

WAGE DYNAMICS IN FRANCE WHEN EMPLOYMENT AND WORKING HOURS ARE DISTINGUISHED

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ABSTRACT

Individual behaviour flexibility and institutional flexibility of the labour market increased in France (overtime hours, part-time and fixed-term contracts). Nevertheless unemployment did not decrease. An explanatory model is proposed which distinguishes employment and working hours. A concept of labour capacity is defined as the notional (or potential) hours supplied by workers in activity. This quantity fits into the relationship between indivisible employment and the effective demand for hours by firms. In a Keynesian regime, in which the demand for hours is rationed, labour is shared according to a customer model, non-cooperative and inefficient, in which wage earners struggle against dismissals by agreeing to be paid for below their marginal productivity and by extending their capacity above the initial contract, namely increasing hours and intensity (extensive and intensive margins). Some hours are not utilised and not paid. The Phillips curve has to be transformed by introducing the discrepancy between potential and effective labour quantities. The latter is measured with the employment survey by part-time, overall fluctuations and work utilisation rates. Estimates of this new Phillips curve are implemented for the non-financial non-agricultural economy and the manufacturing sector. Paradoxically the model applies best for the services and trade sector. Thus a flex-security policy would better be suited to this sector. The manufacturing sector is still of the Taylorian or Toyotian type. The new Phillips curve explains why changes of NAIRU are positively correlated with changes of actual unemployment.

Classification JEL: E1

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RÉSUMÉ

La flexibilité des comportements et la flexibilité institutionnelle du marché du travail (heures supplémentaires, contrats à temps partiel et à durée déterminée) ont augmenté en France. Pourtant le chômage ne s'est pas réduit. On propose un modèle explicatif qui distingue l'emploi des heures travaillées. On définit le concept de capacité de travail au sens des heures notionnelles (ou potentielles) offertes par les travailleurs en activité. Cette grandeur s'insère entre l'emploi indivisible et la demande effective d'heures des entreprises. Dans un régime keynésien où la demande d'heures est rationnée, le partage du travail s'effectue selon un modèle de clientèle non coopératif inefficace où les salariés luttent contre les licenciements en acceptant d'être rémunérés en dessous de leur productivité marginale et en étendant leur capacité au-delà du contrat initial en accroissant les heures ou l'intensité (marges extensive et intensive). Une partie des

heures est inutilisée et non rémunérée. La courbe de Phillips doit être modifiée en introduisant l'écart de la quantité de travail à son niveau potentiel. Ce dernier est mesuré à l'aide de l'enquête emploi part des indices de temps partiel, d'effet conjoncturel et de taux d'utilisation du travail. Des estimations de cette nouvelle courbe de Phillips sont faites pour les entreprises non financières et non agricoles et pour l'industrie. Paradoxalement le modèle s'applique mieux aux services et aux commerces. Le secteur manufacturier applique encore trop les méthodes tayloriennes et toyotiennes. La nouvelle courbe de Phillips explique pourquoi le N AIRU varie en phase avec l'emploi observé.

1. INTRODUCTION

The effect of the financial crisis was a recession, a drop of the rate of growth and a rise of unemployment in Europe. According to the usual theories, the lack of flexibility on the labour market and the rigidity of wages and prices are the causes of the persistence of inflation and unemployment as it is described by an augmented Phillips curve. In this curve, wages depend not only upon inflation expectations but also upon adjustment lags. The non-linearity of the rate of unemployment effect is explained by hysteresis. The degree of utilisation of production capacities and the productivity cycle explain the low inflation rate when labour and capital are underused. Such an analysis just describes aggregate past regularities in order to forecast them but does not take into account either the substance of unemployment, or the regime of the economy, or the innovation in the labour market. Now unemployment must be distinguished when working relationships do not form, or when they are breached, from the case when there is an excess of labour supply, even though workers are employed. This distinction allows to explaining the existence of persistent unemployment in the long run in a non-walrasian equilibrium. There is no need for calling labour market rigidities, but the distinction between employed salaried workers and unemployed workers comes first. A non-cooperative equilibrium between employed workers themselves leads them to offer excess hours of work in order to manipulate the probability of being laid off, when aggregate unemployment is significant. A new trade-off between the desired wage and the excess of offered hours by salaried persons over the demanded hours by employers appears. It is arbitrated by the threat of unemployment.

In order to describe this system, the notion of work capacity is introduced. It is equal to the notional (potential) hours offered by employees. This quantity lies in between the indivisible employment of workers and the effective demand for hours by firms. Employment and unemployment are two forms of social condition, and as such described by a discrete variable. Work is an hour duration, and as such a continuous variable. The labour contract is divided in two: hiring and renewal. In a classical regime, when aggregate employment is not rationed, the sharing out of work is a voluntary decision of wage earners, because there is no unemployment threat. There is turnover and unemployment mismatch only, because of qualification discrepancies. Unemployment is voluntary. Marginal and average profitabilities of work, which are equal to marginal productivity, minus the prime below par accepted by salary earners, minus unemployment benefits, minus the monetary equivalent of the disutility of labour, are nil. The share between employment and hours is not relevant, because both

are voluntary. Hiring and layoffs are symmetrical and reversible. If information is perfect, workers are hired at their marginal productivity. They need not to be protected against unemployment. Wages are fully indexed. Work capacities are equal to work hours of the contract.

In a Keynesian regime, when the supply and the effective hours of workers are rationed, the share of work, within the firm, is operated through a non-cooperative customer model, in which wage earners struggle against lay-off by accepting to earn a wage lower than the marginal productivity, and by offering more hours, or by increasing their intensity of hours. They want to manipulate the choice of the lay-off by the firm. The excess capacity of labour is such that the average profitability (i.e. the effective wage under productivity level, minus unemployment benefits, minus the excess effort monetary equivalent) is nil. It is equivalent to be employed or unemployed, when hiring. But it is better to be employed than unemployed, when laid off. The system is opened at the hiring, but it is closed at the layoff or dismiss. Unemployment is involuntary, eventhough the marginal wage is too high. Indeed a decrease of wage would induce the average profitability to be negative and could not allow to reducing unemployment. On the contrary, an increase of the labour demand would diminish unemployment.

Thus, the Phillips curve should be changed. Wage earners have two controls: firstly, the excess potential supply of hours according to the official, or normal, duration², and secondly, the salary when they accept to earn less than their productivity level (what we call « under-indexation »). The labour contract at hiring fixes the wage (normally equal to marginal productivity) and the number of « theoretical » hours. During its execution, the wage earner chooses between augmenting excess hours or agreeing to reduce income in order to reduce the risk of being laid off³. There exists a desired salary, different from the marginal productivity of labour, which depends on the overall economic climate. It depends positively upon the perceived excess of hour's demand (i.e. negatively upon the unemployment rate), positively upon the excess hour's supply, positively upon effort, positively upon the minimum wage, and is partly indexed on

² The INSEE (The French statistics institute) speaks of « theoretical hour duration » of work, the French ministry of labour of « collective » weekly hour duration to qualify this norm. It is made fit the law around « legal hours », for instance in the case of overtime hours.

³ Here the “extensive margin”, which consists in increasing hours is only considered. The “intensive margin”, which consists in increasing productivity (i.e. efficiency) of hours could also equivalently have been introduced as well. This distinction does not play any part here, because information has been supposed to be complete. When information is asymmetrical, the two margins can play different parts : hours are better observable than efficiency. All depends upon monitoring. For instance, inspectors can be in charge of extracting the knowledge corresponding to the intensive margin to downgrade or to scrap it by upgrading the new collective standard in the firm. In the iron and steel industry, monitoring consisted long ago in establishing at what temperature (what colour) of the pig iron the worker did a certain operation and in building a sensor that replaced the know-how or the dexterity. In the trade, monitoring consists in detecting how a salesman wins over a customer to firm’s catalogue and in introducing then the method in the general draft that is proposed to all sellers during their training course. In Japan, voluntary cooperation was appealed to the staff by a system of dead mailbox, which content was climbed back to the management by a pneumatic tube network. These ways of organisation are gathered sometimes by economists of the institutional school under the name of toyotism.

inflation. The first term is a walrasian tatonnement. The last two terms are the effect of the aggregate economy. The second and the third term are the new trade-off.

To estimate this equation, it has been measured for France the annual supplies of labour hours and annual effective hours, making use of annual surveys on employment. The weekly “effective” and “theoretical” hour durations are computed making use of the surveys of the ministry of labour. These surveys, among the oldest in France, allow to measuring the ratio of the supply of hours over the demand for hours and the hourly and weekly wages. Making use of national accounts completes them, which gives effective employment and unemployment of salary earners in full-time work equivalent. Unemployment is computed according to the definition of the ILO (International Labour Organisation). The extended Phillips curve is estimated for all non-financial, non-agricultural firms.

This work has been extended to the manufacturing sector to discuss the validity of the model, when the producing process is more defined by equipment as in the Taylorian model.

The econometric adjustments are more precise with the rate of growth of salaries than with the level. The “Phillips model” fit better the data than the “WS-PS model”. Usual results for France on a long historical period of time are confirmed. Salaries are slightly under-indexed on inflation. The decrease of the work week duration is compensated for about 60%. The unemployment rate put a pressure of 4% on the nominal hourly wage. Above all, the new trade-off we wanted to identify corresponds to an arbitrage between an increase of 1% of the excess supply of hours over the effective demand of hours, on the one hand, and an increase of 0,67% of the salary on the other hand. A third of the “extensive” or “intensive” margins of work are lost. This cost corresponds to the threat of unemployment, when information is complete. This result does not fit with voluntary unemployment, when, because of the incentives, the intensive and extensive margins should be better paid for. Indeed, in order to encourage workers to adopt the more productive behaviour, the most productive ones should benefit from an informational rent. The coefficient of the excess hours should be greater than one. As the contrary is observed, it means that unemployment is involuntary and is a dominating threat (the pressure to decrease costs also may play a part)⁴.

The results are partly confirmed in the manufacturing sector with the “Phillips model”, but not with the “level model”. The excess supply of hours influences the rate of growth of salaries, when there is no error correction term. The accuracy of estimates, which should be confirmed however at a more detailed level of activity, leads to think that the arbitrage between non-paid hours and the increase of the apparent ex post wage does exist and is partial. Whether a confirmation of the theories inspired by Marxism like

⁴ The intensive margin should be better paid to encourage workers or it should be reduced to suppress asymmetrical information. Toyotism can be interpreted as a system, which makes in the common knowledge the factors of the intensive margin. Suppressing thus asymmetrical information. A classical economist would say that the not paid wage, corresponding to the intensive margin, is the cost to extract knowledge.

Toyotism⁵ or a confirmation of the theory of Keynesian contracts, these encouraging econometric results show the robustness of the Phillips curve and should moderate the questioning about its verticality.

The paper is divided in three parts. Firstly, the model is shortly presented; Secondly, the data computing is explained and statistics are briefly commented; lastly, econometric results are discussed.

2. THE EMPLOYEE RELATIONSHIP

The employee relationship is an open-ended contract, which is split into two time stages. The hiring contract, signed at the beginning, is a symmetrical relationship, because firms hire when the expected productivity of labour is greater or equal to labour cost and the worker commits himself if the profitability of working is positive. When he refuses to commit himself, unemployment is voluntary. During the second stage, the employer can breach the contract according to external parameters as demand, as earning or as the observed activity of the employee. When layoff occurs, unemployment is involuntary. This approach of contracts is general in the sense that firms guaranty, ex ante, the salary, but the contract can be renegotiated ex post or breached.

The indexation of salaries, as the supply of hours, are instruments of employees to avoiding layoffs by accepting a lower income than effective marginal productivity. Thus employees are struggling to avoid unemployment in a competitive scheme with customer effects. However, the process relies upon two factors. In the first place, the macro-economic regime matters. In a neo-classical regime, when there is no aggregate constraint on labour demand, the “ex post” effort fits demand and employees are better off if they obtain a complete indexation. They behave as insiders facing unemployed workers who play as outsiders⁶. In a Keynesian regime, employees must offer an excess supply of labour or accept a lower wage to escape from being laid off. In the second place, consequences depend upon their representation of the aggregate consequences of indexation. Two viewpoints are possible. In the first case, employees take into account the external effect of underindexation upon global activity (external coordination). In the second case, as individualistic, indexation is considered as a pure instrument to struggle against other employees (no internal coordination). An average indexation results from a non-cooperative equilibrium.

Firms are assumed to compete such that employees are hired at their observed productivity. Population is composed of N individuals, among them I are employed (indexed by (i)) and $N - I$ are unemployed. Employees are competing between themselves to avoid unemployment, which probability is equal to the percentage of unemployed people $1 - P = \frac{N - I}{N}$. Individuals have the same monetary disutility of

⁵ See Boyer and Freyssenet (2002). The link between toyotism, the extensive and intensive margins and flex-security are not mentioned. Unobserved margins are, according to us, a private mean of salary earners to secure their employment.

⁶ See Snower and Lindbeck (1988).

labour e . The sharing of layoffs is “manipulatable”. It is assumed that it is done through a customer effect. Employees are ready to work more or earn less, because labour demand is proportional to hour supply and depends on indexation.

The ex ante contract consists in determining the salary $w - \theta$ and the “demanded” or “theoretical” or “collective” hours according to the different definitions of the statistics bodies. The effective salary is equal to marginal productivity, minus below par rating θ . The later is related to inflation or the rate of growth of productivity. The effective hours demand H_i^d by firms is an official maximum for the employee. Ex post, after hiring, the employee acts on employment fluctuations indirectly by changing the “perceived demand” with two instruments: indexation and hour supply. The addressed demand” is homogeneous of degree 1 in capacity and labour types are gross substitutes⁷.

The optimisation program of the employee is the following⁸:

$$\text{Max}_{H_i, H_i^s, \theta_i} R_i = (w_i - \theta_i)H_i P + h(1 - P) - eH_i^s P - h \text{ s.t.}$$

$$H_i \leq H_i^s : \text{labour capacity constraint.}$$

$$H_i \leq H_i^d = H_0 \frac{H_i^s}{\bar{H}^s} (w_i - \theta_i)^{-\gamma} (w_j - \theta_j)^{(\gamma-1)\varepsilon} : \text{effective labour demand sharing constraint}$$

(H_0 are legal or normal hours);

$$P \leq F(w - \theta) : \text{feedback effect of indexation on employment.}$$

with $F'(\cdot) \leq 0$, $\theta_i \geq 0$ are the underindexation effects.

Let H , θ et w be the average of worked hours, of underindexation and nominal wage

$$\text{such that } H = \sum H_i, \theta = \frac{\sum \theta_i H_i}{H} \text{ and } w - \theta = \frac{\sum (w_i - \theta_i) H_i}{\sum H_i}.$$

$$\text{Approximately we have } \frac{H_i}{H} \approx \frac{1}{n} \approx \frac{1}{I}.$$

Let λ , μ and ν be the Lagrange multipliers. The first order conditions say:

$$(1 - \nu)(w_i - \theta_i - h) - \lambda - \mu = 0$$

$$(1 - \nu)e + \lambda + \mu \frac{H_i^d}{H_i^s} = 0$$

⁷ See Benassy (1982 and 1989).

⁸ This model is a simplified version of Villa ones (2005a) and (2005b) where firms are distinguished and mesoeconomic problems discussed. At equilibrium, average profitability is then always positive. There is a double Bertrand equilibrium in prices and wages and a double Cournot equilibrium in capital and labour capacities.

$$(w_i - \theta_i) \left[(1 - \nu)H_i - \mu\gamma \frac{H_i^d}{w_i - \theta_i} \right] F(w - \theta) + \nu \frac{H_i}{H} F'(w - \theta) + \frac{H_i F'(w - \theta)}{H} \left[(w_i - \theta_i - h)H_i - eH_i^s \right] = 0$$

To interpret these equations, we define average and marginal profitabilities. The marginal labour profitability is:

$$R_m = w - \theta - h - e$$

The ex ante average profitability is:

$$R_M^a = (w - \theta - h) - e \frac{H_i^s}{H_i^d}$$

The ex-post average profitability is:

$$R_M = (w - \theta - h) - e \frac{H_i^s}{H_i}$$

An unemployed worker decides to participate to production if the expectation of his gains is positive. He accepts the labour contract if the marginal profitability R_m and if the expected average profitability R_M^a are positive. An employee will remain if the ex post marginal profitability R_m is positive and he will prefer employment to unemployment if the ex post average profitability R_M is positive.

Two regimes appear. In the neoclassical regime, the demand for labour is not constraint ($\mu = 0$), or $H_i < H_i^d$. Thus:

$$(1 - \nu)(w_i - \theta_i - h - e) = 0, \lambda = (1 - \nu)e > 0 \text{ and } H_i = H_i^s < H_i^d.$$

Unemployment is voluntary such that salary earners do not offer excess hours and underindexation is useless. Profitabilities of labour are nil:

$$R_m = R_M = 0$$

This regime corresponds to full employment ($P = 1$) or voluntary unemployment ($P < 1$). Indexation does not matter because equilibrium is obtained by variation of wages. When all employees are identical, the third condition gives:

$$H_i F(w - \theta) + \frac{\nu}{I} F'(w - \theta) = 0$$

The second regime is Keynesian, unemployment is a binding constraint ($\lambda = 0$ et $\mu > 0$). The optimum is given by $H_i = H_i^d$ and $H_i < H_i^s$, or:

$$w_i - \theta_i - h - e \frac{H_i^s}{H_i} = 0$$

At equilibrium, the marginal labour profitability is positive as a condition of participation. Employees offer more hours than the effective demand such that the average labour profitability is nil. It is important to mention that, at equilibrium, employees always pay unemployment benefits. Indeed, if the increase of benefits is financed by an increase in employers' contributions, profits decrease in the short term, prices increase, as consumption. Unemployment appears so long as the labour costs are greater than their initial value. The equilibrium is restored when the real labour cost comes back to its previous value. The underindexation is a substitute to the unemployment contributions of firms. In textbooks, underindexation and contributions are frequently not equivalent (there is non-neutrality, see Cahuc and Zylberberg (1996), pages 318-320). This comes from the hypothesis that firms pay unemployment benefits proportional to the sum of employed and unemployed workers, which is generally not the case.

The equilibrium is inefficient. Cooperation would be to draw, through a procedure that has to be defined, the layoffs in order that they could not be manipulated.

Optimal indexation is given by:

$$\left[(1-\nu)H_i - \gamma e \frac{H_i^s}{w-\theta} \right] F(w-\theta) + \frac{\nu F'(w-\theta)}{I} = 0$$

When firms do not come up against too high wages ($\nu > 0$), indexation follows:

$$F(w-\theta)(w-\theta)^{1-\alpha} = \frac{\gamma e H^s}{H_0}$$

with $0 < \alpha = \gamma - (I-1)\varepsilon < 1 < \gamma$ because labour types are gross substitutes and the equilibrium is symmetrical. Thus the equilibrium salary follows:

$$w-\theta = g(e^{(+)}, H^s^{(+)}, H_0^{(-)})$$

The desired salary increases with effort (disutility effect of labour), increases with hours' supply (arbitrage between paid and unpaid labour) and decreases with the legal hours (effect of the fall of the marginal labour productivity).

Indexation could be divided in three: inflation, the rate of growth of productivity and the under-compensation of the decrease of the labour duration, when the per capita productivity of labour is constant.

From these developments, the existence of a desired wage has the following shape:

$$w^d = G(e^{(+)}, H^s^{(+)}, H_0^{(-)}, \hat{p}_C^{(+)}, \hat{\pi}^{(+)})$$

The Phillips curve must be augmented and divided into two terms:

$$\dot{w} = \lambda(w^d - w) + \mu(N^d - N)$$

where $\hat{\pi}$ is the rate of growth of labour productivity, \hat{p}_C is the rate of growth of consumption prices, N^d is the demand for labour by firms, N is the voluntary supply

of labour by individuals, w is the hourly nominal wage, w^d is the desired hourly salary and \dot{w} is the rate of growth of the nominal salary.

The first term is a slow adjustment of salary to desired salary according to the competitive process we have described and the second term is a walrasian tâtonnement. Thus the extended Phillips curve includes a term of income distribution, and its discrepancy to the desired one. We shall try to estimate this equation by approximating the capacity effect of exceeding hours through the ratio of offered annual hours to effective annual hours.

Before we come to the definition and measure of the statistics corresponding to the Phillips curve, we shall end this paragraph by some adding remarks about the extensions of the theoretical model. The most questionable is the feedback and coordination effect.

Suppose that the function of expectation of global effects has the same shape as the demand functions, that is:

$$F(w - \theta) = (w - \theta)^{-\beta}$$

The indexation equation becomes:

$$(w - \theta)^{-\beta} (w - \theta)^{1-\alpha} = \frac{\gamma e H^s}{H_0} \text{ with } 1 - \alpha - \beta < 0$$

The non-cooperative effect of the exceeding unpaid hours is described by the second term with the exponent $1 - \alpha$. The feedback is the cooperative effect of the first term with exponent $-\beta$.

Cooperative equilibria correspond to $1 - \alpha = 0$ and non-cooperative zero sum equilibria to $\beta = 0$ when employees do not coordinate themselves and imagine that indexation has no impact, either on their social condition, or on global activity. Let us call internal coordination, the situation with $1 - \alpha = 0$ and external coordination the situation with β equal to the parameter of the production function. The least cooperative situation occurs when the feedback effect is not considered and when any internal coordination is refused. A medium coordination would consider the external feedback effect. But it is insufficient. The optimal solution would be for the employees to understand the vacuum of internecine quarrels about salaries and excess hour supplies and to coordinate themselves by considering the $1 - \alpha = 0$ equilibrium. The function of unions can thus be positive, in this model, in the Keynesian regime, because they are an institution, which enforces the internal coordination between employees⁹.

⁹ The textbooks, like Layard, Nickell et Jackman (1991), pages 100 to 143, see in unions only institutions, which create inefficiencies as monopoly powers. This is not the case in France where unions are divided and weak. In France, collective bargaining includes union, firms and the State, but it concerns basic welfare benefits, vocational training, public assisted employment, the integration of young people into the world of work, unemployment benefits (see Freyssinet (2010)).

3. MEASURES OF WORKING HOURS

3.1. Annual supplied and effective working hours

The “annual offered and effective working hours”¹⁰ (DHT) are computed with ACEMO and TPE surveys of the ministry of labour (“Activity and Employment Conditions of Workforce” and “Very Small Enterprises”¹¹). They apply to non-agricultural and non-financial enterprises only. They deal with full-time work only. The working hours of part-time employees is being fixed by the labour contract.

These surveys are used to compute the “collective offered working hours”, which measure the hours of a collective workforce shared by a group of employees as it is displayed at the work place. It is not a matter of individual working hours but definitely official hours exhibited by the employer. The effective hours can diverge for three reasons:

- in the first place, employees can be lead to work more because of the threat of layoff – redundancy or dismissal (supply of labour),
- in the second place, they can work less according to the shirking model (supply of labour),
- in the third place, the firm can demand more or less hours according to the overall economic situation (demand for labour).

The weekly collective hours are transformed in annual supplied and effective hours for the full-time workers only.

The ILO (International Labor Organisation) suggests two definitions. The “individual usual working hours” are obtained from surveys and fit the ordinary week. It means all worked hours, including paid or not paid overtime. The “individual effective working hours” are also obtained from surveys. They include all hours worked by the questioned persons during the preceding week, whether legal or not legal hours, paid or unpaid overtime. They include unworked hours because of illness, accidents, layoffs, dismissals, strikes.

The annual individual working hours, in the sense of the ILO, are thus the collective weekly hours (in the meaning of the ministry of labour) modified by the economic situation and annual effects.

From the “employment surveys” of the INSEE¹², the quantity of working hours is computed by the formula:

$$VHT = ESALT * DHT * SEM * CONJ$$

¹⁰ Some texts of INSEE speak of “theoretical hours”.

¹¹ The first one deals with firms of more than 10 employees, the second one deals with the rest.

¹² The survey happened in spring every year until 2002. It is now over a quarterly period (see Bouvier, Dialo (2001) and Marchand, Minni (2010)).

where VHT , the quantity (or the volume) of working hours is the product of the “equivalent of employment at full-time work” ($ESALT$) by the “collective weekly offered working hours” (DHT) from surveys, multiplied by the number of legal holiday weeks (SEM) and the economic situation ($CONJ$).

Employment at full-time work is computed by multiplying observed employment by a factor, which depends on sectors, gender. These factors come from employment surveys and take into accounts multitasking, moonlighting and part-time work.

Collectives weekly working hours come from the surveys of the ministry of labour.

Holidays, official holidays are given by law and calendar.

The economic situation has three terms:

- overtime minus vocational training courses,
- days of strike (employees’ supply of labour), layoffs (demand for labour by employers),
- days lost because of illness, maternity and accidents at work.

The "conjunctural" effect includes thus institutional, supply and demand effects.

The “annual supply of hours” ($DOFAN$) is the ratio of the worked hours quantity to the product of the equivalent of employment at full-time multiplied by the overall fluctuation effect:

$$DOFAN = \frac{VHT}{ESALT * CONJ}$$

The “effective annual working hours” ($DEFAN$) are the quantity of hours divided by the observed employment:

$$DEFAN = \frac{VHT}{ESAL}$$

where $ESAL$ is the number of the observed salaried employees and $ESALT$ their equivalent number at full-time.

Because full-time equivalents are computed from observed values corrected from part-time, multitasking and moonlighting, all these computations can be summarised by two equalities:

$$\frac{DOFAN}{DEFAN} = \frac{1}{PART * CONJ} = \frac{1}{WUR}$$

The working utilisation rate WUR is defined as the ratio of effective worked hours to theoretical offered working hours. It is the product of the rate of part-time by the “conjunctural” effect.

It would be liked to think about part-time as a voluntary choice of employees, that is as a work supply effect, and about the overall economic fluctuation effect as a choice of firms linked to the demand for goods, i.e. as a work demand effect. Thus the work utilisation rate represents a mixed supply and demand work effect. But it has been

shown that the "conjunctural" effect is more complex. The same is true concerning the part-time effect. Supply and demand should be separated in that case too. It should be distinguished ex ante part-time, chosen or imposed is not here the main question (edict of March 1982 the 31st, of August 1986 the 11th, of January 1991 the 3rd), at the hiring moment, and the ex post effective part-time when the contract is being executed. When ex post hours are greater than ex ante ones, we speak of effective and demanded excess hours. When it is the reverse, we speak of an extensive form of layoff and of an excess supply of hours. In the overall economic situation, it should be distinguished overtime, layoffs, which are demand factors, absenteeism, days lost because of maternity and sickness, which are supply factors, days lost because of accidents and strikes which are transactions effects in the meaning of non-walrasian equilibrium. As we showed now, statistics depend on the underlying theory, sometimes implicit, which precedes definitions. Because we want to arbitrate between efficiency and purity, we shall interpret annual working hours as pure supply and demand. A further study will divide them in holidays, strikes, overtime, chosen and subjected part-time in order to distinguish more precisely supply and demand effects.¹³ .

3.2. Comeback to theory

In our theory, employees choose between unemployment and employment according to the profitability of labour (here wage incomes minus subsistence in the society (minimum social allowances (RMI) or unemployment benefits). When they accept the contract of the employer, they commit themselves in a more or less long relationship. Then the employer changes partly the contract according to the overall fluctuations. He guarantees the stability of the wage, but neither employment nor hours. When the demand for goods increases, he uses overtime by increasing wages according to law or in a discretionary way. When demand decreases, he uses layoffs or part-time outside the contract (sometimes the wage decreases). Generally speaking, the working hours fluctuate more than salary, which can thus be said sticky. But the threat of unemployment remains when shocks or uncertainty are big or persistent. The contract can be breached. Thus employees may have cooperative or uncooperative behaviours. In a cooperative framework, they act collectively, informally or with the help of unions, through strikes or internal pressures, which cannot be observed outside the firm. This can result in the changing of the collective contract hours. But the loss of employment is individual. So each employee may desire to manipulate, without any cooperation, the choice of the dismiss by earning less or working more. The latter consists in increasing productivity (the intensive margin) or the hours (the extensive margin) according the production process is technical dependent (Taylorism) or results dependent (Toyotism). On the contrary he can reduce hours by shirking. The working hours are thus, at the theoretical as at the empirical level, a complex notion, which mixes notional supply of employees, effective demand of employers and the inside strategic equilibrium between wage earners inside the firm. In this model, part-time and overtime outside the contract are effective demand, absenteeism is effective supply. Unemployment, as an intensive variable, must be distinguished from hours, which are an extensive variable.

¹³ Villa (2006) tries to separate the different effects.

3.3. Descriptive analysis

Chart 1 shows annual supply of and demand for hours for non-financial and non-agricultural enterprises. (see Villa (2006)). Chart 2 shows the divide of the work utilisation rate into part-time effect and overall fluctuation effect

Chart 1

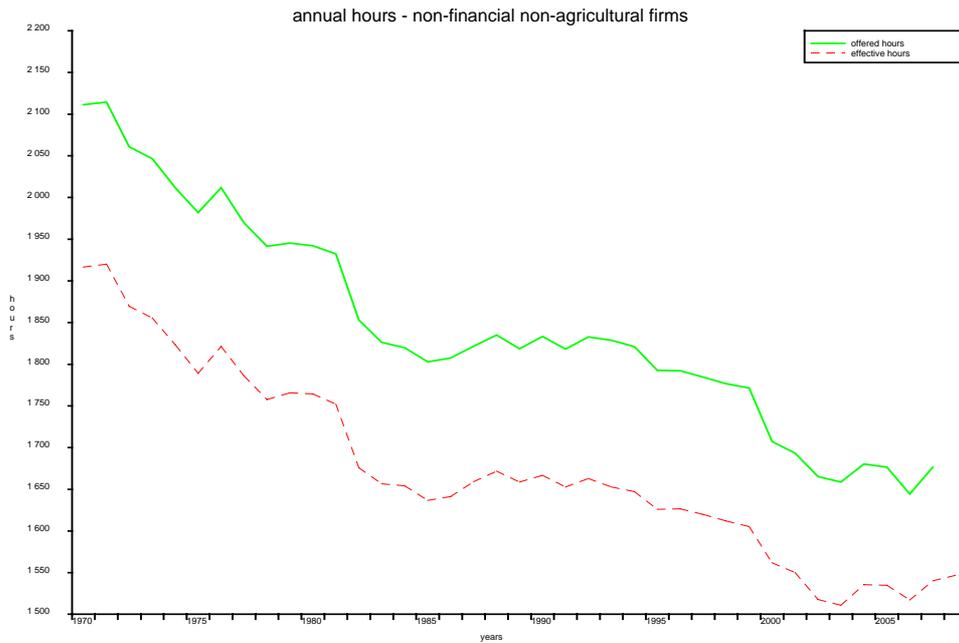
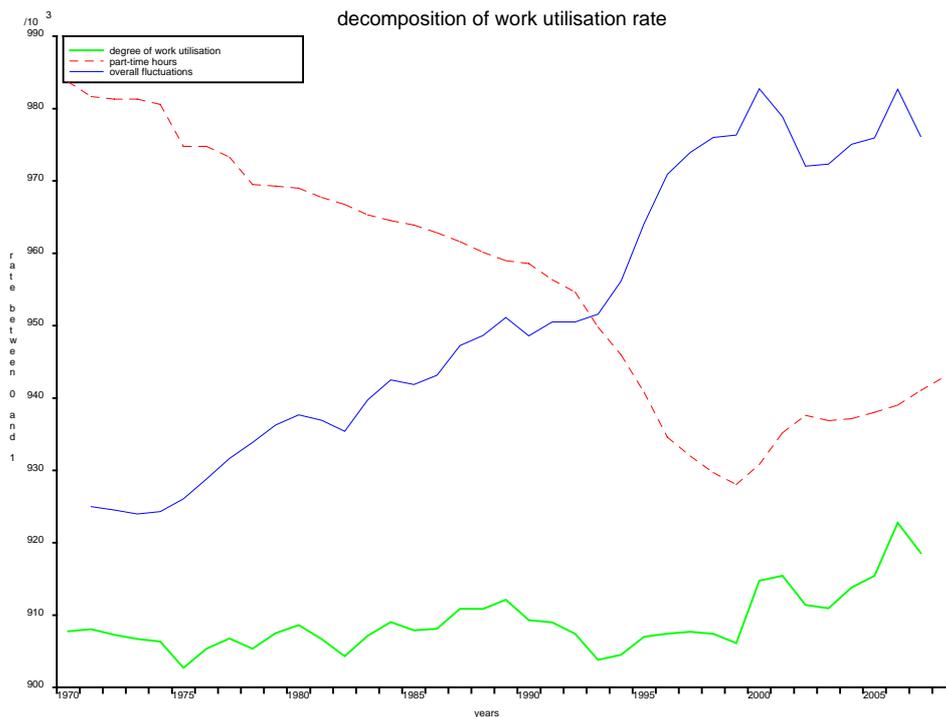


Chart 2



The supply and demand of hours show the same declining trend but there is a big and definitive decrease in 1981 and 1999 after the reduction of the legal hours, reduction which anticipate the trend more than it modifies it. However the discrepancy between supply and demand seems to be independent of the legal hours. The supply of hours is permanently greater than the demand one. It is faced a Keynesian regime of excess hours supply that must be explained. The customer model is our first explanation.

There could be another one. This evolution can be compared with the number of theoretical weeks of holidays (see Villa (2006)). The gap between the two corresponds to part-time. Here the work of Marchand and Thélot (1997) has to be mentioned. The equalization of working hours among employees was interrupted around 1980; but the trend of the reduction of the annual working hours was interrupted earlier in 1977 when the effective hours were close to the legal 40 hours. At that time, working hours began to diversify among individuals because of the diffusion of part-time work. In March 1996, in the employment survey, the share of women in part-time was 30%, but the share of man was a small 5%. At the aggregate level, the percentage of persons working part-time was 16%. The development of such contracts can be dated to the middle of the eighties, as part-time work was 6% of the workforce in 1971, around 7.1% in 1980 and 15.4% in 1994, according to Bordes et Guillemot (1994), and 17.7% in 2000, and 18.1% in 2007 according to the employment survey¹⁴. The end of the period is also characterised by the development of fixed-term contracts (CDD) and public encouraged

¹⁴ All computed data are available in the DEF_DOF_BIS file : see also the appendix.

contracts (contrats aidés) (see Marchand and Minni (2010)), which have an impact upon the “apparent” rate of part-time hours. Thus a further study will be made, in another direction, to ask whether the main impact of the reduction of the legal hours was to hinder the split of individual hours and the development of part-time work, as it is observe in other European countries. This were a possible alternative to our theory.

4. ECONOMETRIC ADJUSTMENTS AT THE AGGREGATE LEVEL

In this paragraph, estimates of the extended Phillips curve cover non-financial and non-agricultural firms. The excess supply of hours is approximated by the ratio of annual offered hours to annual effective hours. Work capacity is measure by the product of employment by offered hours. The work utilisation rate is divided into to terms: part-time and overall fluctuation effect.

Four dynamic equations of the nominal hourly salary have been estimated. The first and second ones explain the variation of the logarithm of salary. In the first one, among explanatory variables, the exceeding hours effect is divided into part-time and overall fluctuations, which are distinguished. The second one groups together the two effects. The third and the fourth ones explain the logarithm of the level. In the third equation, the effects of part-time and overall fluctuations are distinguished and, in the fourth one, the two effects are put together with the work utilisation rate effect. The two first equations correspond to the “rate of growth model” or “Phillips model”; the two last equations correspond to the “level model” or “income distribution conflict model” or “WS-PS model”. These two sorts of models are different and cannot be include in one another. Indeed the “Phillips model” is not the variation or derivative model of the WS-PS one. In the latter one, explanatory variables act at their level with some lags, in the first one they act as differences. But in the two models, the rate of unemployment and the work utilisation rates intervene through their level. So the two models cannot be compared by the usual tests, but by a Cox test.

The explicit formulas tested are the following:

$$\text{EQ1} \quad \begin{aligned} \Delta \text{Ln}(wh) &= a_1 - a_2 \text{Ln}(u) + a_3 \Delta \text{Ln}(p_C) \\ &+ a_4(1 - conj) + a_5(1 - part) - a_6 \Delta \text{Ln}(dh) + a_8 \Delta \text{Ln}(wr_{\min}) \end{aligned}$$

$$\text{EQ2} \quad \begin{aligned} \Delta \text{Ln}(wh) &= a_1 - a_2 \text{Ln}(u) + a_3 \Delta \text{Ln}(p_C) \\ &+ a_4(1 - wur) - a_6 \Delta \text{Ln}(dh) + a_8 \Delta \text{Ln}(wr_{\min}) \end{aligned}$$

$$\text{EQ3} \quad \begin{aligned} \text{Ln}(wh) &= a_7 \text{Ln}(wh) < -1 > + a_1 - a_2 \text{Ln}(u) + a_3 \text{Ln}(p_C) \\ &+ a_4(1 - conj) + a_5(1 - part) - a_6 \text{Ln}(dh) + a_8 \text{Ln}(wr_{\min}) \end{aligned}$$

$$\text{EQ4} \quad \begin{aligned} \text{Ln}(wh) &= a_7 \text{Ln}(wh) < -1 > + a_1 - a_2 \text{Ln}(u) + a_3 \text{Ln}(p_C) \\ &+ a_4(1 - wur) - a_6 \text{Ln}(dh) + a_8 \text{Ln}(wr_{\min}) \end{aligned}$$

wh is the nominal hourly salary, u is the ILO rate of unemployment as defined in 2002, \hat{p}_C is the rate of growth of consumption prices, $1 - conj$ is the share of reduced

hours because of overall fluctuations, $1 - part$ is the share of reduced hours because of (involuntary or voluntary) part-time, dh is collective effective weekly hours and wr_{\min} is the minimum real wage (deflated by the consumption price of households in national accounts). The work utilisation rate is written by definition: $wur = conj * part$. As for example, $part \approx 1$, we made use of the following approximations: $Ln(\frac{1}{part}) = -Ln(part) \approx 1 - part$, and the same ones for $conj$ and wur . Finally Δ is the difference operator.

The results, over the period 1972-2007, are given in table 1.

Table 1 : econometric results with nominal wage

Coefficient CORC	EQ1	EQ2 $a_4 = a_5$	EQ3	EQ4 $a_4 = a_5$
a_1	-0.13 (0.03)	-0.14 (0.02)	2.85 (0.10)	2.70 (0.91)
a_2	0.04 (0.004)	0.04 (0.004)	0.05 (0.03)	0.05 (0.03)
a_3	0.82 (0.05)	0.85 (0.04)	0.70 (0.12)	0.64 (0.12)
a_4	0.59 (0.26)	0.67 (0.25)	0.88 (0.68)	1.11 (0.75)
a_5	0.51 (0.33)	0.67 constrained	1.96 (0.86)	1.11 constrained
a_6	0.61 (0.15)	0.55 (0.12)	0.86 (0.20)	0.83 (0.21)
a_7	difference	difference	0.34 (0.09)	0.42 (0.09)
R^2	0.991	0.991	0.996	0.996
DW	2.02	1.99	1.84	1.82
ρ	-0.39 (0.08)	-0.41 (0.07)	0.60 (0.11)	0.42 (0.11)
Dickey-Fuller	-8.17	-8.24	-3.60	-3.61

The minimum real wage is not significant, coefficient from CORC estimation (standard deviations in parentheses), correlation and DF from OLSQ.

The same estimations have been made for the full-time equivalent wage. The results are given in table 2.

Table 2: econometric results with full-time wage

Coefficient CORC	EQ1	EQ2 $a_4 = a_5$	EQ3	EQ4 $a_4 = a_5$
a_1	-0.17 (0.03)	-0.18 (0.03)	2.87 (0.89)	2.57 (0.99)
a_2	0.04 (0.004)	0.04 (0.003)	0.05 (0.03)	0.05 (0.03)
a_3	0.82 (0.05)	0.83 (0.04)	0.71 (0.12)	0.58 (0.13)
a_4	1.05 (0.26)	1.11 (0.25)	0.98 (0.68)	1.36 (0.75)
a_5	1.03 (0.33)	1.11 (0.25)	2.84 (0.88)	1.36 (0.75)
a_6	0.47 (0.15)	0.44 (0.12)	0.87 (0.20)	0.79 (0.23)
a_7	Difference	difference	0.33 (0.09)	0.47 (0.09)
R^2	0.991	0.991	0.995	0.995
DW	2.07	2.07	1.79	1.78
ρ	-0.43	-0.43	0.74	0.73

The minimum real wage is not significant (standard deviations in parentheses)

These econometric results show that the work utilisation rate, whether considered as a global effect or divided in part-time effect and overall fluctuation effect, is a significant explanatory variable of the rate of growth of nominal salaries besides the more traditional variables as weekly hours, inflation and unemployment. The WS-PS model is less accurately estimated than the Phillips one, but a Cox test does not allow to choose between the two models. The part-time effect and the overall fluctuation effect cannot be significantly separated. According to the Phillips model, the coefficient of the work utilisation rates are less than 1 and, according to the WS-PS model, they are greater than 1. In the first case, the effect of excess hours is Keynesian and can be explained by our model of non-cooperation between employees and the pressure of unemployment. In the second case there is an asymmetrical information effect and excess hours are paid to reveal information. So the specification is important because it leads to different ideas concerning the extensive margin.

Because of this problem, a model of the full-time salary has been estimated (table 2). If it is supposed (and it is a tough assumption) that we could measure a full time equivalent salary by dividing the observed salary by part-time hours, we can estimate the same equations with this theoretical wage. Table 2 shows that, in that case, the effects of the work utilisation rates are greater than 1. In that case, the regressions explain the effects by the informational model. The theoretical wage includes

informational premium to reveal information. But the effect of unemployment is no more significant.

These last regressions on table 2 have been presented to raise the discussion. But it is important to understand that they present a flaw. When salaries are divided by part-time hours, there is an artificial correlation between the endogenous full-time salary and the exogenous variables, which are no more exogenous. The same regressions can be run by ruling out the work utilisation rate effect. But in that case, an implicit assumption, that the effect is equal to 1, is made such that the adjustments lose their interest.

5. ECONOMETRIC RESULTS IN THE INDUSTRIAL SECTOR

The preceding results must be verified at the level of the manufacturing sector. Indeed, it is necessary to verify if the model does fit the service sector only, or the industrial sector as well, where Taylorism is still widespread. Indeed, this model is interpreted not only as a contract model but also as a Toyotism model, where employees try to obtain a non-cooperative advantage by distinguishing themselves from other employees through the level of indexation and excess hours (the extensive margin) and the efficiency (the intensive margin). It is a model in which security at employment is obtained by individual strategies. The latter ones are called into question, when knowledge falls into common place. Thus the model asks the question of replacing these private strategies by a flex-security policy.

As the services and trade sector lacks of data, we are focused on the industrial sector. But the estimates are unfortunately unstable in the course of time. There are at least three explanations of this, which do not deal with the same level of signification. Thus a roundabout way has to be made about the building of data. Firstly, there can be cointegration between variables. It can be shown that every series are integrated of order 1 except for the overall fluctuation effect. Secondly, the computation of the indicators of part-time and overall fluctuation effects relies on the national accounting basis and on the stability of the employment survey over a long period of time. Thirdly, the behavior of firms changed over time. Concerning the second point, in the 1980 basis of national accounts, the share of part-time hours regularly decreased. This means that the share of part-time contracts increased slowly from 1972 up to 2000. In the 2000 basis, the effect of part-time is constant to 1999. This difference questions about the durability of the used concepts. Thirdly, the structural changes concerning the labour market in France since 1990 must be invoked. The share of part-time contracts increases from 1990 to 2000, then decreases afterwards and increases after 2007. The decrease of the weekly hours was substituted for part-time after 2000 (see appendix). Moreover, overall fluctuation reasons of annual hours have diversified in the course of time. So, the indicator, which is a summary of all effects, can be mainly explained by part-time jobs, short-time working and overtime working.

The estimates of effects are the following:

$$CONJ = 0.905 + 0.0013* SPART - 0.365* STW + 0.257* SOH$$

(0.003) (0.0003) (0.011) (0.056)

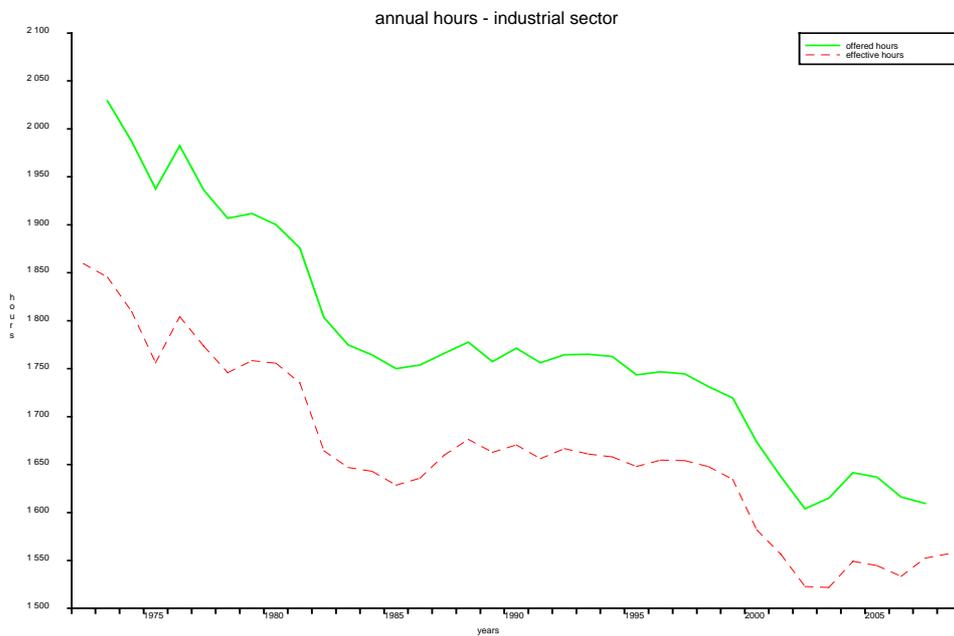
$R^2 = 0.85$, $DW = 2.00$, $\rho = 0.48$, period 1972-2008.

$$WUR = 0.912 + 0.0013* SPART - 0.303* STW + 0.288* SOH$$

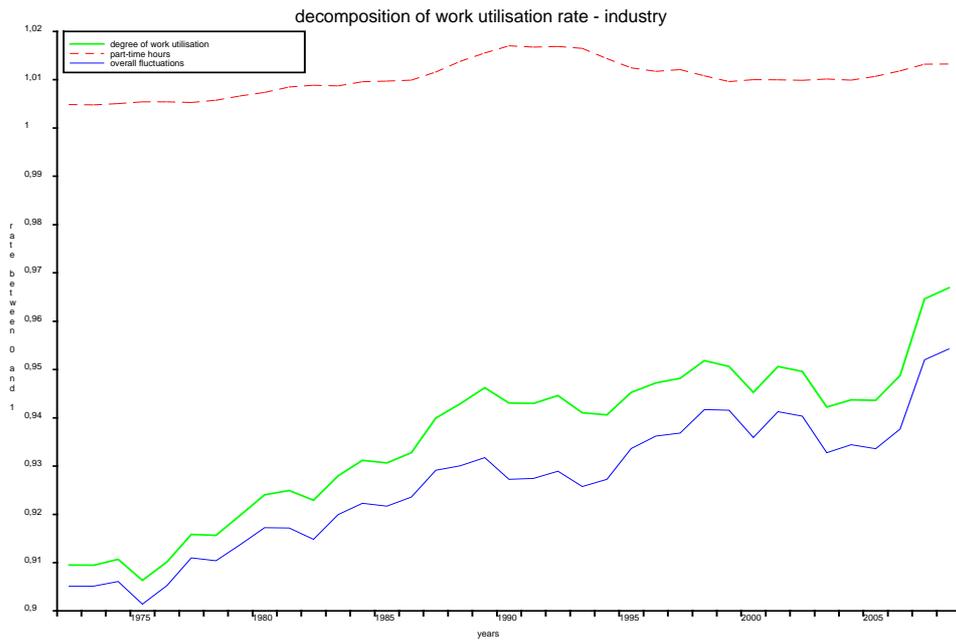
(0.007) (0.0005) (0.113) (0.064)

$R^2 = 0.65$, $DW = 2.17$, $\rho = 0.74$, period 1972-2008.

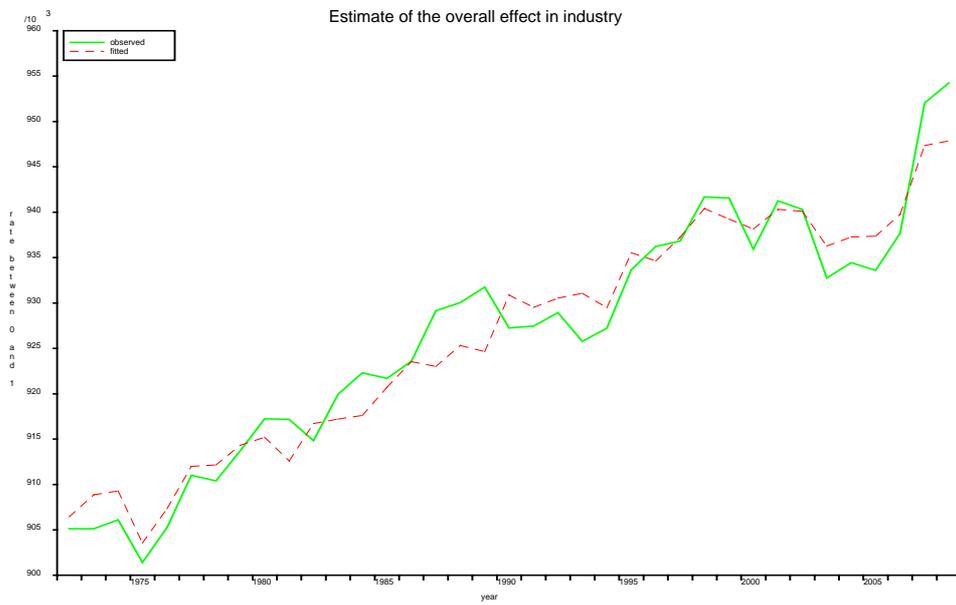
Graph 3



Graph 4



Graph 5a



Graph 5b



SPART is the share of the reasons for part-time contracts, *STW* the share of the reasons for short-time working and *SOH* the share of the reasons for overtime hours. The graphs 5a and 5b, associated with these estimates, lead us to emphasize some facts, which are slightly different from the usual knowledge.

- a) The first oil shock was partly absorbed by a decrease of hours.
- b) During the eighties the work utilisation rate increased: it could be asked if it is a consequence of Taylorism (technical explanation) or of Toyotism (management explanation).
- c) From 1991 to 1994 the intensity of labour was stagnant.
- d) The decrease of weekly hours in 2000 was followed by a decrease of the work utilisation rate.
- e) Since 2007, an increase of the work utilisation rate has been observed.
- f) There is a correlation between the overall fluctuation effect and the part-time hours. This can mean either that both are at play when aggregate demand fluctuates (economic interpretation) or that the statistics methods do not separate frankly the two effects (statistical interpretation).

The new evolutions since 2000 can be attributed to two effects:

- (i) The first one is related to economic policy. Overtime hours are more declared since they allow a decrease of social contributions.

- (ii) The second one is purely inside organisation of firms. They have limited overtime and part-time hours and relied heavily on cost reduction.

In both cases, the decrease of working time was an opportunity to diminish the dispersion of working hours among employees (reduction of overtime and part-time hours). On the other hand, since 2007, this dispersion increased again. As is described in Marchand and Minni (2010), the crisis was managed with part-time and fixed-term contracts.

The econometric adjustments will be discussed with these reserves in mind.

5.1. 1980 basis national accounts

The same specification as for the whole non-agricultural and non-financial economy has been estimated and is presented on table 3.

Table 3: econometric results with nominal wage (industrial sector).
Period 1973-2000, 1980 basis of national accounts

Coefficient CORC	EQ1	EQ2, $a_4 = a_5$	EQ3	EQ4 $a_4 = a_5$
a_1	-0.14 (0.05)	-0.14 (0.04)	2.59 (1.54)	6.38 (1.55)
a_2	0.03 (0.008)	0.03 (0.008)	0.10 (0.03)	0.05 (0.03)
a_3	0.71 (0.08)	0.71 (0.06)	0.59 (0.15)	0.59 (0.11)
a_4	1.24 (0.62)	1.24 (0.60)	3.22 (1.03)	2.22 (0.84)
a_5	1.24 (0.96)	1.24 constrained	6.13 (2.07)	2.22 constrained
a_6	0.94 (0.31)	0.96 (0.24)	0.42 (0.37)	0.88 (0.32)
a_7	difference	difference	0.54 (0.11)	0.16 (0.12)
R^2	0.976	0.976	0.996	0.850
DW	1.66	1.65	1.71	1.77
ρ (correlation of residuals)	0.20 (0.15)	0.20 (0.16)	0.67 (0.08)	0.61 (0.14)
CRDW	1.84	1.85	1.71	1.49
Dickey-Fuller	-5.67	-5.66	-4.24	-2.62

The real minimum wage is not significant, standard errors in brackets, correlation, CRDW and DF from OLSQ estimation.

With the Phillips model, which is well estimated because there is no correlation of residuals, the part-time effect and the overall effect have the same coefficient and cannot be distinguished. The coefficients are equal to 1.24, significantly different from 0 but not from 1. So here the Keynesian effect, which decreases the salary when there is an “ex post” under-utilisation of labour, cannot be separated from the classical one, when “ex ante” salaries are raised in order to enforce productivity. The unemployment rate has a 3% effect on wages (comparable to the whole economy effect), which are 70% indexed on inflation and on that period the decrease of the weekly hour duration was completely cancelled by the increase of hourly wages.

The model of the level of wages is worse estimated, probably due to the correlation of residuals. The effects of part-time and overall fluctuation are obviously exaggerated. We do not comment these equations any more, because the instabilities of the indicators, which we mentioned earlier, due to the change of national accounts, make it more efficient to turn to the estimates in the new basis of national accounts.

5.2. 2000 basis national accounts

We changed the specification of the model because of the correlation of the variables, which are integrated of order 1. So the Phillips model and the WS-PS models cannot be simply compared anymore.

As far as the Phillips model is concerned, the specification concerning the rate of growth of the average wage is the same as for the whole economy, that is:

$$\text{EQ1} \quad \Delta \text{Ln}(wh) = a_1 - a_2 \text{Ln}(u) + a_3 \Delta \text{Ln}(p_C) + a_4(1 - conj) + a_5(1 - part) - a_6 \Delta \text{Ln}(dh)$$

$$\text{EQ2} \quad \Delta \text{Ln}(wh) = a_1 - a_2 \text{Ln}(u) + a_3 \Delta \text{Ln}(p_C) + a_4(1 - wur) - a_6 \Delta \text{Ln}(dh)$$

The estimates over the period 1973-2008 are reported on table 4.

Table 4: econometric results Phillips model.

Coefficient CORC	EQ1	EQ1	EQ2 (WUR)
a_1	-0.05 (0.02)	-0.05 (0.02)	-0.05 (0.01)
a_2	0.03 (0.007)	0.02 (0.007)	0.02 (0.007)
a_3	0.87 (0.06)	0.74 (0.07)	0.74 (0.07)
a_4	0	0.62 (0.22)	0.62 (0.20)
a_5	0	0.57 (0.66)	Idem

a_6	0.71(0.21)	0.76 (0.19)	0.76 (0.18)
R^2	0.963	0.973	0.973
DW	1.69	1.81	1.81
ρ	-0.21 (0.17)	-0.26 (0.16)	-0.26 (0.16)
Dickey-Fuller	-7.21	-8.07	-8.08

Correlation and DF from OLSQ estimation (standard-errors in brackets)

The part-time and the overall fluctuation effect cannot be separated and the improvement they bring is very small compared with the usual extended Phillips curve. In this model, microeconomic considerations are of the second rate¹⁵.

The WS-PS model

The estimates deal with the ratio of hourly real wage divided by the hourly productivity of labour. This variable is integrated of order 1 and shows a declining trend: the real wage was not totally indexed on productivity. We have tested whether the part-time and the overall fluctuation effects were short term or long term determinants.

The specification of the cointegration equation is the following:

$$\text{EQ5} \quad \begin{aligned} \ln(wrprod) = & a_1 + a_2 * t - a_3 * \ln(u) + a_4 * \ln(dh) + a_5 * \ln(pcm) \\ & + a_6 * \ln(1/part) + a_7 * \ln(1/conj) \end{aligned}$$

And the specification of the short-term effect of the intensity of hours are modelled by a correction error specification:

$$\text{EQ6} \quad \begin{aligned} \Delta \ln(wrprod) = & -a_1 * \ln(wrprod - x) < -1 > + a_2 * \Delta \ln(1/part) \\ & + a_3 * \Delta \ln(1/conj) + a_5 \Delta \ln(1/wur) \end{aligned}$$

where $wrprod$ is the ratio of the real weekly wage divided by the hourly productivity of labour, t is the time trend, u is the rate of unemployment, dh is the weekly hours, $part$ is the part-time effect, $conj$ is the overall fluctuation effect and $wur = part * conj$ is the work utilisation rate, and finally x is the fitted value of $\ln(wrprod)$ in the “long run” cointegration equation EQ5. Finally Δ is the difference operator.

All variables are integrated except the overall fluctuation effect. Thus the estimates (on the period 1972-2008) are some cointegration equations, because they fulfil the conditions. They show that the part-time, the overall fluctuation and the work utilisation rate effects are not significant in the long term (see table 5). The discrepancy between wage and productivity corresponds to a diminishing trend of -2%, which explains the change of the income distribution. The effect of unemployment is 7%, 56% of the decrease of the weekly hours were compensated and 80% of prices.

¹⁵ The correlation of residuals is negative, so that there is no risk they can be integrated: the estimates constitute a cointegration equation.

Table 5: the level model in the industrial sector: one possible cointegration equation (EQ5).

Coefficient OLSQ	EQ5	EQ5	EQ5 (WUR)
a_1	6.40 (0.87)	4.97 (1.50)	6.21 (1.06)
a_2	-0.02 (0.0009)	-0.02 (0.0013)	-0.02 (0.0012)
a_3	0.074 (0.036)	0.118 (0.052)	0.076 (0.037)
a_4	0.44 (0.18)	0.72 (0.29)	0.48 (0.21)
a_5	0.20 (0.047)	0.29 (0.085)	0.21 (0.048)
a_6	-	2.81 (2.33)	-0.0015 (0.75)
a_7	-	0.04 (0.74)	Constraint
R^2	0.993	0.993	0.993
DW	1.68	1.84	1.66
ρ (correlation of residuals)	0.23 (0.16)	0.26 (0.16)	0.83 (0.09)
Dickey-Fuller	-4.83	-4.57	-1.70
CRDW	1.96	1.99	2.47

Correlation, CRDW and DF from OLSQ estimation (standard-errors in brackets)

We turn now to the test of the short-term effect of hours, which is given on table 6 over the 1973-2008 period.

Table 6 short-term relation (EQ6).

Coefficient OLSQ	EQ6	EQ6
a_1	-0.82 (0.16)	-0.70 (0.17)
a_2	1.83 (0.57)	-
a_3	0.064 (0.082)	-
a_4	0	-0.19 (0.05)

R^2	0.658	0.527
$CRDW$ (Dickey-Fuller)	1.69 -5.38	1.43 -3.65
ρ (CORRELATION OF RESIDUALS)	0.13 (0.16)	0.48 (0.14)

(standard-errors in brackets)

This equation shows that part-time effect is significant only, the work utilisation rate has a reverse effect in the short run. This means that when hours decrease in the short period due to short-time unemployment or to the decrease of overtime hours, this has no impact on the real wage and even the reverse effect for people actually working at full time. The lector can interpret this result as a shortcoming of the macroeconomic method or as a confirmation of an insider-outsider effect.

5.3. Come back to alternative labour theories.

In France, some labour economists (Boyer and Freyssenet (2000) and (2002) for example) see two industrial organisations aiming at reducing the level and variability of labour costs. The first one (broadly called Taylorism) consists in dividing labour between engineers, who define a precise and constraining production process, which productivity is incorporated in equipment. The income of employees is thus fixed according to the whole performance of the firm and/or considering macroeconomic economic or social variables. The second one (broadly called Toyotism) consists in establishing a long term relationship between employees and management, such that the former cooperate and share their know-how to help improve products and production technology in exchange of a compensation. The question, implicitly raised here, in the framework of these studies, is what model has dominated, and still is, in France.

The second organisation is usually divided in three in the automotive industry (the economists of institutions are fond of taxonomy).

In the Toyotian model (Toyota), employees have financial incentives to reduce costs because salaries depend on the reduction of working time to operate in each team, but the implicit contract is a long term contract. In fact the production process is near Taylorism, because there are great units of production and no buffer stocks.

In the Sloanian model (Volkswagen), the purchasing power of wages increases regularly with the expansion of social security, outside and inside the firm (pay as you go or firm's pension fund), and with the progression of careers. The incentives concern the changes of work types, of jobs, which are not definitely fixed. The equipment is multitasking, as work, and so there are buffer stocks to smooth flexibility between different types of process.

In the Hondian model (Honda), the careers are more individualistic, even at the hiring, and during the activity in the firm. Individual innovations are encouraged through the level of wages. The production units are smaller and more independent.

So, in my viewpoint, the actual Hondian model of organisation is the nearest one our formalisation, when the incentives are dominating, that is when the coefficient of the work utilisation rate is great. The Toyotian model, when diminishing costs is the main target, corresponds to a small coefficient. The Sloanian model is intermediate.

An estimation of the “level model” in the “car and transportation equipment sector” helps to assess these statements. In this sector, the endogenous variable is the average hourly real salary divided by the hourly labour productivity. This variable is independent of the duration of the working week. The following table gives the results for the cointegration and error correction equations. The specification is the following:

$$\text{EQ7 } \ln(wrprod) = a_1 - a_2 \ln(prod) + a_3 \ln(p_c) - a_4 \ln(u)$$

$$\text{EQ8 } \Delta \ln(wrprod) = -a_5 x_{<-1>} + a_6 * (1 - conj) + a_7 * (1 - part) + a_8 * (1 - wur) + a_9 * overtime$$

where *wrprod* is the ratio of hourly salaries divided by hourly productivity, *overtime* is the ratio of overtime hours and *x* is the error term of the cointegration equation. The other variables are defined as previously.

Table 7 cointegration and short term equations in the car industry

Coefficient Olsq (1972-2008)	EQ7	EQ8	EQ8(WUR)
a_1	0.72 (0.71)	-	-
a_2	0.62 (0.04)	-	-
a_3	0.37 (0.08)	-	-
a_4	0.25 (0.07)	-	-
a_5	-	0.42 (0.26)	0.48 (0.25)
a_6	-	4.40 (2.14)	-
a_7		1.87 (0.79)	
a_8			4.14 (0.75)
a_9			1.92 (0.75)
R^2	0.94	0.25	0.26
<i>DW</i>	1.51	1.88	1.91
Dickey-Fuller	-2.03	-5.48	-5.31
ρ	0.76 (0.11)	0.05 (0.18)	0.01 (0.18)

(Standard errors in brackets, weekly hours not significant)

According to the long-term equation, the coefficient of indexation on labour productivity is 40% only, the indexation on prices is 130% and the decrease of official weekly hours has no effect on monthly wages when they are corrected by productivity. Hourly wages are totally made up for hours such that monthly salaries are unaffected and the over-indexation on prices is offset by the under-indexation on productivity. Moreover the effect of unemployment is considerably greater than in the whole economy or the whole manufacturing sector; finally the coefficients of the part-time effect, of the overtime effect and of the total utilisation of work effect are big; on the other hand, the coefficient of the overall fluctuation effect is not significantly different from 0. Thus automotive firms try to reduce costs in the long term by increasing wages less than the productivity gains. On the other hand, the decrease of working hours was completely offset. This means that the intensive margin of the efficiency of labour was not completely paid for in the long term. On the contrary part-time and the extensive margin were monetised in the short term. But economic fluctuations had no influence on the average salary. These econometric estimates are compatible with a Toyotian model where salaries are partly indexed on productivity gains. But the “desired wage” of employees does not include any effect of excess hours. On the other hand, the later effect acts in the short term only. The high level of coefficients indicates that this is an incentive effect with asymmetrical information, rather than an ex post Keynesian effect. But these incentives do not remain in the long term. So the increase of the productivity of employees is diluted in the general productivity gains and the employees receive a part of them only. Thus, as far as our results are confirmed, the model is Hondian or Sloanian in the short run and Toyotian in the long run.

If this discussion could be extended outside the automotive industry and if this metaphorical analogy could be acceptable, the industrial sector in France could be qualified as more Taylorian or Toyotian as is usually said to be.

Graph 6 : automobile sector



6. CONCLUSIONS

In order to take into account the persistent unemployment that is observed in Europe, and specially in France, while flexibility on the labour market increased continuously during the last years, at the institutional level, as at the individual level, as well, a theoretical model has been proposed, which introduces the notions of work capacity, notional supply of hours by employees, effective demand for hours by employers, work utilisation rate, average and marginal profitability of labour. The same ones in capital theory inspire these notions. For instance, extensive and intensive margins of work are linked to extensive margin (the ex post life duration of equipment) and intensive margin (the rate of growth of productivity incorporated in the new investments) of the capital vintage models. These notions are included in a model, which combines insider-outsider theory and Keynesian non-walrasian equilibria. This leads to an extended Phillips curve with a desired salary depending on margins through the work utilisation rate.

Econometric results are not confirmed in the manufacturing sector, in which Taylorism and pure Toyotism are still dominant. So, paradoxically, the theory applies better to the whole economy or the service and trade sector than to the manufacturing sector. Part-time, overall fluctuation and the hour's utilisation rates act upon wages like ex post adjustment variable in a Keynesian framework, more than through incentive effects. The estimates have nevertheless the flaw of grasping at an aggregate level inside behaviour in the firm and to reduce the effects. Desaggregated estimation would be better if surveys were available. The Phillips curve still describes the long term evolution of salaries in France, eventhough economic policy has been diversifying, including the decrease of work duration, the emergence of part-time (although less than in other European countries) and the development of temp work and fixed-term contracts.

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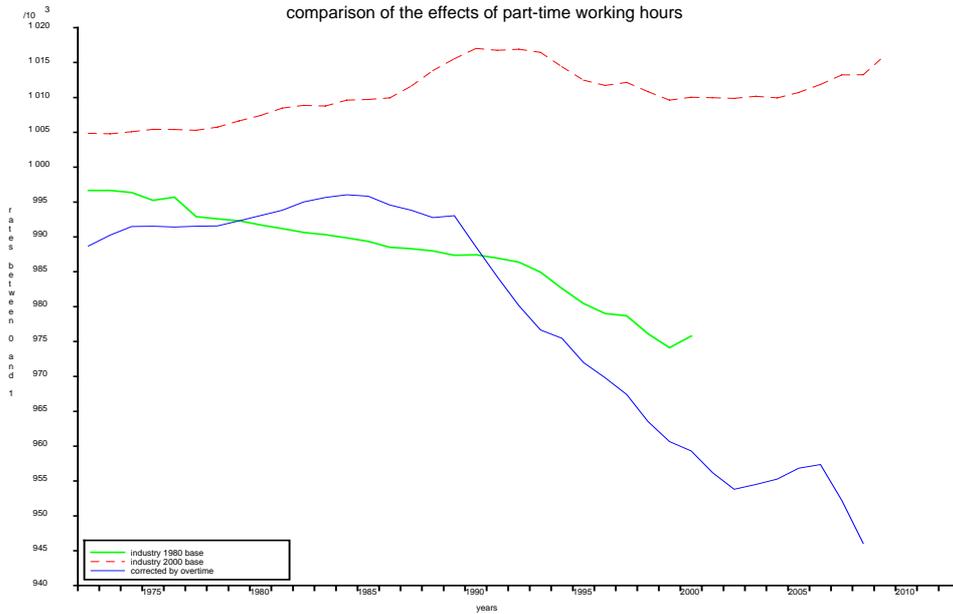
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APPENDIX
DISCUSSION OF THE WORKING UTILISATION RATE IN THE INDUSTRIAL
SECTOR

Generally speaking the two indicators, the effect of part-time on hours and the effect of overall fluctuation, have been computed from the employment survey. But we have used incomplete works of INSEE, which depend heavily on the basis of national accounts and on the underlying computing methods, which are not published.

The effect of part-time is the ratio of the equivalent number of employees, if they were working at full time, to the observed number. The series are quite different according to the 1980 and 2000 bases of national accounts as it is shown in graph 6. In the 1980 basis, the indicator decreases slowly and regularly from 1970 up to 2000. It means that part-time contracts increased with the same (opposite) slope. In the 2000 basis, the influence of part-time work is constant up to 1990, then decreases up to 2002 and increases afterwards. The share of part-time workers moved obviously the opposite way. Thus the 39 hours law of 1981 had no effect on the shape of job contracts. On the other hand, the 35 hours law of 2000 stopped the trend of part-time contracts. The discrepancy between the two indicators can be explained neither by the changing of nomenclature, nor by the valuation system. It originates in the way the reasons why the effective hours are not the official ones in the surveys are handled. So we try to exclude overtime (see graph 7). But the new series fluctuate and show a trend that is not confirmed by other studies. So we have given up such a correction, eventhough the indicator is greater than 1. This problem explains partly why the part-time effect is not significant in the estimates using the 2000 basis.

Graph 7



The overall fluctuation index had to be harmonized because the survey shows a rupture, when it began to be implemented continuously since 2003. The indicators of short-time working and declared overtime hours are the only variables, which held the same definitions. So the indicator of overall fluctuations in industry on the period 1972-2000 has been estimated with these two variables and the results have been used to compute the overall effect in industry over the period 2001–2008. The estimate is the following:

$$CONJ = 0.917 - 0.768 * UPART + 0.419 * OVERT$$

(0.002)
(0.13)
(0.067)

$$R^2 = 0.85, \quad DW = 1.43, \quad \text{period 1972-2000}$$

where *UPART* is the rate of short-time working, *OVERT* is the rate of overtime working and *CONJ* the overall fluctuation of hours.

The work utilisation rate is the product of the two indicators. It is shown on chart 5 that it raised continuously in the industrial sector and remained constant for the whole economy. This shows that the industrial sectors responded to the decrease of working hours by a sort of rationalisation with a decrease of lost hours by hours fluctuations and an increase of overtime hours. But these overtime hours increased regularly. This result is not confirmed by the survey of the ministry of labor. In this survey the overtime hours are the official ones decl

ared by firms. So the latter did not declared the usual structural permanent overtime hours, considered as usual hours, and began to declare them after the 2007 law which gave them some subsidies. So the usual indicators fluctuate according to law. On the other hand, our indicators, based on the responses of employees, does not.

These measurement problems give an example of recurrent questions in the field: we do not know if the raised questions originate in the reality, in the statistics apparatus or in the way we conceptually intend to appreciate the former.