = hourly wage rate

Tri = variable for the i^{th} quarter

P = household consumption price deflator

log D/O or $\frac{1}{TU}$ = indicators of labour market disequilibrium

GENR = real wage rate in GENs (major national enterprises)

SMICR = real SMIC

SMIC = nominal SMIC

PROD = apparent hourly labour productivity (introduced with three possibilities: instantaneous, smoothed over one year, and lagged one year).

$\bar{H}$ = underlying hours worked(1)

H = hours worked

A dot over a variable denotes the latter's rate of growth.

The results of estimating equation(1) are given in Table 1. These results will be analysed for each variable in turn.

(i) Price-indexation

8. It must be noted at the outset that explicit price-indexation clauses are prohibited in France. However by a variety of means, firms and trade unions often agree to adjust wages for inflation.

9. The degree and speed of index-linked adjustment differ very considerably from one sector to another. The degree of price-indexation of the wage rate ranges from 0.74 (for insurance and financial institutions - although some doubt remains here as to the choice of indicator for labour market disequilibrium), 0.82 (building), 0.83 (distributive trades),

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(1) $\bar{H}$ was obtained by fitting to hours worked a polynomial of second degree for time - which enables the slower decrease in hours worked in recent years to be taken into account. For all sectors together, it is found that:

$H = 4677 - 5.3T - 0.055T^2$ where T = time

(17.8) (7.3) (3.1) $R^2 = 0.07$

DW = 0.48

0.85 (agriculture), to 1.32 (agricultural and food industries), and 1.30 (services), with the average for all sectors together being exactly 1. This is an astonishing spread and possibly results from statistical problems, or else it reflects wide inter-sector differences in the principles governing wage-agreements. Six sectors out of 13, however, have a degree of indexation very close to 1, these being the industrial sectors. The average price-indexation lag varies ranges from 0 (energy, and household durables, a small sector for which statistics are of doubtful reliability) to 1.66 quarters (motor vehicles) and 1.58 quarters (capital goods). The average is 0.75 of a quarter, which is quite short. In those sectors where nationalised or public-sector firms are numerous (energy, transport and telecommunications, insurance and financial institutions), adjustment is rapid.

10. In several sectors (agricultural and food industries, capital goods, motor vehicles), the weight of the price increase rate in quarter -3 is large while in nearly all cases that for quarter -2 is nil or virtually nil. This may indicate an anticipatory mechanism whereby for the coming quarter a price increase is forecast based on that observed currently and very recently (current quarter and quarter -1) and on the increase observed for the same quarter a year earlier (quarter -3)(1). This led on to examining the seasonality of wage formation and trying to measure it more accurately than with variables for individual quarters. In principle the variables are seasonally adjusted, but any seasonal divergences in the price-indexation lag would certainly show up in the data used. In periods of nearly steady inflation these divergences do not show through and seasonal adjustment is probably not feasible under these conditions. Equation(1) has therefore been re-estimated for all sectors by combining the indexation lags and the variables for individual quarters, therefore including another term:

$$\sum_{i,j} a_{ij} \overset{\circ}{P}_{-i} \, Trj \qquad \begin{matrix} i = 0,1,2,3 \\ j = 1,2,3 \end{matrix}$$

The results are shown on page 11:

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(1) This is not the extrapolation of an annual rate of inflation since in that case all the quarters would have the same weight.

Table 1

Equations for Hourly Wage Rate by Sector(a)

	Cte.	$\dot{P}$	$\dot{P}_{-1}$	$\dot{P}_{-2}$	$\dot{P}_{-3}$	LOG (D/O)	$\dot{GENR}$	$\dot{GENR}_{-1}$	$\dot{GENR}_{-2}$	$\dot{SMICR}$	$\dot{SMICR}$ weighted	Productivity growth rates I	Productivity growth rates II	Productivity growth rates III	$\hat{H}$	R^2	DW	SEE (%)	Sum of coefficients for $\dot{P}$	Average indexation-lag (quarter)	Sum of coefficients for $\dot{GENR}$	Average lag on $\dot{GENR}$ (quarter)
All sectors	0.013 (5.6)	0.51 (4.4)	0.39 (2.9)	-0.06 (0.5)	0.16 (1.6)	-0.0032 (3.9)	0.24 (4.5)	0.14 (3.2)		0.06 (1.9)						0.90	1.79	0.36	1.00	0.75	0.38	0.37
	0.013 (5.6)	0.51 (4.4)	0.39 (2.9)	-0.06 (0.5)	0.15 (1.6)	-0.0032 (3.9)	0.24 (4.5)	0.14 (3.2)			0.13 (1.9)					0.90	1.79	0.36	0.99	0.72	0.38	0.37
	0.011 (4.0)	0.40 (4.0)	0.41 (2.8)	-0.07 (0.5)	0.18 (1.7)	-0.0030 (3.5)	0.22 (4.0)	0.14 (2.9)		0.07 (1.9)				0.13 (1.2)		0.90	1.77	0.37	1.01	0.80	0.36	0.39
Agriculture	0.027 (5.8)	0.53 (2.3)	0.32 (1.3)			-0.0069 (4.3)	0.22 (2.1)	0.17 (1.9)								0.64	1.02	0.75	0.85	0.38	0.39	0.44
	0.024 (4.7)	0.55 (2.4)	0.37 (1.5)			-0.0071 (4.5)	0.22 (2.1)	0.16 (1.9)				0.12 (1.4)				0.66	0.95	0.74	0.92	0.40	0.38	0.42
	0.029 (5.7)	0.45 (1.7)	0.25 (1.0)			-0.0076 (4.2)	0.22 (2.1)	0.16 (0.8)							-0.85 (0.8)	0.65	1.01	0.75	0.70	0.36	0.38	0.42
Agro-food	0.013 (3.7)	0.53 (3.0)	0.38 (1.8)	-0.01 (0.1)	0.42 (2.9)	-0.0050 (4.1)	0.16 (2.0)	0.17 (2.4)			0.14 (1.4)					0.85	0.99	0.56	1.32	1.23	0.33	0.52
	0.012 (3.2)	0.40 (2.9)	0.33 (1.6)	0.03 (0.2)	0.50 (3.4)	-0.0056 (4.8)	0.10 (2.5)	0.15 (2.3)						0.06 (0.9)		0.86	1.17	0.53	1.35	1.40	0.34	0.44
Energy	0.014 (2.6)	0.93 (7.0)				-0.0048 (2.6)	0.62 (5.2)			0.09 (1.2)						0.66	2.00	0.46	0.93	0	0.62	0
	0.019 (0.3)	1.07 (7.7)				-0.0024 (1.2)	0.62 (5.4)			0.09 (1.2)			0.25 (2.5)			0.70	2.07	0.41	1.07	0	0.62	0
Intermediate goods	0.017 (5.0)	0.49 (2.8)	0.57 (3.3)			-0.0051 (4.3)	0.17 (2.3)	0.13 (2.1)								0.79	0.81	0.55	1.06	0.54	0.30	0.43
	0.016 (4.4)	0.47 (2.7)	0.60 (3.4)			-0.0053 (4.5)	0.17 (2.2)	0.14 (2.2)						0.07 (1.5)		0.80	0.90	0.54	1.07	0.56	0.31	0.45
Industrial capital goods	0.006 (1.1)	0.22 (0.8)	0.38 (1.1)	-0.04 (0.1)	0.41 (0.7)	-0.0013 (1.7)	0.21 (1.7)	0.31 (2.9)	0.15 (1.4)							0.58	0.72	0.87	0.97	1.58	0.67	0.91
Motor vehicles	0.009 (2.0)	0.32 (1.4)	0.23 (0.8)	-0.11 (0.4)	0.53 (2.7)	-0.0011 (0.7)	0.09 (0.9)	0.12 (1.5)	0.08 (1.0)							0.63	0.85	0.70	0.96	1.66	0.29	0.97
Consumer goods	0.016 (4.9)	0.57 (3.5)	0.45 (2.7)			-0.0040 (3.6)	0.12 (1.7)	0.12 (2.0)								0.79	0.91	0.52	1.02	0.44	0.24	0.50

(a) The variables for individual quarters are not shown in the tables of results.

I: Instantaneous.

II: Smoothed over 1 year.

III: Smoothing over 1 year lagged by 1 year.

Data are quarterly from 1964I to 1980IV, excluding 1968II to 1969I.

Table 1 (Continued)

	Cte.	$\dot{P}$	$\dot{P}_{-1}$	$\dot{P}_{-2}$	$\dot{P}_{-3}$	LOG (D/O)	$\frac{1}{TU}$	$\dot{GENR}$	$\dot{GENR}_{-1}$	$\dot{SMICR}$	$\dot{SMICR}$ weighted	Productivity growth rates I	II	III	$\Delta(H-\Pi)$	R^2	DW	SEE (%)	Sum of coefficients for P	Average indexation -lag (quarter)	Sum of coefficients for $\dot{GENR}$	Average lag on $\dot{GENR}$ (quarter)
Private capital goods	0.014 (1.3)	1.04 (3.4)				-0.0032 (0.8)										0.18	0.50	2.21	1.04	0	0	0
	0.018 (1.6)	1.02 (3.3)				-0.0044 (1.0)									0.0003 (1.3)	0.20	0.53	2.20	1.02	0	0	0
	0.005 (0.5)	1.03 (3.5)				-0.0008 (0.2)							0.24 (2.3)			0.25	0.54	2.13	1.03	0	0	0
Building	0.017 (4.1)	0.47 (2.3)	0.35 (1.7)			-0.0019 (1.4)		0.17 (1.9)	0.20 (2.6)							0.62	0.67	0.64	0.82	0.43	0.37	0.54
	0.014 (3.5)	0.49 (2.5)	0.45 (2.2)			-0.0022 (1.6)		0.11 (1.3)	0.15 (1.9)					0.19 (1.8)		0.68	0.73	0.62	0.94	0.48	0.26	0.58
Transport and telecommunications	0.004 (1.6)	0.75 (5.3)	0.22 (1.3)	0.15 (1.0)	0.05 (0.4)	-0.0021 (2.2)		0.65 (0.7)								0.90	1.20	0.45	1.17	0.57	0.65	0
Services	0.010 (1.8)	0.38 (1.2)	0.92 (2.8)			-0.0034 (1.5)				0.16 (1.8)						0.58	1.04	1.12	1.30	0.71	0	0
	0.006 (0.9)	0.58 (1.6)	0.73 (2.1)			-0.0026 (1.1)		0.21 (1.4)		0.12 (1.3)						0.60	1.68	1.11	1.31	0.56	0.21	0
	0.006 (0.9)	0.46 (1.2)	0.80 (2.2)			-0.0019 (0.8)		0.18 (1.2)		0.11 (1.2)		0.29 (1.1)				0.61	1.73	1.11	1.26	0.63	0.18	0
Insurance and financial institutions	0.018 (2.2)		0.74 (3.0)			-0.0019 (0.6)				0.31 (2.3)						0.28	2.45	1.66	0.74	1	0	0
	-0.006 (0.4)		1.19 (3.3)				410^{-4} (1.8)			0.31 (2.5)						0.32	2.57	1.62	1.19	1	0	0
	-0.005 (0.4)		1.11 (3.1)				310^{-4} (1.4)	0.28 (1.3)		0.24 (1.9)						0.34	2.61	1.60	1.11	1	0.28	0
Distributive trades	0.023 (5.0)	0.29 (1.1)	0.26 (0.8)	0.23 (0.7)	0.05 (0.2)	-0.0059 (3.2)				0.07 (1.0)						0.48	0.56	0.91	0.83	1.05	0	0
	0.019 (4.1)	0.17 (0.7)	0.29 (0.9)	0.15 (0.5)	0.14 (0.6)	-0.0042 (2.4)				0.06 (0.8)				0.54 (3.6)		0.56	0.69	0.83	0.76	1.33	0	0

	In first quarters	In second quarters	In third quarters	In fourth quarters
Coefficient for $\overset{\circ}{P}$	0.58	0.61	0.25	0.78
Coefficient for $\overset{\circ}{P}_{-1}$	0.25	0.37	0.55	0.05
Coefficient for $\overset{\circ}{P}_{-2}$	-0.32	0.10	-0.02	0
Coefficient for $\overset{\circ}{P}_{-3}$	0.47	-0.03	0.27	0.09
$\sum \overset{\circ}{P}$	0.93	1.05	1.05	0.92
Average Indexation-lag	1.04(*)	0.46(*)	1.26(*)	0.35(*)

(*) quarter.

F for joint null value of a_{ij}: 1.16 (value at 5 per cent: 2.11).

Total indexation to prices appears to be roughly steady from one quarter to another, with a dip in the fourth quarter. The speed of indexation is much higher in the second and fourth quarters, which are probably the ones in which most wage contracts are renewed with allowance for recent inflation. In the first and third quarters wage increases are probably due in part to phased application of agreements concluded three quarters earlier on the basis of inflation at that time (i.e. in the second and fourth quarters of the previous year), as indicated by the high coefficient of P_{-3} for both quarters. However, the very tentative nature of these results, notwithstanding their interest, and the low value of the nullity test for a_{ij} (which is accepted) mean that this specification has not been used further in this study.

(ii) The labour market

11. In all sectors except insurance and financial institutions, the log (D/O) indicator (unemployment/job vacancies) gives better results than 1/TU (1/rate of unemployment). This possibly denotes a degree of independence from the general pace of business activity in banking or the recruitment rate in banking. Labour market disequilibria have a widely varying influence on wage rates in the different sectors, with the log (D/O) coefficient

varying in a ratio of 1 to 6. Very great sensitivity to these disequilibria is observed in agriculture, the agro-food industries, energy, intermediate goods and the distributive trades. Sensitivity is very low in capital goods, motor vehicles, building, insurance and banking. There is apparently no relationship between the degree of price-indexation and the strength of this labour market effect. On average, an increase of 10 per cent in the number of unemployed, with the number of unfilled job vacancies remaining constant, reduces the increase in the hourly wage rate by 0.13 per cent per annum.

(iii) Administered wages (in national enterprises, the SMIC)

12. It is observed first of all that SMIC increases have a significant effect on wages only in a few sectors: services, insurance and financial institutions and, marginally, agro-food and energy. On the other hand, wage increases in the major nationalised enterprises affect wages in practically all sectors (except household durables and the distributive trades). Obviously, this effect is immediate and strong where there are large numbers of such corporations (energy, transport and telecommunications). Spill-over into other sectors varies in degree (coefficient ranging from 0.2 for services to 0.7 for industrial capital goods) and in time-lag (from 0, in services, to almost 1 quarter, in industrial capital goods and motor vehicles). In France, therefore, real wage trends in nationalised enterprises apparently play a very significant role.

(iv) Sectoral characteristics

13. These are seldom significant. Working hours (whether in terms of the cyclical or the non-cyclical component) appear to have no effect on the formation of hourly wages. This may either mean that wages set on a weekly or monthly basis are in the minority, if the underlying decrease in hours worked does not lead to their being adjusted and therefore if employees do not agree to a cut in wages, or it may mean that employees whose wages are set on an hourly basis agree to a cut in pay in return for more free time. Obviously, the possibility should not be ruled out of the estimate being affected by statistical problems (mismeasurement of hourly wages, or of the number of hours worked, etc.) or by collinearities in the equation (e.g. with job vacancies in the case of the cyclical component of hours worked).

14. Productivity growth only influences the hourly wage rate to any truly significant extent in three sectors: energy (it is known that EDF wages take productivity into account), building and the distributive trades. In the latter sector, the coefficient is high (0.54), although the poor quality of the statistics on value added in the distributive trades (in calculating which the conventional commercial rates of mark-up are used) cast some doubt on the result. The absence of a productivity impact does not in the long term affect the division

of value added between wages and profits, which depends on the formulation of the price equation, but it does affect the short-term movement of real wages.

15. Table 2 shows the relationship of hourly wage rates in individual sectors to the average wage rate for all sectors, combined, which are then divided into three groups. Some sectors (energy, industrial capital goods, financial institutions, the agro-food industries, intermediate goods, the distributive trades and building) show a fairly stable relative wage. In others, the trends are remarkable: a decline in motor vehicles, private capital goods, transport and services, and a marked improvement in agriculture. Table 3 gives the apparent hourly productivity growth rate for employees in the different sectors. In certain cases (financial institutions, the distributive trades), calculation of production being based on convention, it is not possible to do very much with the figures. The same applies to agriculture and partly to the agro-food industries in which the self-employed account for a major share of production.

16. Bearing these caveats in mind, it will be noted that, with the exception of household durables, wage-differentials between sectors are a relatively good reflection of the long-run trend in productivity. Building and services are seen to rank lowest in both wage rates and productivity, while energy, industrial capital goods and motor vehicles rank highest. In view of this, it is surprising that productivity should have so little significance in the wage-rate equations. Even if its effect were only very long-run, the equation constants in Table 1 should be seen to be higher in those sectors where productivity gains are larger on average, but this is not the case.

17. In the foregoing, wage level and the productivity growth rate clearly move together, even over a long run of figures. A line has been added to Table 3 giving the absolute level of apparent hourly productivity in 1963 and 1980. As might be expected, there is no relationship between the level of wage rates and the level of apparent labour productivity, since the share of wages in value added in each sector depends on the production techniques used. In fact the pattern of wage differentials between sectors had already been set at the start of the period, so it is quite logical to find econometrically that the trend in differentials since 1963 is not linked to the trend in labour productivity. It would seem, therefore, that the trend of wage rates in the various sectors results from that of variables common to the economy as a whole and not from sectoral characteristics, and that wage differentials between sectors result from differences of reaction to movements in these overall variables (different bases for indexation, different effect of labour market disequilibria, etc.). These points will be reverted to when examining wage dispersion between sectors. It should also be remembered that for the time being no spill-over effect has been taken into account.

Table 2

Relative hourly wage rates

Sector	Wage Average wage in 1963	Wage Average wage in 1968	Wage Average wage in 1972	Wage Average wage in 1980
High-wage sectors				
Energy	1.34	1.36	1.44	1.40
Industrial capital goods	1.14	1.10	1.13	1.14
Motor vehicles	1.24	1.18	1.14	1.07
Insurance and financial institutions	1.41	1.56	1.48	1.39
Middle-wage sectors				
Agro-food industries	0.99	0.92	0.99	1.06
Intermediate goods	1.07	1.05	1.05	1.07
Consumer goods	0.92	0.95	0.95	0.98
Household durables	1.02	1.01	0.93	0.91
Transport and telecommunications	1.13	1.08	1.06	1.03
Distributive trades	1.09	1.05	1.02	1.02
Low-wage sectors				
Agriculture	0.54	0.62	0.67	0.79
Building	0.81	0.89	0.85	0.88
Services	0.94	0.88	0.89	0.85

Table 3

Labour productivity growth rates (dependent employment)

(change over 1 year)

	Total	Agri-culture	Agro-food	Energy	Inter-mediate goods	Capital goods	Motor vehicles	Consumer goods	Household durables	Build-ing	Transport & tele-communi-cations	Services	Insurance and finan-cial insti-tutions	Distributive trades
1964	4.0	9.2	10.8	11.6	8.4	3.2	9.2	0.8	-2.0	3.2	5.2	-0.4	8.8	0.8
1965	5.2	6.4	13.2	6.8	5.2	10.8	9.6	12.8	14.0	3.2	4.8	-0.8	0.8	0.8
1966	2.4	5.6	-2.4	3.2	8.8	3.6	4.4	2.0	16.8	2.0	4.8	-2.4	7.2	1.6
1967	5.6	16.0	12.8	10.4	2.8	11.2	0.4	8.8	3.2	6.0	-0.4	-1.2	2.8	2.8
1968	6.8	2.4	12.8	14.4	12.0	20.0	29.2	15.2	20.4	-1.2	6.4	1.6	11.6	7.2
1969	1.6	2.8	10.8	9.2	6.0	-4.0	3.6	4.4	-4.4	2.4	6.8	-2.0	15.6	-4.4
1970	5.6	10.8	6.4	20.8	4.0	3.2	18.8	5.2	4.4	4.4	4.8	2.8	-1.2	6.4
1971	4.8	6.0	5.2	5.6	3.6	13.2	-2.4	6.4	14.8	5.6	6.4	4.4	-0.8	4.8
1972	5.6	8.8	7.6	12.0	8.0	3.2	10.4	4.0	14.4	4.0	9.2	3.2	-2.4	3.2
1973	3.6	10.8	2.8	9.6	5.6	5.6	6.8	-0.8	8.8	-2.0	6.8	1.6	13.6	4.0
1974	2.0	4.0	8.8	2.0	-3.2	4.4	-4.8	6.0	-1.6	9.6	-7.2	2.0	2.4	0.4
1975	5.2	0	7.2	3.2	2.4	14.8	6.0	4.8	16.8	6.8	8.4	0.8	-8.0	2.8
1976	4.0	4.4	3.2	6.4	11.6	0.8	7.2	6.0	23.6	-0.4	4.8	1.2	6.4	2.4
1977	2.4	8.8	3.6	4.4	2.0	8.0	2.4	2.4	-8.0	2.0	3.6	-0.8	4.8	-1.2
1978	5.6	13.6	3.6	4.0	7.6	10.4	3.2	5.6	10.0	1.2	6.8	2.4	1.6	4.4
1979	3.6	8.4	2.4	3.2	7.2	6.0	2.8	2.8	2.8	1.2	4.4	0.8	10.8	1.2
1980	0.4	2.4	0.4	1.6	-2.4	3.6	-2.8	2.8	2.0	-3.6	1.2	-0.8	6.8	-0.4
Average	4.0	7.1	6.4	7.6	5.3	6.9	6.1	5.2	8.0	2.6	4.5	0.7	4.8	2.2
Level of productivity														
1963	100	140.1	105.3	154.4	75.3	72.0	59.9	56.3	48.1	73.2	75.0	212.0	126.9	124.9
1980	100	235.4	140.0	289.5	95.7	107.4	71.4	67.9	89.8	59.6	82.3	121.3	138.1	91.6

Note:

(a) Productivity for all sectors combined is taken as the reference level for each year.

☐ Denotes the two highest growth rates on a 2-year moving average basis, excluding agriculture, agro-food industries and financial institutions.

18. Chart 1 shows the series that has been fitted for all sectors combined. The largest residuals appear in 1969 II and 1969 IV (the year 1969 being undoubtedly disturbed by the effects of the wage rises in 1968), and 1973 II, probably as a result of the reduction in the rate of VAT at the beginning of the year which does not seem to have been passed through to wages. During the period of the first oil crisis (1975 - early 1976), wage rates show fluctuations which the equation does not reproduce.

II. Wage dispersion between sectors

(a) Measurement and description

19. The dispersion of hourly wage rates among the 13 sectors considered has been measured by the DISP indicator calculated as follows:

$$(2)\quad DISP = \frac{1}{\overline{W}}\sqrt{\sum_{i=1}^{13} (W_i - \overline{W})^2 \frac{E_i}{\overline{E}}}$$

where $\overline{W}$ = average wage rate for the 13 sectors

W_i = wage rate in sector i

E_i = employment in sector i

$\overline{E}$ = total employment in the 13 sectors

DISP is shown in Chart 2.

Because of the type of data used, wage-rate differentials between sectors derive both from inter-sectoral differences in the structure of job skills and from wage differences in the same skill category. A sharp fluctuation in dispersion may therefore result from inter-sectoral differences in the manner of wage formation for a certain type of job, or from differences in wage formation for individual skill levels. Furthermore, the long-run trend of dispersion may reflect shifts in average skill patterns for each sector. The focus here will therefore be on short-term dispersion movements.

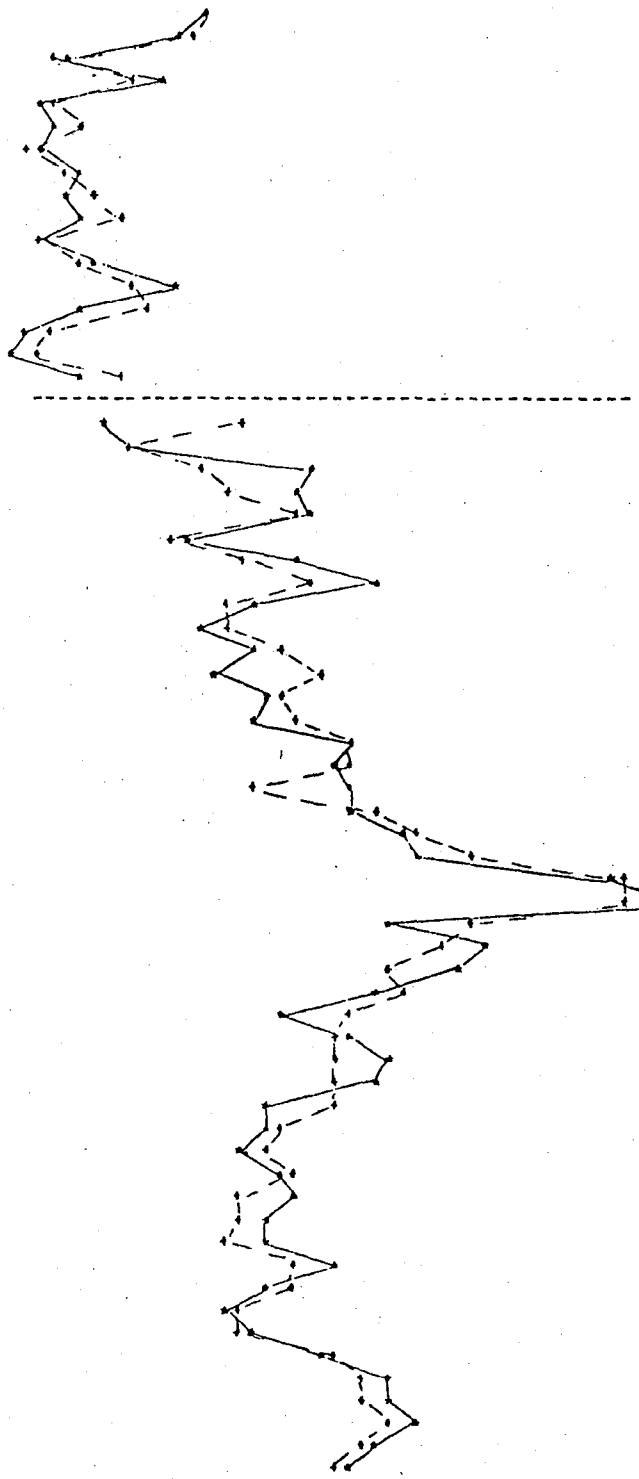
20. Wage dispersion between sectors decreased sharply from 1964 to 1966 and then more steadily from 1967 to 1971. It then began to fluctuate markedly, rising in 1973 and 1979, falling between 1974 and 1977 and again in 1980. To what can these fluctuations be traced? The big SMIC increases occurred in 1968 (second and third quarters), 1973 (third quarter) and 1974 (second and third quarters). In 1968, their effect appears to have been more transient. It was perhaps more marked in 1973-1974. The SMIC increases do not in any case appear to explain developments after 1975; these seem to be related to the cyclical situation; which improved in the winter of 1975-76 and in 1979, possibly causing the dispersion

CHART 1

The fit for all sectors combined

_____ actual series

---------- fitted series



ID	ACTUAL	FITTED	RESIDUAL
6401	.2409E-01	.2461E-01	.786E-04
6402	.2276E-01	.2363E-01	-.872E-03
6403	.1530E-01	.1374E-01	.156E-02
6404	.2197E-01	.1933E-01	.265E-02
6501	.1326E-01	.1392E-01	-.640E-03
6502	.1413E-01	.1558E-01	-.144E-02
6503	.1290E-01	.1224E-01	.662E-03
6504	.1633E-01	.1514E-01	.119E-02
6601	.1539E-01	.1677E-01	-.139E-02
6602	.1401E-01	.1674E-01	-.274E-02
6603	.1451E-01	.1394E-01	.570E-03
6604	.1807E-01	.1639E-01	.478E-03
6701	.2235E-01	.1963E-01	.271E-02
6702	.1572E-01	.2055E-01	-.482E-02
6703	.1179E-01	.1451E-01	-.272E-02
6704	.1137E-01	.1353E-01	-.216E-02
6801	.1554E-01	.1913E-01	-.359E-02
6902	.1729E-01	.2728E-01	-.900E-02
6903	.2054E-01	.1977E-01	.270E-03
6904	.3229E-01	.2440E-01	.776E-02
7001	.3139E-01	.2635E-01	.504E-02
7002	.3229E-01	.3096E-01	.133E-02
7003	.2263E-01	.2307E-01	.563E-03
7004	.3177E-01	.2732E-01	.445E-02
7101	.3700E-01	.3241E-01	.459E-02
7102	.2814E-01	.2695E-01	.119E-02
7103	.2486E-01	.2648E-01	-.162E-02
7104	.2848E-01	.3064E-01	-.216E-02
7201	.2585E-01	.3353E-01	-.768E-02
7202	.2576E-01	.3078E-01	-.102E-02
7203	.2804E-01	.3097E-01	-.293E-02
7204	.3688E-01	.3541E-01	-.535E-03
7301	.3435E-01	.3523E-01	-.879E-03
7302	.3497E-01	.2813E-01	.684E-02
7303	.3522E-01	.2720E-01	-.198E-02
7304	.3526E-01	.3963E-01	-.369E-03
7401	.3596E-01	.4401E-01	-.405E-02
7402	.5366E-01	.5473E-01	-.108E-02
7403	.5813E-01	.5438E-01	.375E-02
7404	.3766E-01	.4383E-01	-.617E-02
7501	.4517E-01	.4177E-01	.340E-02
7502	.4219E-01	.3705E-01	.514E-02
7503	.3067E-01	.2905E-01	-.217E-02
7504	.3034E-01	.3491E-01	-.457E-02
7601	.3473E-01	.3438E-01	.351E-03
7602	.3403E-01	.3458E-01	.346E-02
7603	.3694E-01	.3455E-01	.240E-02
7604	.2957E-01	.3460E-01	-.504E-02
7701	.2916E-01	.2999E-01	-.809E-03
7702	.2753E-01	.2986E-01	-.232E-02
7703	.3016E-01	.3119E-01	-.103E-02
7704	.3134E-01	.2767E-01	.367E-02
7801	.2530E-01	.2735E-01	.195E-02
7802	.2566E-01	.2650E-01	.316E-02
7803	.3456E-01	.3160E-01	.297E-02
7804	.2912E-01	.3116E-01	-.204E-02
7901	.2838E-01	.2742E-01	-.103E-02
7902	.2805E-01	.2792E-01	.131E-03
7903	.3303E-01	.3417E-01	-.114E-02
7904	.3145E-01	.3655E-01	.164E-02
8001	.3790E-01	.3596E-01	.194E-02
8002	.3594E-01	.3790E-01	.205E-02
8003	.3064E-01	.3578E-01	.868E-03
8004	.3508E-01	.3410E-01	.979E-03

to widen. In 1977 and 1980 the business situation worsened, possibly causing wage differentials to narrow. To shed light on these points, equations were first of all estimated for dispersion including the same explanatory variables as for the wage rate equations (Table 4)(1). It is observed that:

- in every case, the indicator of labour market strain, negatively affects wage dispersion over the 13 sectors. In periods of high activity, the spread between sectors widens, as noted just now by reference to the chart(2);

- the increase in prices significantly reduces dispersion(3);

- the temporary positive dispersion effect of wage increases in the national enterprises is scarcely visible. This is probably quite natural, however, since in the short term these increases affect only those sectors with large numbers of GENs - causing wage differentials to widen - and then, as we have seen, they spread economy as a whole;

- the effect of real SMIC increases is very slight, which is consistent with the fact that the value of the coefficient for this variable in the wage-rate equations has been found to be very small(4) purely nominal changes being represented by price movements.

---

(1) In theory, dispersion should be explained with the aid of administered price and wage levels. This formulation, arrived at by writing out the dispersion expression in analytical form, did not yield any worthwhile results however.

(2) It should be pointed out that this result is the opposite of that obtained for the United States by Perry (1978) and Wachter (1974). An attempt will be made further on to explain some of the reasons for this difference.

(3) Wachter (1974) achieved the same result for the United States, but Perry (1978) found the reverse to be the case.

(4) Furthermore, SMIC is introduced in real terms, purely nominal changes being represented by price movements.

CHART-2

Inter-Sectoral-wage-dispersion

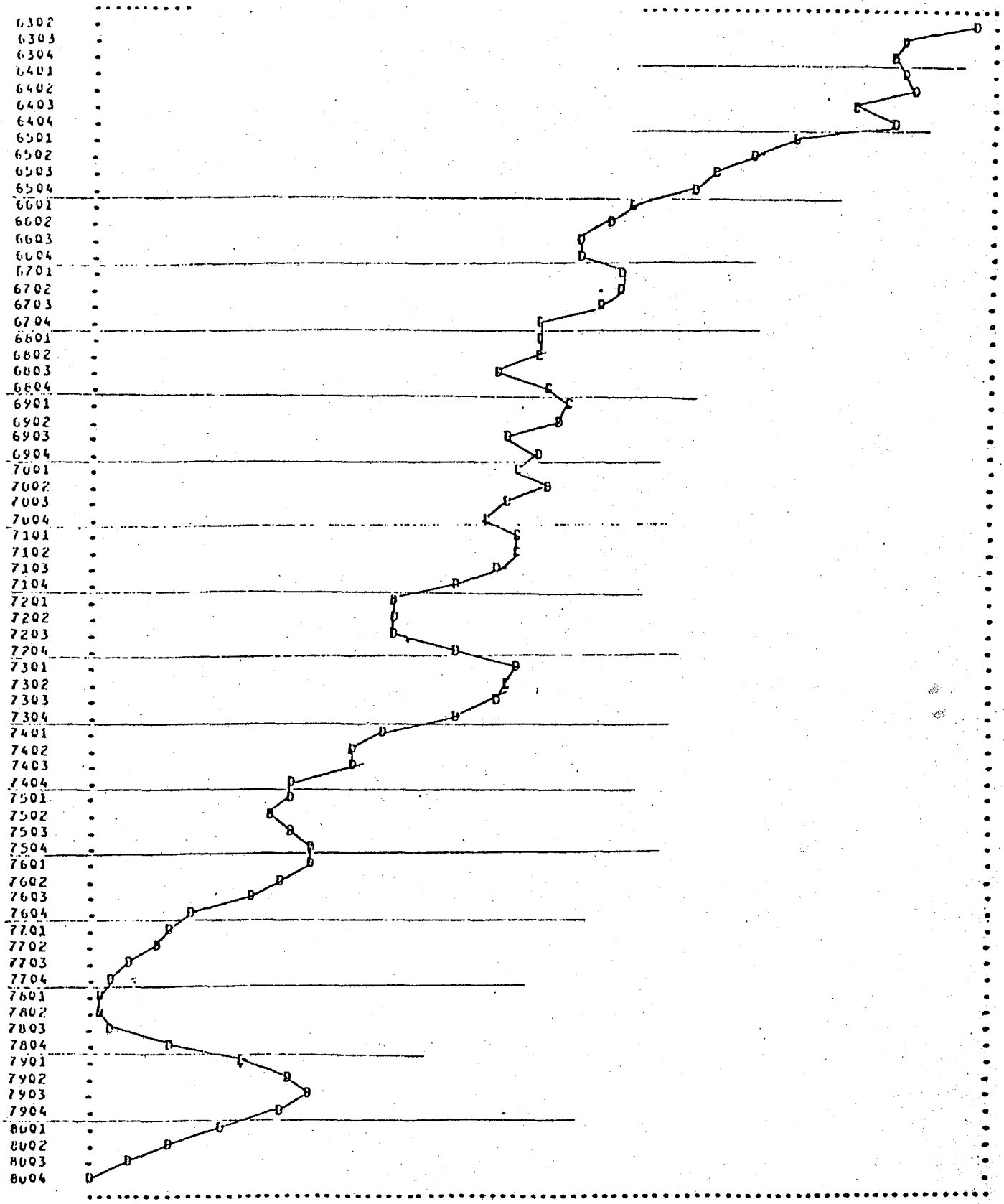


Table 4

Dispersion equations

Constant	$\overset{\circ}{P}$	$\overset{\circ}{P}_{-1}$	$\overset{\circ}{P}_{-2}$	$\overset{\circ}{P}_{-3}$	$\Sigma\overset{\circ}{P}$	LOG (D/O)	$\overset{\circ}{SMICR}$	$\overset{\circ}{GENR}$	$\overset{\circ}{GENR}_{-1}$	Productivity growth rate for middle-wage sectors	Inter-sectoral variance of employment	R^2	DW	SEE (%)
0.19	-0.46	-0.40	-0.14	-0.14	-1.14	-0.0051	-0.04	0.05	-0.05			0.70	0.20	0.008
(37.7)	(1.8)	(1.4)	(0.5)	(0.7)	(8.1)	(3.0)	(0.6)	(0.5)	(0.6)					
0.18	-0.29	-0.27	-0.12	-0.34	-1.02	-0.0051	-0.02	-0.03	-0.07	-0.08		0.71	0.19	0.008
(39.8)	(1.4)	(1.0)	(0.5)	(1.8)	(9.3)	(3.3)	(0.3)	(0.3)	(0.9)	(0.7)				
0.19	-0.29	-0.25	-0.09	-0.39	-1.02	-0.0070	-0.05	-0.05	-0.14	-0.12	392.0	0.74	0.36	0.006
(40.9)	(1.4)	(1.0)	(0.4)	(2.1)	(9.3)	(4.1)	(0.8)	(0.6)	(1.6)	(1.1)	(2.2)			

Quarterly data, excluding 1964I to 1980IV and 1968II to 1968IV.

The low value for the Durbin-Watson test shows, however, that dispersion is affected by other factors, all the structural components of which were mentioned earlier.

21. In order to pinpoint these results for wage dispersion between sectors, equations were estimated to explain the wage-formation process in each of the three groups of sectors established earlier (high wage - middle wage - low wage - see Table 2). Differences in the wage-formation process could confirm the effects discovered in the equations for dispersion.

(b) The three groups of sectors according to relative wage level

22. It is now proposed to consider the three groups of sectors characterised by high, middle and low wages respectively. In order to be examined as groups, they need to be fairly homogeneous. To test for homogeneity, dispersion (raised to the second power) was first broken down into two components: the dispersion average for the three groups together and weighted dispersion within each group, as follows:

$$(3)\quad DISP^2 = \frac{1}{\bar{W}^2} \sum_{i=1}^{13} (W_i - \bar{W})^2 \frac{E_i}{E} = \frac{1}{\bar{W}^2} \sum_{j=F,M,B} (W_j - \bar{W})^2 \frac{E_j}{E}$$

$$+ \frac{1}{\bar{W}^2} \sum_{j=F,M,B} \frac{E_j}{E} DISP_j^2$$

where F, M and B denote the high, middle and low wage groups respectively, E_F, E_M and E_B the total workforce in each group, and $DISP_F$, $DISP_M$ and $DISP_B$ the wage dispersion within each group.

Year by year, the first component of the breakdown in equation (3) accounts for an increasing share of total dispersion, rising from 68 per cent in 1963 to 81 per cent in 1981. It certainly seems that these three groups are self-contained and can be analysed as such, since the differentials within each one remain narrow.

23. The second criterion examined is the econometric analysis of wage-rate formation as shown in Table 1. Are there any common features in the results for sectors within the same group? A number of points emerge:

- the sectors in which the labour market effect on wage formation is pronounced are to be found in the middle-wage group - excluding agriculture, which is a special case;

- the sectors in which wage-price elasticity is distinctly higher than unity are found in the middle-wage group (and low-wage services); in the high-wage group, price indexation appears to be imperfect.

Lastly it can be pointed out that the average annual rates of increase in apparent labour productivity are 6.4 per cent in the high-wage group, 4.6 per cent in the middle-wage group and 2.5 per cent in the low-wage group.

24. An attempt will be made to clarify these points by estimating equations for wage-rate formation identical to equation (1) for the average wage rate in each of the three groups. Chart 3 shows the trends for these three wage-rates, and affords a better view of the causes of the dispersion variations identified earlier. The 1968 wage rise affected the three groups about equally, which accounts for there being no change in dispersion. In 1973-1974 the increase mainly benefited the middle- and low-wage sectors, and the dispersion narrowed. With the introduction of the "Plan Barre" (late 1976, early 1977), increases in the high-wage sectors slowed markedly (especially in the motor industry and financial institutions), with the result that the inter-sector dispersion narrowed. The subsequent variations in dispersion were caused by the wide fluctuations in wage rates in the low-wage sectors. These fluctuations (a slight increase in 1979, a steep rise in 1980) were apparent in the three sectors concerned (agriculture, building, services), which would tend to confirm that the groups are individually consistent. In Chart 3 no systematic lag is discernible between wage increases in the three groups. At times a slight lag, of the order of one quarter, can be seen in the increases for those sectors in which wage rates are near the average (64.1, 70.1, 73.1, 76.3, 77.2), but there is nothing systematic in this and the reverse is sometimes observable (69.1, 70.4, 74.2).

25. Table 5 gives the results of estimating equation (1) for these three wage rates. The features mentioned earlier are found to recur after analysis of the results for each of the 13 sectors:

- price-indexation is higher in middle- or low-wage sectors than in high-wage sectors (in the region of 1 as against 0.91)(1). Thus in periods of high inflation, wage dispersion must narrow, which confirms the result obtained when estimating the equations for dispersion. It can be also seen that index-linked adjustment of wages is much faster in the low-wage group (0.4 quarter on average) than in the middle-wage group (0.7 quarter) and especially, the high-wage group (1.1 quarter).

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(1) This is consistent with the finding by Gaspard-Lecuyer (1980) that price-indexation of wages is distinctly lower for management than for the other occupational categories.

CHART 3

Hourly wage rate in the three sector groups

High-wage (F)
Middle-wage (M) (quarterly rate of increase)
Low-wage (B)

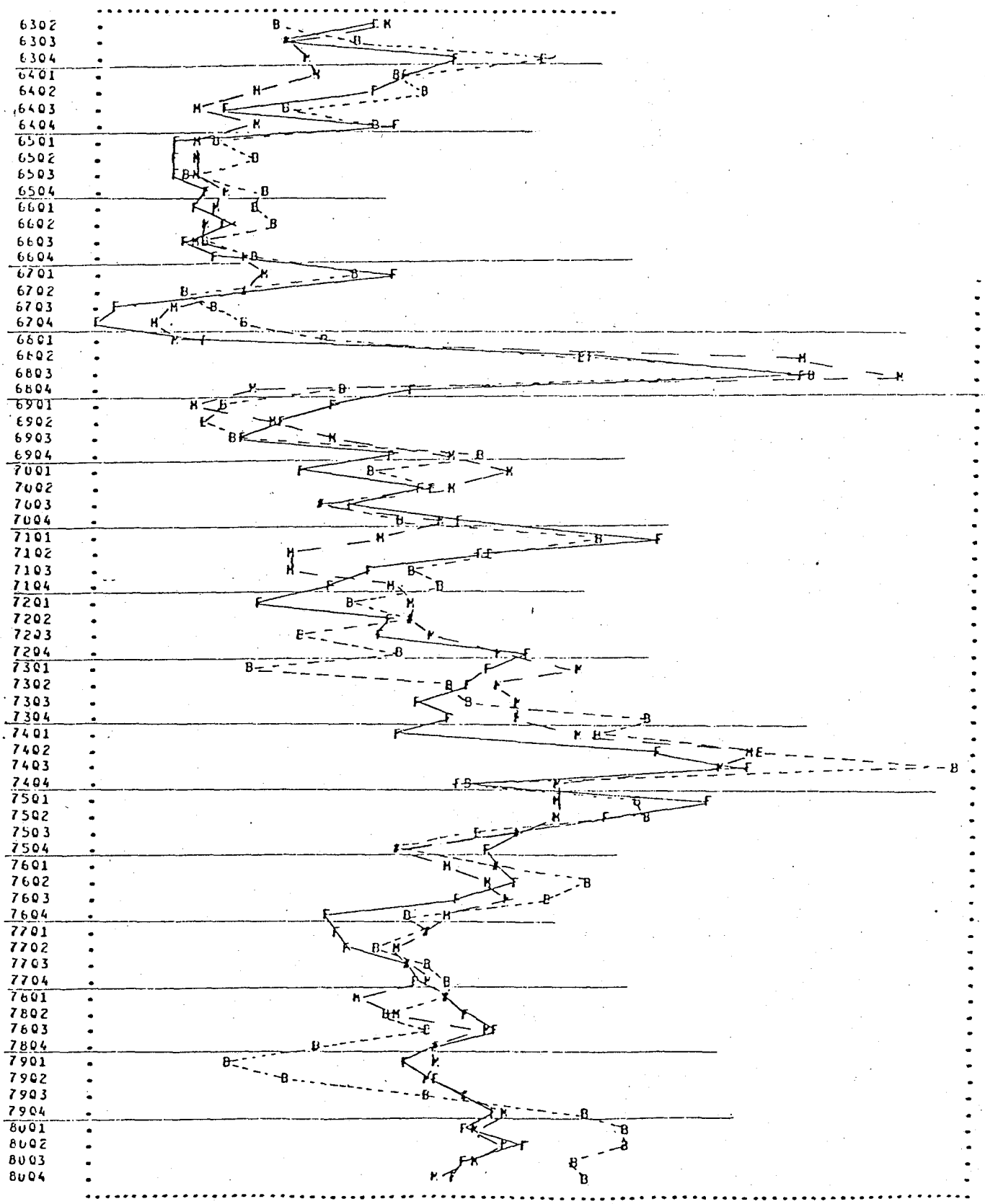

Table 5

	Constant	$\ddot{P}$	$\ddot{P}_{-1}$	$\ddot{P}_{-2}$	$\ddot{P}_{-3}$	LDO	SMICR	$\ddot{GENR}$	$\ddot{GENR}_{-1}$	Productivity growth rate: Inst.	Smoothed 1 year	Smoothed lagged 1 year	Wage dispersion: -1	-2	-3	Sum of weights over P	Average indexation-lag		R^2	DW	SEE (%)
Average wage rate	0.012 (5.6)	0.51 (4.4)	0.39 (2.9)	-0.06 (0.5)	0.06 (1.5)	-0.0032 (3.9)	0.06 (1.9)	0.24 (4.5)	0.14 (3.2)							1.00	0.75	qtr.	0.90	1.79	0.36
	0.011 (4.0)	0.49 (4.0)	0.41 (2.8)	-0.07 (0.5)	0.18 (11.7)	-0.0030 (3.5)	0.07 (1.9)	0.22 (4.0)	0.14 (2.9)			0.13 (1.2)				1.01	0.81	qtr.	0.90	1.77	0.37
	0.024 (2.1)	0.46 (3.9)	0.43 (3.1)	-0.09 (0.7)	0.13 (1.4)	-0.0035 (4.1)	0.05 (1.6)	0.23 (4.5)	0.15 (3.3)				-0.06 (1.0)			0.93	0.69	qtr.	0.90	1.71	0.36
	0.030 (2.2)	0.44 (3.7)	0.43 (3.0)	-0.08 (0.6)	0.13 (1.2)	-0.0037 (4.0)	0.05 (1.5)	0.20 (3.7)	0.13 (2.8)			0.14 (1.4)	-0.10 (1.4)			0.92	0.66	qtr.	0.90	1.70	0.36
Wage rate, high-wage sectors	0.007 (2.0)	0.37 (1.9)	0.40 (1.8)	-0.02 (0.0)	0.36 (2.3)	-0.0010 (0.8)	0.09 (1.7)	0.30 (3.5)	0.22 (3.0)							0.91	1.14	qtr.	0.74	1.34	0.59
	0.006 (1.5)	0.38 (1.9)	0.45 (1.9)	-0.24 (1.0)	0.35 (2.1)	-0.0010 (0.8)	0.09 (1.6)	0.28 (3.1)	0.23 (2.9)			0.02 (0.3)				0.94	1.09	qtr.	0.75	1.31	0.61
	0.030 (1.8)	0.30 (1.6)	0.37 (1.6)	-0.22 (1.0)	0.32 (2.1)	-0.0017 (1.2)	0.08 (1.5)	0.31 (3.6)	0.21 (2.9)						-0.12 (1.4)	0.77	1.16	qtr.	0.75	1.32	0.59
Wage rate, middle-wage sectors	0.015 (6.1)	0.52 (4.2)	0.37 (2.5)	0.02 (0.2)	0.11 (1.0)	-0.0042 (4.9)	0.03 (1.0)	0.21 (3.8)	0.11 (2.2)							1.02	0.72	qtr.	0.88	1.02	0.38
	0.013 (4.9)	0.48 (3.9)	0.34 (2.3)	0.05 (0.3)	0.17 (1.6)	-0.0042 (4.9)	0.03 (0.8)	0.21 (3.7)	0.10 (2.1)			0.15 (2.3)				1.04	0.91	qtr.	0.89	1.18	0.37
	0.048 (4.5)	0.44 (3.8)	0.31 (2.3)	0 (0)	0.07 (0.7)	-0.0052 (6.1)	0.02 (0.7)	0.22 (4.2)	0.09 (1.9)					-0.18 (3.2)		0.82	0.63	qtr.	0.90	1.10	0.39
	0.048 (3.8)	0.43 (3.7)	0.30 (2.2)	0.03 (0.2)	0.10 (1.0)	-0.0052 (5.9)	0.02 (0.6)	0.20 (3.7)	0.08 (1.7)			0.14 (2.4)		-0.18 (2.8)		0.86	0.77	qtr.	0.91	1.25	0.35
Wage rate, low-wage sectors	0.013 (2.8)	0.51 (2.5)	0.61 (2.5)	-0.19 (0.7)	0.05 (0.3)	-0.0022 (1.4)	0.06 (1.0)	0.21 (2.1)	0.17 (1.9)							0.98	0.39	qtr.	0.70	1.50	0.69
	0.011 (2.5)	0.59 (2.5)	0.69 (2.5)	-0.16 (0.5)	-0.05 (0.3)	-0.0022 (1.3)	0.08 (1.2)	0.17 (1.6)	0.16 (1.7)			-0.05 (0.2)				1.05	0.20	qtr.	0.73	1.60	0.69
	-0.041 (2.2)	0.56 (3.1)	0.70 (2.8)	-0.17 (0.7)	0.13 (0.7)	-0.0007 (0.5)	0.08 (1.4)	0.21 (2.2)	0.19 (2.5)						0.28 (3.0)	1.32	0.54	qtr.	0.75	1.81	0.64

Quarterly data from 641 to 801V, excluding 6811 to 681V.

Employees in this last group of sectors are on average less well and less rapidly compensated for inflation than employees in other sectors. The latter observation does not apply to the energy sector, however, where index-linked adjustment is immediate;

- the effect of labour market disequilibria is slight in the high- or low-wage sectors, but strong in the middle-wage sectors. Wages at the lower end of the scale or those corresponding to more highly-skilled jobs appear not to depend on the business situation to any great degree;

- SMIC increases effect low-wage sectors, as might be expected, but they also affect high-wage sectors, in which pay scales tend to be rigid and may pass on all increases in the minimum wage. However, as seen previously, the coefficients obtained for the SMIC are very small;

- real wage increases in the major national enterprises have much the same effects on wages in the middle- and low-income groups, while their effect on wages in the high-income group is very strong. This is not just because energy is included in this group, since GEN wages are also influential in wage formation in industrial capital goods and motor vehicles. All in all, the effect on wage dispersion is ambiguous in this case too;

- productivity gains are significant only in the equation for sectors with a close-to-average wage.

26. The small impact of the labour market situation on high-wage industries is a classic finding for the United States. The explanation given by Wachter (1970) is that there are waiting lines for work in these industries, which consequently never have any labour-hiring problems. In the low-wage industries, on the other hand, when the labour market tightens, businesses have to raise wages to keep their employees. Another suggested hypothesis is that high-wage industries are highly unionised and concentrated, making wages and prices less dependent on cyclical developments. High-wage industries, it is maintained, are oligopolistic and take relatively little account of the demand situation in pricing. On this reasoning, wage formation is linked to price formation, and during slump periods, these industries could pay wages higher than those in the competitive sector, with a catch-up occurring in periods of buoyant activity(1).

27. This explanation is valid in France for the high-wage and middle-wage sectors. Thus, in periods of buoyant activity, the incomes of employees in the middle-wage group draw closer to those in the high-wage group and the spread between the two groups narrows. However, employees in the low-wage group

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(1) See an application of this idea in Haworth-Reuther (1978) and Gay (1978).

(where waiting lines are probably forming because of the low skill requirements) then find their incomes lagging behind, and it has been seen earlier that this is the effect which is decisive since unemployment has a negative impact on dispersion.

23. A more accurate analysis can be made of differences in wage-formation behaviour between the three groups of sectors established earlier, using the methodology proposed by Deruelle (1974). The first step is to stack the three sectors and estimate a first equation in which the coefficients of all variables are the same for all sectors. Then for each sector in turn the possibility is introduced of different coefficients for the explanatory variables and this sectoral differentiation is tested for significance. The results of these tests are given in the table below.

	F for different coefficients between sectors	Critical value for F at the 5 per cent threshold
Different constant for each sector	1.76	3.05
Different coefficients for the rate of price increase	1.17	2.00
Different coefficients for quarterly seasonal variables	0.47	2.16
Different coefficient for indicator of labour market strain	2.60	3.05
Different coefficients for administered wages	0.90	2.16

It can be seen that the introduction of different coefficients for each sector is never significant at the 5 per cent threshold. It is when the coefficient for the labour market indicator is allowed to have three different values for the three sectors that the closest approximation to significance is obtained as intimated earlier: this is the only noticeable point of divergence among the three sectors. This can be pinpointed with still greater precision if the logarithm for unemployment and the logarithm for unfilled job vacancies are separated in the wage-rate equations (Table 6). In the high- and middle-wage sectors, unemployment has no significant impact. On the other hand, job vacancies, i.e. the hiring requirements of firms, have an appreciable influence, which, as noted above, is stronger, in the high-wage sector. The situation is entirely

reversed in low-wage sectors, where only unemployment has an effect. These sectors take advantage of higher unemployment to pay lower wages but do not seek to attract additional workers by adjusting pay. By contrast, the other sectors do not take the number of unemployed into account in calculating wages, these being determined solely by the need to fill vacancies.

29. In order to clarify the relationship between wage and price increases, it was also decided to test, using the three-group breakdown, the idea sometimes put forward that price-indexation of wages depends on the level of inflation itself(1). This idea was tested by making equation (1) non-linear, with the coefficients for $\mathring{P}_{-i}$ becoming linear functions of $\mathring{P}_{-i}$ ($\mathring{P}^2_{-i}$ terms therefore appear in the equation) (Table 7). For all sectors taken together there is no discernible effect(2). On the other hand, it would appear that higher inflation reduces the degree of indexation in the high- or middle-wage sectors and increases it in low-wage sectors, although the effect's significance is not pronounced. In the latter group, when the increase in prices is 6 per cent per annum, the degree of indexation would appear to be 0.50, rising to 0.83 for inflation at 12 per cent per annum. If this is true, higher inflation reduces wage dispersion for two reasons: because the degree of price-indexation of wages is high on average when the wage level is low (see earlier) and because the degree of indexation increases with inflation for low-wage sectors while the reverse occurs in the other sectors.

30. The use of terms such as $\mathring{P}^2$ is sometimes justified on the grounds that it enables the equation to be made homogeneous for the whole of the period from 1963 to 1980, and in particular that it prevents an explicit break having to be introduced for 1968. The equations for Table 5 were estimated for the sub-periods 1964-1968 and 1969-1980 (quarters 68II to 68IV are still excluded from the sample) and the equality of the coefficients tested. This tended to confirm the hypothesis(3) that the same equation remains valid throughout the period whether terms in $\mathring{P}^2$ are included or not. The three groups show the same characteristics for the recent period as for the entire period. They

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(1) Bronfenbrenner and Holzmann (1965) maintain that indexation decreases with inflation in the high-wage sectors. Courbis (1980) takes the opposite view and contends that for the whole of the French economy the degree of indexation increases with the speed of price increases, with households feeling it more necessary to defend their purchasing power. This is similar to the idea that prices affect wages only above a certain threshold - see e.g. Hamermesh (1980) or Vanderkamp (1972).

(2) This conflicts with the result obtained by R. Courbis. However, the periods of estimation and the choice of non-price explanatory variables are different.

(3) The Fischer test gives 0.2 and 1.0 according to sector.

Table 6

Effects of unemployment and job vacancies

$F_{1,51}$ at the 5% threshold: 4.04	te	Q 1	Q 2	Q 3	$\dot{P}$	$\dot{P}_{-1}$	$\dot{P}_{-2}$	$\dot{P}_{-3}$	log(D)	log(O)	SMICR	GENR	$GENR_{-1}$	Productivity growth rate	R^2	DW	see (%)	F for D and O separation
All sectors	0.0007 (0.1)	$5\,10^{-4}$ (0.4)	$14\,10^{-4}$ (1.1)	$-7\,10$ (0.5)	0.44 (3.5)	0.42 (3.1)	-0.09 (0.7)	0.13 (1.4)	-0.021 (1.6)	0.0039 (3.7)	0.05 (1.6)	0.23 (4.4)	0.14 (3.0)		0.90	1.72	0.36	1.01
High-wage sectors	-0.023 (1.1)	$13\,10^{-4}$ (0.6)	$33\,10^{-4}$ (1.4)	$1\,10^{-4}$ (0.1)	0.25 (1.3)	0.33 (1.5)	-0.23 (1.1)	0.32 (2.1)	0.0016 (0.7)	0.0028 (1.6)	0.08 (1.5)	0.30 (3.5)	0.20 (2.6)		0.75	1.37	0.58	2.33
Middle-wage sectors	-0.019 (1.6)	$4\,10^{-4}$ (0.3)	$10\,10^{-4}$ (0.7)	$-2\,10^{-4}$ (0.2)	0.30 (3.1)	0.29 (2.1)	0.01 (0.1)	0.07 (0.7)	-0.0012 (0.9)	0.006 (5.7)	0.02 (0.7)	0.21 (4.0)	0.08 (1.7)		0.90	1.03	0.36	7.90
	-0.020 (15)	$6\,10^{-4}$ (0.5)	$11\,10^{-4}$ (0.8)	0 (0)	0.37 (3.0)	0.29 (2.0)	0.03 (0.2)	0.12 (1.2)	-0.0013 (0.9)	0.006 (5.5)	0.02 (0.6)	0.19 (3.6)	0.07 (1.5)	0.15 (2.5)	0.90	1.22	0.35	10.31
Low-wage sectors	0.058 (2.5)	$-11\,10^{-4}$ (0)	$8\,10^{-4}$ (0.3)	$-22\,10^{-4}$ (0.8)	0.68 (2.9)	0.72 (2.7)	-0.17 (0.7)	0.09 (0.5)	-0.0052 (2.5)	-0.0004 (0.2)	0.08 (1.3)	0.21 (2.2)	0.21 (2.4)		0.72	1.71	0.57	4.02

Quarterly data from 64I to 80IV, excluding 68II to 68IV.

Table 7

Inflation-dependent indexation(a)

	$\dot{P}$	$\dot{P}_{-1}$	$\dot{P}_{-2}$	$\dot{P}_{-3}$	$\Sigma\dot{P}$	$\dot{P}^2$	$\dot{P}_{-1}^2$	$\dot{P}_{-2}^2$	$\dot{P}_{-3}^2$	$\Sigma\dot{P}^2$	LOG (D/O)
Average wage rate	0.69 (2.5)	-0.21 (0.7)	0.14 (0.5)	0.50 (2.0)	1.12 (13.7)	-5.06 (0.8)	15.95 (2.4)	-6.70 (1.0)	-7.72 (1.4)	-3.53 (0.5)	-0.0030 (3.8)
High-wage sectors	0.61 (1.2)	-0.08 (0.1)	0.44 (0.9)	0.36 (0.8)	1.33 (3.0)	-6.58 (0.6)	12.28 (1.1)	-17.52 (1.6)	0.41 (0)	-11.41 (1.0)	-0.0063 (0.5)
Middle-wage sectors	0.58 (1.9)	0.20 (0.6)	0.15 (0.5)	0.61 (2.2)	1.54 (17.1)	-2.01 (0.3)	3.96 (0.5)	-3.57 (0.5)	-12.14 (2.0)	-13.76 (1.9)	-0.0038 (4.4)
	0.38 (1.1)	0.06 (0.2)	0.29 (0.9)	0.79 (2.8)	1.52 (16.0)	1.37 (0.2)	6.14 (0.8)	-6.02 (0.9)	-14.33 (2.4)	-12.84 (1.7)	-0.0039 (4.5)
Low-wage sectors	0.80 (1.5)	-1.07 (1.9)	-0.09 (1.1)	0.53 (1.15)	0.17 (0.4)	-5.54 (0.5)	40.55 (3.3)	-4.65 (0.4)	-8.39 (0.8)	21.97 (1.7)	-0.0024 (1.6)

(a) Quarterly data, 1964I to 1980IV, excluding 1968II to 1968IV. For purposes of simplification, only the price coefficients are shown.

are even more definite, with the lack of labour-market impact on high-wage sectors, and higher indexation the lower the wage. The significance of the non-linear effect of inflation only remains for the low-wage sectors. All in all, it would appear that the equations specified perform as adequately in representing wage formation before 1968 as after.

31. Another discontinuity in wage formation sometimes mentioned is supposed to have occurred at the end of 1976 when the "Plan Barre" was brought into operation. It was studied in the same way as the supposed break in 1968 and the result appears to provide definite confirmation that the equations are stable both before and after 1976. The coefficients indeed show very little change(1). A slight fall is discernible in the degree of indexation in middle-wage sectors and a slight increase in the labour-market effect in the high- or middle-wage sectors.

(c) Wages-and-wage dispersion

32. It is often maintained that inter-sector wage differentials have an influence on wage growth, with employees in low-wage sectors demanding a catch-up in their incomes when they fall too far behind those in other sectors. Employees in high-income sectors, on the other hand, try to maintain their relative position(2).

33. To test this hypothesis, it was decided to introduce into the equations for the three sector groups the variable for inter-sector wage dispersion, lagged by a certain number of quarters. The only robust effect which seems to emerge (see Table 5) concerns those sectors in which the wage is below average. With a best lag of three quarters, wage dispersion appears to act positively on the sectors in that category, where a wage catch-up is discernible. In the other sectors there is no sign of any attempt to maintain wage differentials; if anything, a high degree of dispersion in those sectors would appear to act as a brake on income growth.

(d) The-conventional-theory-of-wage dispersion

34. So far, wage dispersion between sectors has been explained by interpreting the basic equations estimated for each sector or group of sectors. The conventional explanation of dispersion is different: it is attributed not to different reactions by each sector to various indicators of the overall economic situation (inflation, labour market, etc.) - which is what has been studied up to this point - but to the existence of labour-demand differentials as between sectors, causing

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(1) This is in contrast with the result obtained by the authors of the Copain model (1981) in which a significant "Plan Barre" variable is introduced.

(2) Here we are in fact encroaching on the subject of wage spill-over between sectors which is studied in the next section.

those sectors in which labour demand is high to raise wages compared with those in which labour demand is slack. The only finding submitted up to now is that job vacancies, calculated at the overall and not the sectoral level, have differing influences on the three groups of sectors [see II (b)]. It is now proposed to investigate the validity of this theory for France.

35. As a first stage, equations for wage-rate increases were estimated for the three given groups of sectors, with the addition of the employment growth rate (smoothed where appropriate) in those sectors. The employment coefficient still has the right sign, with closely approximating values for the three sectors, but it is of very low significance. The same result was obtained in estimating the same equations for the 13 basic sectors. The first indications are not therefore entirely favourable to the environmental theory of wage dispersion(1).

36. The second stage was to calculate the variance among the 13 sectors of the quarterly rate of growth of numbers employed. This variable, shown in Chart 4, is clearly seen to increase in periods of depressed activity (1965, 1967, 1970, 1975, 1977 and 1980), reaching low levels in periods of buoyant activity (1969, 1972-73, 1976 and 1978); the benefits of this buoyancy therefore seem to be more evenly spread over the sectors than the disadvantages of the economic recessions. This variance was introduced into the equations for wage dispersion between sectors (Table 4), and a significant positive coefficient was obtained. The small effect of workforce growth found in each sector is therefore sufficient to cause an increase in dispersion when trends in numbers employed diverge(2).

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(1) It appears, too, that employment in the low-wage sectors grew faster on average (+ 1.9 per cent a year) than in the other sectors (high-wage: + 1.3 per cent; middle-wage: + 0.5 per cent).

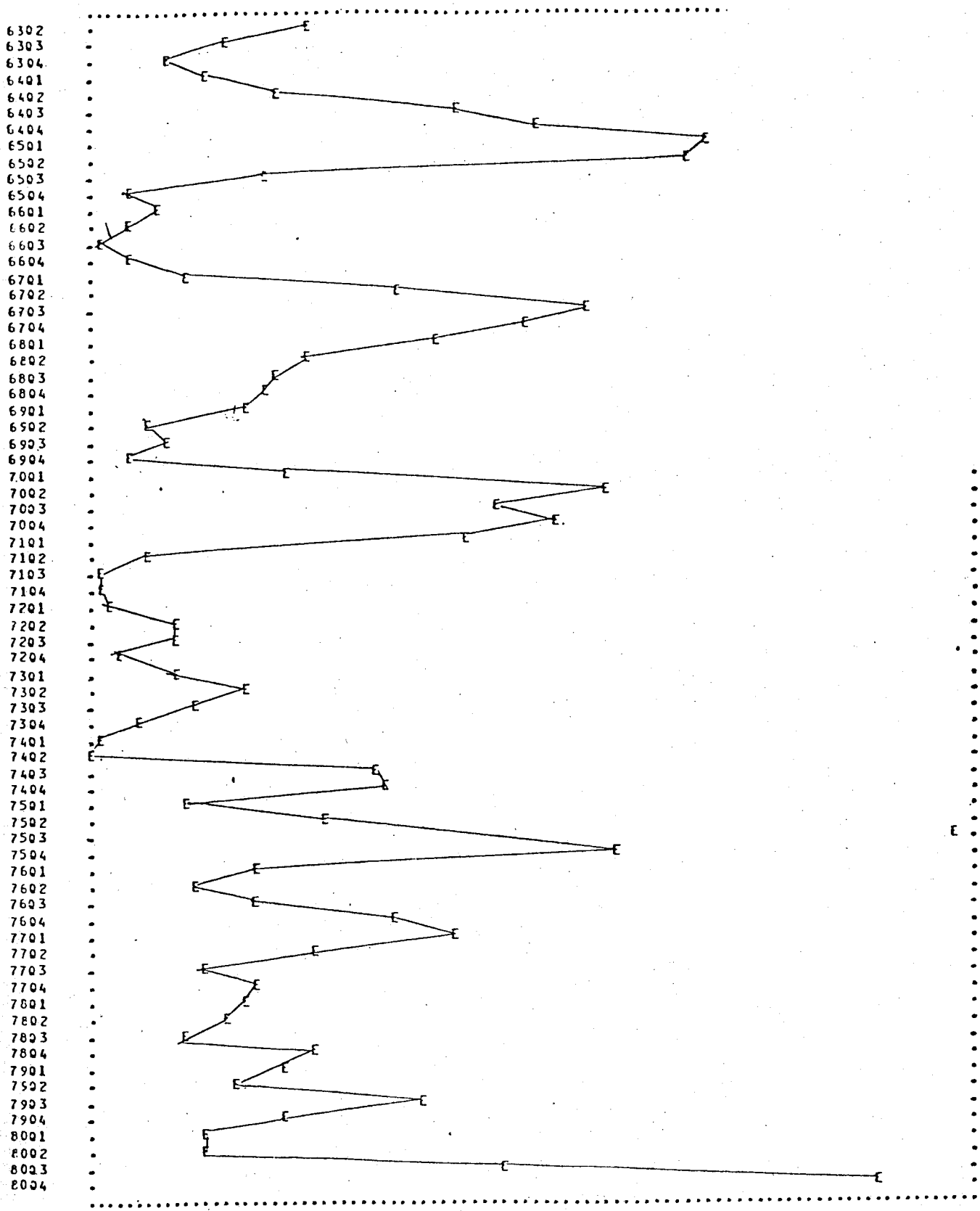
(2) The apparent correlation between intersectoral variance of growth in numbers employed and the level of business activity might have suggested that the variance is just another way of representing the job market situation. In fact, this can be shown to create no econometric difficulty for the dispersion equations, since variance for employment (VARE) and LOG (D/O) are quite far apart as shown by the equation:

$$\underset{(3.2)}{VARE = 0.310^{-5}\ LOG\ (D/O) + 0.5710^{-6}}$$

$R^2 = 0.14$
DW = 0.83
SEE = 0.510^{-5} (mean value of VARE = 0.710^{-5}).

CHART.4

Intersectoral variance of the rate of growth in numbers employed



37. Employment-growth differentials in the sectors are often submitted as a factor in wage increases. It is then no longer a question of intersectoral wage dispersion but the fact that the overall indicator of labour-market disequilibrium, as an aggregation of sectoral job-market disequilibria, cannot represent the magnitude of these sectoral disequilibria, which under certain conditions may influence the wage rate(1). Thus, there also needs to be an indicator of dispersion of sectoral employment situations(2). When the intersectoral variance of rates of increase in numbers employed was introduced into the equation for wage rates in all sectors together, no significant result was obtained. A difference in business activity levels between sectors therefore affects wage-differentials between those sectors but not the average wage for the economy as a whole.

38. After analysing wage-formation and the causes of wage differentials, it is now proposed to consider wage spill-over from one sector to another.

III. Wage spill-over between sectors

39. As already stated, this question has been studied a number of times in France. The conclusions reached have often conflicted. According to Boyer (1978) and Boyer and Mistral (1978), taken up by Basle, Mazier, Vidal (1980) and Gaspard-Lecuyer (1980), the key sectors are either capital goods, intermediate goods or energy. The result is established by showing that productivity in these sectors is significant in the wage formation equations for all categories combined and for all sectors combined(3), or else by showing that another variable specific to those sectors (rate of capacity utilisation, increase in numbers employed compared with average growth of numbers employed in the economy as a whole) also plays a significant part. The spill-over effects are sometimes also studied by way of introducing the wage rate for one sector (or region) into the equation explaining the wage rate for another sector (or region)(4).

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(1) See Lipsey (1960), Perry (1970), Archibald (1970) and Brechling (1974) - studies based on the non-linearity of sectoral indicators of labour-market strain.

(2) Or even higher order moments.

(3) See also Eatwell, Llewellyn, Tarling (1974) who showed the role of productivity in key sectors in explaining wage-growth differentials between countries (including France) by stacking the average increases in wages and productivity in those countries.

(4) See Gaspard-Lecuyer and Courbis, the REGINA model, and Eckstein and Wilson (1962) for the United States, and McGuire and Rapping (1968). This method is extremely dangerous since all wage rates change under the influence of common variables, and furthermore, all the equations for wage-rate formation need to be estimated simultaneously, since the residuals are undoubtedly correlated, being influenced by chance developments common to them all (cyclical shocks, etc.). The latter method will therefore not be followed here.

40. Two possible forms of spill-over will now be considered, corresponding to two methods of study. First, it is proposed to take up the idea that the wage rate for a sector is influenced by a variable specific to that sector, and that this influence then spreads to the other sectors. This is therefore a permanent form of wage spill-over. Next, a more transitory form of spill-over will be examined, using the methodology developed by Mehra (1976) for the purpose of studying the correlations between the residuals of identical sectoral equations.

(a) Permanent spill-over

41. The equations constructed in Sections I and II showed that one sector-specific variable which sometimes appeared to be significant in wage formation in that sector was growth of apparent labour productivity. Neither hours worked nor absolute growth of numbers employed gave satisfactory results. Those sectors in which the rate of productivity growth appears significantly are energy, intermediate goods, household durables, building and the distributive trades (see Table 1). It was therefore decided to re-estimate the sectoral equations, systematically testing for all sectors the five productivity growth variables corresponding to the five sectors in which they play a role (Table 8). The results are disappointing and give some appearance of being the result of chance. Productivity in intermediate goods, which other studies show as playing an important role, intervenes significantly only in the equation for agro-food industries. Productivity in building appears to influence wages in the motor industry and agriculture, which would only be just about understandable if those sectors were competing for unskilled or immigrant labour. Productivity in the distributive trades, the measurement of which is somewhat conventional as stated earlier, plays a role in two other sectors. No clear pattern emerges, and it would appear that no sector acts consistently as a leader by reason of the productivity gains it achieves(1).

42. In another attempt to discover a sector which acts as a wage-leader through its productivity increases, the 13 sectors were stacked (giving a vector of 780 observations)(2). It can be seen in Table 9 that the rate of productivity growth (whatever the sector) never significantly influences wage rates as a whole. The best results are obtained for productivity gains in capital goods and services, the latter result being strange.

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(1) This result conflicts with that obtained by Gaspard-Lecuyer (1980), probably because that study does not make any breakdown by occupational category, or because of statistical differences which explain why in that study the labour market situation has never appeared significant.

(2) This has the advantage of providing an overall view of the phenomenon and, by comparison with the study of the average wage rate for all sectors combined, of not disturbing the series explained by structural changes (shifts in relative sector size). On the other hand, this is tantamount to giving each sector the same weight in calculating an overall wage rate.

Table 8(1)

Productivity spill-over effects

	Productivity				
	Energy	Intermediate goods	Household durables	Building	Distributive trades
All sectors		0.04 (1.2)			
Agriculture				0.27 (2.2)	
Agro-food		0.09 (2.1)			
Energy	0.25 (2.5)				
Intermediate goods		0.07 (1.5)			0.17 (1.7)
Industrial capital goods				0.18 (1.2)	
Motor vehicles				0.27 (2.4)	
Consumer goods	0.10 (1.6)				
Household durables			0.24 (2.3)		
Building		0.06 (1.1)		0.19 (1.8)	0.20 (1.8)
Transport and telecommunications		0.05 (1.3)			
Services		0.10 (1.0)			
Distributive trades				0.17 (1.1)	0.54 (3.6)

(1) For purposes of simplification, only the productivity coefficients are shown.

Table.9

Estimation on Stacked Data

I: rate smoothed over 1 year

II: rate smoothed over 1 year and lagged 1 year

Constant	$\mathring{P}$	$\mathring{P}_{-1}$	$\mathring{P}_{-2}$	$\mathring{P}_{-3}$	Log (D/O)	$\mathring{SMICR}$	$\mathring{GENR}$	$\mathring{GENR}_{-1}$	Productivity Growth Rates								R^2	SEE (%)	$\Sigma\mathring{P}$
									Total		Energy		Intermediate Goods		Capital Goods		Building		Services		Distributive Trades				
									I	II	I	II	I	II	I	II	I	II	I	II	I	II			
0.013 (8.2)	0.53 (6.5)	0.41 (4.2)	-0.15 (1.5)	0.22 (3.1)	-0.0033 (5.6)	0.04 (2.1)	0.26 (7.3)	0.16 (5.0)															0.54	0.89	1.01 (24.0)
0.012 (6.6)	0.52 (6.3)	0.41 (4.1)	-0.14 (1.4)	0.23 (3.3)	-0.0032 (5.5)	0.04 (2.1)	0.25 (7.0)	0.16 (4.7)	0.09 (1.2)														0.54	0.89	1.02 (26.8)
0.013 (5.2)	0.53 (6.5)	0.41 (4.1)	-0.15 (1.5)	0.22 (3.1)	-0.0032 (4.7)	0.04 (2.1)	0.26 (7.3)	0.16 (4.9)			0.003 (0.1)												0.54	0.89	1.01 (23.9)
0.012 (7.7)	0.53 (6.4)	0.41 (4.1)	-0.14 (1.5)	0.23 (3.2)	-0.0033 (5.6)	0.04 (2.1)	0.26 (7.3)	0.16 (4.9)					0.01 (0.6)										0.54	0.89	1.03 (23.4)
0.012 (7.9)	0.53 (6.4)	0.40 (4.0)	-0.13 (1.4)	0.23 (3.2)	-0.0034 (5.7)	0.04 (2.1)	0.25 (7.1)	0.15 (4.7)							0.03 (1.5)								0.54	0.89	1.03 (24.0)
0.012 (8.0)	0.52 (6.4)	0.42 (4.2)	-0.13 (1.3)	0.22 (3.1)	-0.0033 (5.6)	0.04 (1.9)	0.25 (7.0)	0.15 (4.5)									0.05 (1.1)						0.54	0.89	1.03 (23.4)
0.013 (8.2)	0.50 (5.9)	0.40 (4.0)	-0.13 (1.4)	0.21 (3.0)	-0.0029 (4.7)	0.04 (1.9)	0.25 (6.7)	0.14 (4.2)											0.16 (1.5)				0.54	0.89	0.98 (19.6)
0.013 (8.2)	0.54 (6.6)	0.41 (4.1)	-0.15 (1.5)	0.22 (3.1)	-0.0034 (5.7)	0.04 (2.1)	0.27 (7.4)	0.16 (5.0)													-0.05 (1.0)		0.54	0.89	1.02 (23.7)

43. This series of estimations for the 13 sectors was also made replacing productivity by the variable suggested by R. Boyer and J. Mistral, i.e. the difference in growth of numbers employed as between the leader sectors and all sectors collectively. These authors suggest that it is labour hiring in the leader sectors which is the root cause of changes in labour market strain. This idea was tested using each of three possibles for the wage leader:

- the intermediate goods sector;
- the intermediate goods and capital goods sectors;
- the intermediate goods, capital goods and energy sectors.

The results are shown in Table 10.

44. In seven sectors out of 13, employment-growth differentials as between the wage-leader and all sectors collectively have no significant influence. In the six others, however, the effects are very distinct. It is the second possibility for wage-leader (intermediate goods + capital goods) which most often gives the best results. The implication accordingly is that the employment-growth differential for intermediate goods + capital goods not only influences wage rates in those two sectors but also influences wages in agro-food, consumer goods, transport and telecommunications and services. This would make the two sectors a wage-leader for a good part of the economy(1).

---

(1) It can be noted that in the equations where the employment-growth differential is significant, the conventional variable for labour market strain loses some or all of its significance. In fact, by contrast with what was previously observed for variance of sectoral employment growth rates, the two representations of labour market disequilibrium are fairly highly correlated, as seen in the equation below (BI + BE standing for intermediate goods + capital goods):

$$\mathring{N}_{BI + BE} - \mathring{N}_{TOT} = \underset{(6.7)}{0.006} - \underset{(9.5)}{0.0041} \log (D/0)$$

employment growth differential: $R^2 = 0.60$, DW = 0.46, SEE = 0.0023

Chart 5 represents this regression. It can be seen that the employment-growth differential as between the leader sectors and all sectors combined fluctuates much more sharply than the usual log (D/0) indicator; workforce adjustments in the leader group are more drastic than in the other sectors.

Table 10

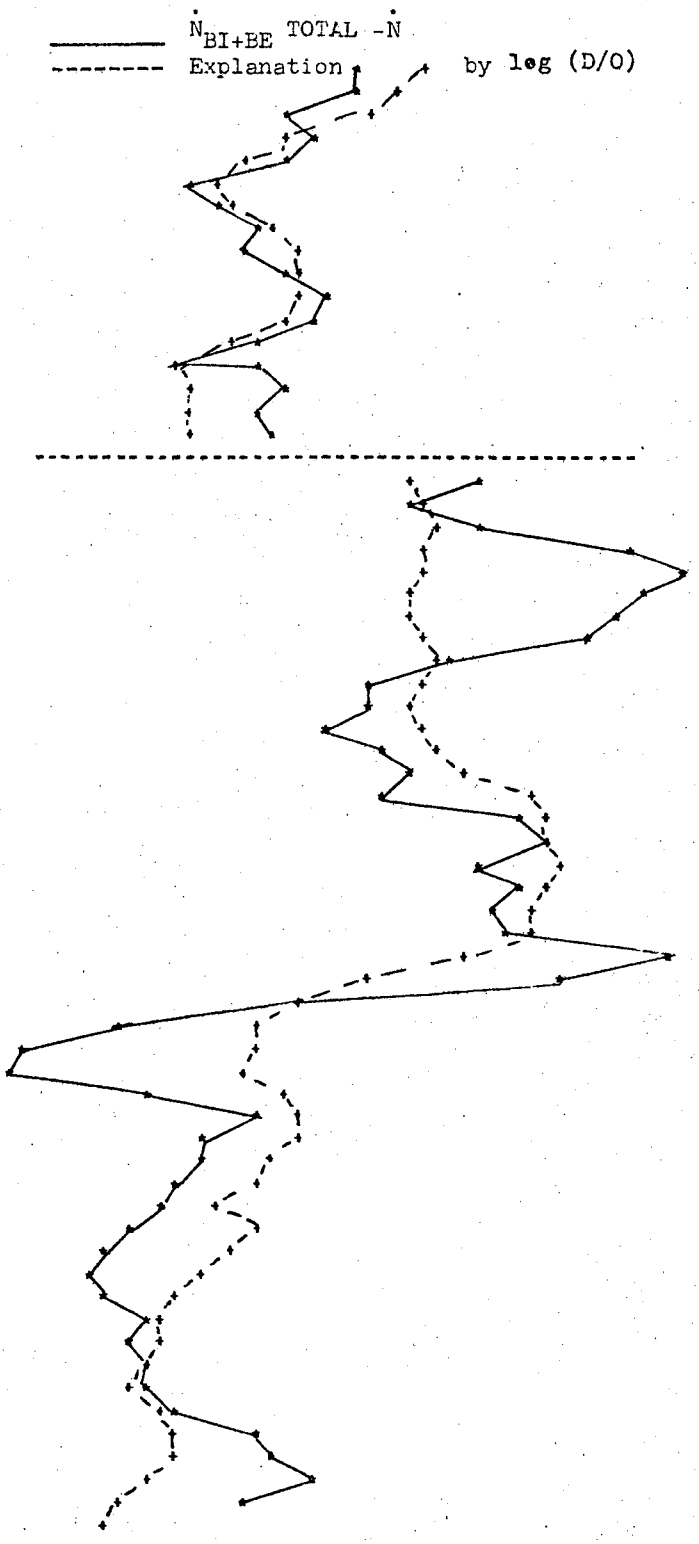
Employment growth of differentials(a)

	Intermediate goods			Intermediate goods + capital goods			Intermediate goods + capital goods + energy		
	Instantaneous	Smoothed over 1 year	Smoothed over 2 years	Instantaneous	Smoothed over 1 year	Smoothed over 2 years	Instantaneous	Smoothed over 1 year	Smoothed over 2 years
All sectors	0.29 (1.3)			0.27 (1.3)			0.31 (1.4)		
Agriculture									
Agro-food		0.95 (2.7)			1.00 (3.3)		1.14 (3.2)		
Energy									
Intermediate capital goods	0.48 (1.5)			0.62 (2.0)			0.64 (1.9)		
Industrial capital goods		0.88 (1.5)			0.98 (1.9)			1.36 (2.3)	
		0.72 (1.7)			0.72 (2.0)			1.05 (2.3)	
Motor vehicles									
Consumer goods	0.58 (1.9)			0.61 (2.1)			0.77 (2.4)		
Houschold durables									
Building									
Transport and telecommunications			0.97 (2.8)			0.64 (2.1)			0.70 (2.1)
Services			2.93 (3.3)			2.75 (3.7)			3.10 (3.4)
			1.82 (3.0)			1.65 (3.3)			2.04 (3.2)
Insurance and financial institutions									
Distributive trades									

(a) For the purposes of simplification only the coefficients for numbers employed are shown here. Quarterly data from 1965I to 1980IV, excluding 1968II to IV.

CHART 5

ID	ACTUAL	FITTED
6401	-.1144E-02	.2649E-03
6402	-.1035E-02	-.3504E-03
6403	-.2464E-02	-.7219E-03
6404	-.1981E-02	-.2649E-02
6501	-.2659E-02	-.3293E-02
6502	-.4657E-02	-.2970E-02
6503	-.3689E-02	-.3566E-02
6504	-.3279E-02	-.2791E-02
6601	-.3345E-02	-.2237E-02
6602	-.2450E-02	-.2231E-02
6603	-.1773E-02	-.2277E-02
6604	-.2092E-02	-.2615E-02
6701	-.3155E-02	-.3504E-02
6702	-.3265E-02	-.4309E-02
6703	-.2569E-02	-.4722E-02
6704	-.3616E-02	-.4651E-02
6801	-.2606E-02	-.4679E-02
6902	.1579E-02	.9832E-04
6903	.1183E-03	.3811E-03
6904	.1413E-02	.6533E-03
7001	.4594E-02	.3403E-03
7002	.5605E-02	.1750E-03
7003	.4933E-02	.1156E-03
7004	.4335E-02	-.2442E-04
7101	.3717E-02	.4118E-03
7102	.7507E-03	.6329E-03
7103	-.8967E-03	.3639E-03
7104	-.8439E-03	.6157E-04
7201	-.1693E-02	.2679E-03
7202	-.5345E-03	.6497E-03
7203	-.4164E-04	.1204E-02
7204	-.6699E-03	.2647E-02
7301	.2324E-02	.2857E-02
7302	.3007E-02	.3022E-02
7303	.1397E-02	.3191E-02
7304	.2320E-02	.2852E-02
7401	.1671E-02	.2647E-02
7402	.2477E-02	.2631E-02
7403	.5646E-02	.1217E-02
7404	.3133E-02	-.7289E-03
7501	-.2421E-02	-.2419E-02
7502	-.6119E-02	-.3263E-02
7503	-.3137E-02	-.3192E-02
7504	-.8348E-02	-.3355E-02
7601	-.5546E-02	-.2473E-02
7602	-.3122E-02	-.2369E-02
7603	-.4179E-02	-.2247E-02
7604	-.4372E-02	-.2923E-02
7701	-.4868E-02	-.3285E-02
7702	-.5295E-02	-.3924E-02
7703	-.5660E-02	-.3973E-02
7704	-.6406E-02	-.3603E-02
7801	-.6574E-02	-.4372E-02
7802	-.6189E-02	-.4962E-02
7803	-.5554E-02	-.5212E-02
7804	-.5734E-02	-.5155E-02
7901	-.5543E-02	-.5503E-02
7902	-.5389E-02	-.5631E-02
7903	-.4501E-02	-.5243E-02
7904	-.3177E-02	-.4967E-02
8001	-.2729E-02	-.5025E-02
8002	-.1935E-02	-.5543E-02
8003	-.3326E-02	-.5999E-02
8004	-.6445E-02	-.6369E-02



45. The results suggest a division of the labour market into two. The segment that corresponds to jobs in capital goods, transport and telecommunications and services is influenced by the state of business activity in the leader sectors. The other segment, corresponding to jobs in agriculture, energy, motor vehicles, building, financial institutions and the distributive trades, is completely uninfluenced. Lastly, hiring in certain sectors (agro-food, intermediate goods, consumer goods) draws on both segments of the labour market.

(b) Temporary spill-over

46. The method proposed by Y. Mehra for analysing wage spill-over between sectors is as follows: the first stage is to regress wage rates independently for all sectors on a number of variables which must be common to all sectors and exogenous to wage rates. The second stage is to work on the residuals of these first-stage estimations. Y. Mehra applies this method to wage-rate levels, but here their growth rates have been used. The advantage of this is that it is easier to derive steady-state series and economic interpretation is easier: if the wage level is worked on, the residual of an equation corresponds only to a temporary change in that level. If on the other hand the rates of growth in wage-rates are worked on, a residual corresponds to a permanent change in the wage level, and the transmission of this change to another sector is meaningful(1).

(i) Method

47. Only the broad outline of the method will be given here, all the technical details being supplied in Annex 1. The first stage is to construct equations for wage rates (in terms of rates of increase), with common explanatory variables which must not be dependent on wage rates. It is therefore necessary to test for exogeneity and it was found that the distributive trades had to be excluded from this second analysis of wage spill-over, but it was possible to work on the other 12 sectors. The fact that the wage rate in the distributive trades "causes" consumer prices can be explained. If the wage rate rises, traders react by raising their margins and all goods purchased by households are affected accordingly. If, on the other hand, the wage rate rises in another sector, only the price of one fraction of the goods will move and the overall price index will not change very much. Once this analysis has been made, if first-stage regressions can be carried out for the 12 remaining sectors and their residuals obtained.

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(1) However, by contrast with the phenomenon studied in Section III (a), spill-over here is only temporary in terms of the growth-rate of wages.

48. The common variables used to explain changes in wage rates are identical to those used earlier (see page 6) next stage is to look for "key groups" of sectors which act as wage-leaders. An influence of this kind will be indicated by the fact that the residuals of the equations described above and corresponding to possible key sectors have a positive significant influence on the residuals of the equations for the other sectors. Where this is the case, it means that when the wage-rate rise in the key sector is an autonomous movement (not resulting from fluctuations in the earlier-mentioned variables common to the whole economy), this movement spills over to the other sectors. Conversely, the residuals corresponding to the sectors outside the key group must never influence the residuals of the equations constructed for the other sectors. This is examined by constructing equations for each sector to explain the residuals of the first-stage equations by lagged values for those residuals, the average residual(1) for the sectors in the "key group" of sectors (also with lags), the average residual for sectors other than those in the key group. Six possible key groups were worked on.

- Key group 1: the high-wage sectors identified earlier (energy, industrial capital goods, motor vehicles, insurance and financial institutions).

- Key group 2: the sectors with the highest average(2) productivity gains over the period 1963 to 1980 (energy, industrial capital goods, motor vehicles and household durables) (see Table 3).

- Key group 3: the capital goods sectors (industrial capital goods and household durables).

- Key group 4: a group which changes from year to year and comprises those sectors which have shown the highest productivity gains for the year (see Table 3). This group comprises:

  from 1963 to 1968: energy, industrial capital goods, motor vehicles, household durables;

  in 1969 and 1970: energy and motor vehicles;

  from 1971 to 1973: energy and household durables;

  in 1979 and 1980: intermediate goods and industrial capital goods.

---

(1) Weighted by numbers employed.

(2) Even if the productivity growth rate in these sectors appears to have no influence on wage formation, they may still act as leaders and transmit wage-rate changes unrelated to productivity changes or only temporarily related.

- Key group 5: intermediate goods.

- Key group 6: the low-wage sectors (agriculture, building, services).

(ii) Results

49. The results obtained and summarised in Table 11, which shows the significant positive influences, are disappointing. Only the residuals for key group 4, the group with varying composition, significantly influenced the residuals of the wage equations for several sectors (and even then only three sectors out of twelve). It seems clear that there is no key group which influences the rest of the economy, at any rate from the standpoint of temporary spill-over.

50. A recent symptom of spill-over had been found, however, when the economy was split into three groups of sectors (high; middle- and low-wage), with intersectoral wage-dispersion exerting a positive influence on the low-wage group (see page 35). To ascertain whether or not the type of analysis done here confirms this effect, it was applied to these three groups of sectors and the relationships between the residuals of a high- or middle-wage equation and the low-wage group were studied. The only significant effect to appear was spill-over from middle-wage to high-wage sectors with a time-lag of three quarters. A second symptom found earlier (see page 37) was that relative growth in numbers employed in the intermediate goods + capital goods group appeared decisive in establishing job-market equilibrium in industry (with the exception of motor vehicles) and services. Unfortunately, the examination of the residuals did not reveal this "leader" function of industry. By adjusting the equations described above which explain the changes in residuals, and also the equations making employment-growth differentials a factor of wage-rate determination, a consistent conclusion was reached: in four sectors (agro-food, capital goods, consumer goods, and services), this wage-differential variable has a significant influence (Table 12).

51. There would thus appear to be wage spill-over-related to the situation in one particular segment of the labour market - from intermediate goods, through capital goods to agro-food, consumer goods (quite rapid)(1) and services (fairly slow). This spill-over is nevertheless fairly slight, as shown by the limited improvement in the accuracy of the equations when the employment growth rate in key sectors is introduced, and by the fact that in a certain type of analysis it is indistinguishable from straight behavioural inertia as depicted by auto-correlation of residuals. Furthermore, a large number of sectors (agriculture, energy, motor vehicles, building, transport and telecommunications, and financial institutions) are not reached by these spill-over effects and their wages are formed for entirely independent reasons.

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(1) See (page 38) the lags in the equations constructed with the employment-growth differential.

Table 11

Interdependence amongst residuals

	Key group. 1			Key group. 2			Key group. 3			Key group. 4			Key group. 5			Key group. 6		
	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
Agriculture																X		
Agro-food																		
Energy	X	X		X	X			X		X(a)	X							
Intermediate goods										X(a)			X					
Industrial capital goods	X			X			X			X(a)	X							
Motor vehicles	X			X						X(a)							X	
Consumer goods																		X
Household durables				X			X			X(a)								
Building																X		
Transport and telecommunications											X							
Services														X		X		
Financial institutions	X																	

I: Belonging to Key Group.

II: Positive significant influence of key-group residuals.

III: Positive significant influence of non-key-group residuals' effect of residuals in sectors not belonging to key group significant and positive.

Table 12

Interdependence of residuals

(without autoregressiveness)

	Key sector: capital goods		Key sector: intermediate goods		Key sector: capital goods + intermediate goods	
	I	II	I	II	I	II
Agriculture						
Agro-food		X	X		X	
Energy					X	
Intermediate goods			X			
Industrial capital goods	X	X	X	X	X	
Motor vehicles						
Consumer goods			X		X	
Household durables	X					
Building						
Transport and telecommunications						
Services		X	X		X	
Financial institutions						

I: Significant positive influence of key-sector residuals.

II: Significant positive influence of non-key-sector residuals.

IV. Conclusion of the study on wage-rise spill-over

52. The two most robust effects which emerged are these: first, relative employment growth in the intermediate goods + capital goods group appears to be a determinant of labour-market equilibrium and therefore of wages in industry (except motor vehicles) and services; second - an effect identified at the beginning of the study - wage fluctuations in the major national enterprises seem to have repercussions in all sectors (except the distributive trades and private capital goods). Labour-hiring in heavy industry and public policy would therefore appear to be central to spill-over process.

53. Some effects emerged when the sectors were split into three groups according to the level of wages they paid: a high degree of dispersion triggers a catch-up by low wages, and wage movements in middle-wage sectors affect those in high-wage sectors. These results are partial, but suggest that wage movements spread from middle-wage sectors (i.e. agro-food, intermediate goods, consumer goods, household durables, transport and telecommunications, the distributive trades) to the high-wage sectors (energy, industrial capital goods, motor vehicles, insurance and financial institutions), thereby widening the gap between them and the low-wage sectors (agriculture, building and services) where ultimately a catch-up occurs.

54. Some negative results were obtained. In particular, no sector acts as a wage-leader, whether permanent or temporary, as a result of its productivity gains(1). The role of heavy industry, even, is not considerable. It should be borne in mind, as seen earlier, that the major component of wage growth arises from variables common to the economy as a whole (prices, unemployment, etc.) or from increases in administered wages. Furthermore, the situation in these central sectors has no influence on a large number of industries mentioned in the previous paragraph.

---

(1) This was found either by combining the productivity effects in the wage equations, or by analysing the role of the residuals corresponding to high-productivity sectors.

ANNEX

Technical particulars of the Mehra method

1. As seen in the main text, the first stage is to construct wage-rate equations with common variables which must be exogenous to sectoral wage rates. The main problem is obviously consumer prices, which cause wage movements but are also influenced by them. The indicator of labour market strain was also tested for exogenousness. The method used is that proposed by C. Sims (1972), which amounts to testing the simultaneous significance of the future values of the variable that needs to be tested for exogenousness (in this case prices) in explaining the variable presumed to be "caused" (in this case wage rates), using an equation in which past, present and future values of the variable presumed to be exogenous are introduced.

2. These tests were conducted as between the indicator of labour market tension and the rates of increase in wage rates, as between the rate of price increases and the rates of wage increase, and as between the price logarithms and the wage-rate logarithms after using the filter suggested by N. Nerlove (1964). The test is therefore conducted on steady-state series, and rates of growth still display a trend since inflation has been higher in recent years.

3. The assumption of exogenousness of the indicator of labour market strain is accepted for all sectors. If the growth-rate equations are used, the conclusion reached is that prices are exogenous in all sectors except the distributive trades. If the filter is used, some endogenousness of prices is observable for two other sectors (agriculture and consumer goods) as well for all sectors taken together. Lastly, as mentioned earlier, it was decided to exclude the distributive trades from the analysis. With the residuals of these equations established, it is possible to go on to the second stage.

4. Assuming that a certain group of sectors consitutes a key group, the average residual (weighted by numbers employed) is calculated for that group in the first-stage equations, giving R^C, and similarly the average residual for the other sectors, R^{NC}. Then equations of the following form are estimated for each sector:

$$(4)\quad R^i = \sum_{j=1}^{k} a_j R^i_{-j} + \sum_{j=1}^{k} b_j R^C_{-j} + \sum_{j+1}^{k} c_j R^{NC}_{-j}$$

where R^i_{-j} is the residual in the first-stage equation specified for sector i, lagged by j quarters, and k is the maximum lag used (expressed in quarters).

By excluding R_0^C and R_0^{NE}(1) from the equation a serious problem of simultaneity is circumvented, since it is probable that R_0, R_0^C and R_0^{NC} are affected by the same random factor resulting from variables (socio-political or other) omitted from the first-stage equations. R_0^C and R_0^{NC} are not therefore independent from the residual of equation (4). Furthermore, wage spill-over cannot be expected to be instantaneous.

5. A number of indices will be examined to ascertain whether the group of sectors being considered is or is not a "key group":

- value and significance of b_j, c_j, Σb_j, Σc_j;

- the overall significance of b_j tested by comparing:

(4A) $$R^i = \sum_{j=1}^{k} a_j R^i_{-j} \text{ with}$$

(4B) $$R^i = \sum_{j=1}^{k} a_j R^i_{-j} + \sum_{j=1}^{k} b_j R^C_{-j}$$

For the sectors in the key group, neither the b_j nor c_j should be significant - only auto-correlation of the residuals for the sector should appear. For sectors outside the key group, the b_j should be significant but not the c_j. These characteristics are difficult to apply in one key group (number 4), whose constituent, sectors vary over time.

6. A negative significant link between residuals sometimes appears but is not meaningful for the purposes of the analysis here. The results are not always easy to interpret. The residuals often show a fairly high degree of auto-correlation, so it is not uncommon to find in the estimation of equation (4) b_j or c_j which are significant but with the opposite sign, the sum of which is small and not significant. For example, if the residuals corresponding to the key sector are auto-correlated, this may cause changes of sign in the b_j sequence so as to correct this auto-correlation. However, even in this case Σb_j must be positive and significant. For example, obtaining $b_1 \simeq -b_2$(2), both of them, significant, was not taken to be proof of intersectoral spill-over. If the wage in one sector grows faster and this causes a wage movement in another sector for just one quarter, this cannot be termed spill-over.

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(1) Instantaneous values of R^C and R^{NC}.

(2) Coefficients for the first two lags.

7. As seen earlier, equations (4) and (4B) were also re-estimated with aj = 0 (no auto-correlation) for the key sector comprising capital goods + intermediate goods. Given that the employment-growth differential does not appear in the general equations for the first stage, its component not explained by the general variables [log (D/O), etc.] shows up in the residuals and ought subsequently to exert a positive influence on the residuals for other sectors, since a direct econometric exercise on wage rates reveals a role of this kind. However, this is not the case, or by no means consistently so, (the only effects observed are intermediate goods on services and the variable-composition high-productivity group on industrial capital goods): the only difference between the econometric approach and that derived from Mehra is the fact that the residuals are in this case presumed to be auto-correlated(1) when they are analysed, while no correction for auto-correlation is introduced for the estimation of the wage-rate equations. If this correction is then made in the equations which include the employment-growth differential in capital goods and intermediate goods, and the equations applied to those sectors in which this variable is significant, this significance is still found in four sectors (agro-food, capital goods, consumer goods and services). If, symmetrically, the residuals are analysed for interdependence, without introducing auto-regressiveness, the same conclusion is reached for those four sectors.

8. Equations (4), (4A), and (4B) were estimated with several lag options (k). The best results were obtained using lags of four or eight quarters.

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(1) Since lagged residuals for the sector considered are introduced as an explanatory variable.

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