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ABSTRACT

In this paper we model the determinants of firm level wages and employment explicitly allowing for firm and worker heterogeneity. Our firms have three types of workers (cadres, skilled and unskilled) and may explicitly choose from among three distinct contracting regimes (strong form efficiency, labor demand/right to manage, and incentive contracting). We apply the model to a representative sample of 1,097 French enterprises for the period 1978 to 1987. We find that firms with enterprise level agreements appear to implement incentive contracts. This is significant because in France a firm level agreement is voluntary. On the other hand, firms without accords appear to operate on their labor demand curves. That is, they make labor demand decisions using the sector level agreement as the relevant wage rate. Efficient contracts are dominated by the other two contractual possibilities. External wage rates, which we estimate for each group of workers within each firm, appear not to influence employment decisions in the manner predicted by efficient contracts regardless of the accord status of the firm.

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1. Introduction

Throughout the 1980s economists from several countries tried to apply explicit models of contracting to explain wage and employment patterns in firms with unionized workforces. The explicit form of these models has always been derived from basic cooperative/noncooperative bargaining frameworks. In the United States, for example, these models consider the arrangements that give rise to firm-level negotiations; that is, the models explain firm-level employment and negotiated wages using external wage rates, product market conditions, and firm-specific performance measures.[1] The public nature of collective bargaining agreements and company-level financial information, which is a peculiarity of American industrial relations, has permitted micro-economic analysis of those firms with unions. There are no comparable American data for nonunion firms. In Canada, the institutional arrangements are sufficiently similar to the U.S. that equivalent studies have also been attempted with unionized Canadian firms. Recently, studies have appeared using firm-level data in Great Britain that take a comparable approach to wage and employment determination.

All of the models of which we are aware share two common features. First, the researchers have tried to determine which kind of bargaining/negotiation model best describes the wage settlements and employment outcomes in a sample of firms. Thus, the heterogeneity among the firms never gives rise to multiple contracting environments in the estimated models. Second, all workers within a firm are taken to be homogeneous. Thus, the skill composition of the workforce is not allowed to influence the statistically-selected "preferred model." To be sure, both of these characteristics arise more from problems in the data than from the researchers' prior constraints.

Finally, all of the micro-economic analyses mentioned above share a common, and deliberate, modelling decision--the firm never voluntarily chooses to pay more than the negotiated wage rate. In the United States this possibility does not arise in conventional models of collective bargaining, although it is an important element of theories of nonunion wage structures. In contrast, European modelers have treated the problem of "wage drift," which is defined as paying more than the sector-level collective bargaining agreement requires.[2] Wage drift has generally been studied using only macroeconomic data; however, in Great Britain Nickell and Wadhwani (1991) allow an efficiency wage model among the various microeconomic models of employment and wage determination they study.

In this paper we consider firm and worker heterogeneity directly. Our firms have three types of workers (cadres, skilled and unskilled) and may explicitly choose from among three distinct contracting regimes (strong form efficiency, labor demand/right to manage, and incentive contracting). We apply the model to a representative sample of 1,097 French enterprises for the period 1978 to 1987. We find that firms with enterprise level agreements appear to implement incentive contracts. This is significant because in France a firm level agreement is voluntary. On the other hand, firms without accords appear to operate on their labor demand curves, using the sector-level wage rate as the relevant price of labor. That is, they take the sector level agreement as given. Efficient contracts are dominated by the other two possibilities. External wage rates, which we estimate for each group of workers within each firm, appear not to influence employment decisions regardless of the accord status of the firm.

Section 2 describes the three basic models we use for salary and employment determination. Section 3 describes our data

sources and methods. Section 4 presents the estimation results. We conclude in section 5.

2. Efficient Contracting, Labor Demand and Incentive Models

We begin by adopting a standard notation for describing the salary and employment decision-making processes at the enterprise level.

Definitions

x_t ≡ opportunity costs of time for J skill groups in year t (Jx1),

w_t ≡ internal salaries for J skill groups in year t (Jx1),

L_t ≡ full-time equivalent employment in J skill groups during year t (Jx1),

p_t ≡ $\frac{L_t}{\sum_{j=1}^{J} L_{jt}}$, proportion of total employment in each skill group (Jx1),

y_t ≡ factors affecting the product market and the productivity of the J skill groups (Jx1),

$R(L_t, y_t)$ ≡ value-added, revenue net of material costs from employment L_t given conditions y_t,[3]

Ω_t ≡ information set available at time t,

$V(x_t, \Omega_t)$ ≡ total quasi-rents, revenue net of material costs and opportunity costs from employment L_t given information Ω_t,

γ_t ≡ proportion of the quasi-rent per worker that goes to employees in each of the J skill groups during year t (Jx1).

The Efficient Contracting Model (EC)

In an efficient contract (strong form, see Brown and Ashenfelter 1986) the total quasi-rent is maximized over the choice of employment levels given the current information available to the parties. Thus, the employment levels are determined by the solution to the problem:

$$V^0(x_t, \Omega_t) = \max_{\{L_t\}} E\left[R(L_t, y_t) - \sum_{j=1}^{J} x_{jt} L_{jt} \mid \Omega_t\right] \tag{1}$$

The labor demands are functions of the external salaries and the information set, which solve equation (1):

$$L_t^0 = L_t^0(x_t, \Omega_t) \tag{2}$$

The wage settlements can be expressed directly as a function of the maximized quasi-rent per worker:

$$w_{jt}^0 = x_{jt} + \gamma_{jt}^0\left(\frac{V^0(x_t, \Omega_t)}{\sum_{k=1}^{J} L_{kt}^0}\right) \tag{3}$$

Alternatively, the wage settlements can be re-expressed in terms of the value-added per worker:

$$w_{jt}^0 = x_{jt} - \gamma_{jt}^0 x_t' p_t^0 + \gamma_{jt}^0\left(\frac{R(L_t^0, y_t)}{\sum_{k=1}^{J} L_{kt}^0}\right) \tag{4}$$

Either equation (3) or (4) may be used to define the quasi-rent splitting γ_{jt}^0's; however, neither the labor demand equations (2) nor the maximized quasi-rent from (1) depend upon these parameters. On the other hand, since we have not specified the game played to determine γ_{jt}^0, it is possible that both employment and total quasi-rents affect the equilibrium values of these parameters.[4]

The Labor Demand/Right to Manage Model (LD)

In the labor demand model (formally equivalent to the right to manage in this static framework) the wage settlement is specified as w_{jt}^{*}. Given this wage settlement, the firm unilaterally maximizes its profit level to determine the demand for each skill group. The demand equations solve:

$$R^{*}(w_t^{*}, \Omega_t) = \max_{(L_t)} E\left[R(L_t, y_t) - \sum_{j=1}^{J} w_{jt}^{*} L_{jt} \middle| \Omega_t\right] \tag{5}$$

The labor demand equations are:

$$L_t^{*} = L_t^{*}(w_t^{*}, \Omega_t) \tag{6}$$

Without loss of generality, we can use the same definition of the rent splitting parameters, γ_{jt}^{*}, as was used for the efficient contract. That is, we can define the wage settlement as the external salary x_{jt} plus some proportion γ_{jt}^{*} of the theoretical maximum quasi-rent per employee:

$$w_{jt}^{*} = x_{jt} + \gamma_{jt}^{*}\left(\frac{V^{0}(x_t, \Omega_t)}{\sum_{k=1}^{J} L_{kt}^{0}}\right) \tag{7}$$

The equation can be restated as a function of value-added per worker in the same form as equation (4) with γ_{jt}^{*} replacing γ_{jt}^{0}.

Finally, for comparison with the other models, we note that the maximized value of total quasi-rents in the labor demand model is given by:

$$V_t^{*}(x_t, w_t^{*}, \Omega_t) = R^{*}(w_t^{*}, \Omega_t) + (w_t^{*} - x_t)' L_t^{*} \tag{8}$$

The equation (8) for the maximized quasi-rent is only true when all employment demand equations are determined according to equation (6).[5] We have not described the form of the various

models when the different skill groups are managed according to different principles within the same firm. As is well-known, the maximized total quasi-rent from the efficient contract, equation (1), is greater than the total quasi-rent from the labor demand model except when all γ^*_{jt}'s are zero. In contrast with the efficient contract model, both the labor demands equations (6) and the total quasi-rent (8) depend upon the parameters γ^*_{jt}. In addition, since we have not specified the bargaining game, the quasi-rent splitting parameters may depend upon both employment and total quasi-rents.

The Incentive Compensation Model (IC)

In the basic incentive compensation model there are two possible effort levels for each group: effort level H_j, which is the high effort level, and N_j, which is the normal effort level. The utility given by normal effort corresponds to the utility level on the external market. The choice of effort level is made by the firm subject to the usual feasibility and incentive compatibility constraints. Our model is a simple version of Holmström and Milgrom (1990) among many others. To put the model in our notation, let γ_{jt} represent the sensitivity of salaries to the output per employee:

$$w_{jt}=x_{jt}+\gamma_{jt}\left(\frac{R(L_t,y_t)}{\sum_{k=1}^{J}L_{kt}}-x_t'p_t\right) \tag{9}$$

which can be restated as:

$$w_{jt}=x_{jt}-\gamma_{jt}x_t'p_t+\gamma_{jt}\left(\frac{R(L_t,y_t)}{\sum_{k=1}^{J}L_{kt}}\right) \tag{10}$$

Thus, we can interpret γ_{jt} and $x_{jt}-\gamma_{jt}x_t'p_t$ as the slope and intercept, respectively, of the linear function that determines salary given revenue per employee.[6] The levels of employment are endogenous and, in contrast with the negotiated wage models presented above, the parameters γ_{jt} are determined by the firm as a part of the basic maximization problem that determines employment and total quasi-rents.

To pose the model completely, assume that for each skill group the chosen effort level is denoted e_{jt}. The firm's revenue is given by:

$$R(y_t,\Theta)=y_t'L_t-\frac{1}{2}L_t'\Theta L_t \tag{11}$$

where y_t is the vector of revenue shifters and Θ is a JxJ matrix of parameters that do not depend upon either t or the chosen effort level. The revenue function shifters are modelled as:

$$y_t=\mu_t+Ad_t+\epsilon_t \tag{12}$$

where

$$\mu_t=E[y_t\,|\,e_{jt}=0,\ \forall j]$$

$$d_{jt}=\begin{cases}1, if\ e_{jt}=H_j\\ 0, if\ e_{jt}=N_j\end{cases},\ j=1,\ldots J$$

$$\epsilon_t\sim N(0,\Sigma),\ \forall e_{jt}$$

A is lower triangular. Since we have ordered the skill groups from highest (j=1) to lowest (j=J), the form of A means that the effort choice by the highest skill group can affect the marginal productivity of all the groups below, and so on down the

hierarchical structure. In addition, the quadratic term in the revenue function, Θ, is not a function of the employees' effort levels.

The feasibility constraints for effort levels H_j and N_j, respectively, are:

$$CE\left[x_{jt}-\gamma_{jt}x_t'p_t+\gamma_{jt}(y_t'p_t-\frac{1}{2}L_t'\Theta p_t)\,|H_j\right]-H_j > CE\left[x_{jt}\right] \tag{13a}$$

$$CE\left[x_{jt}|N_j\right] = CE\left[x_{jt}\right]= x_{jt},\ \forall j \tag{13b}$$

We assume that the feasibility constraint for effort level H_j, which generates a disutility of H_j, does not bind. On the other hand, the feasibility constraint for effort level N_j, which generates a disutility normalized to zero, binds and is equal to the certainty equivalent of the opportunity cost of time. That is, we assume that the low effort wage rate is the external wage rate.[7] Furthermore, the certainty equivalent of the opportunity cost of time is equal to the external salary itself.

The incentive compatibility constraint for the choice of H_j is:

$$\begin{aligned} &E\left[u(x_{jt}-\gamma_{jt}x_t'p_t+\gamma_{jt}(y_t'p_t-\frac{1}{2}L_t'\Theta p_t))\,|e_{jt}=H_j\right]-H_j \geq \\ &E\left[u(x_{jt}-\gamma_{jt}x_t'p_t+\gamma_{jt}(y_t'p_t-\frac{1}{2}L_t'\Theta p_t))\,|e_{jt}=N_j\right],\ \forall j \end{aligned} \tag{14}$$

The incentive compatibility constraint is always binding if the feasibility constraint is nonbinding.

The certainty equivalent of the utility of consumption (c) is specialized to:

$$CE[c]=E[c]-\frac{r}{2}Var[c]$$

which is the constant absolute risk aversion case with risk aversion parameter r.

With a binding incentive compatibility constraint we have:

$$\begin{aligned} &x_{jt}-\gamma_{jt}x_t'p_t+\gamma_{jt}\left(y(H_j, e_{-jt})'p_t-\frac{1}{2}L_t'\Theta p_t\right) \\ &-x_{jt}+\gamma_{jt}x_t'p_t-\gamma_{jt}\left(y(N_j, e_{-jt})'p_t-\frac{1}{2}L_t'\Theta p_t\right)-\frac{r}{2}p_t'(\Sigma_H-\Sigma_N)p_t=H_j \end{aligned} \tag{15}$$

where

$$y(e_{jt}, e_{-jt})=E[y|e_{jt}, e_{-jt}]$$

and e_{-jt} is the vector of all effort levels except level e_{jt}. Because of the hierarchical structure of A and the assumption that $\Sigma_H = \Sigma_N$ the incentive compatibility constraints specialize to:

$$\gamma_{jt}=\frac{H_j}{\sum_{k=j}^{J}a_{jk}p_{kt}} \tag{16}$$

In particular, this condition implies that the effort decision for one skill group will not depend upon the effort levels chosen for the others.

The interesting case to examine specifically occurs when the firm solves the problem for the high-effort outcome:

$$R^*(x_t, \Omega_t)=\max_{\{L_t, \gamma_t\}}E\left[R(L_t, y_t)-\sum_{j=1}^{J}w_{jt}(x_t, \gamma_t)L_{jt}\,|\,\Omega_t, e_{jt}=H_j, \forall j\right] \tag{17}$$

subject to equations (12), (13) and (14). Equation (17) determines the profits of the firm when an incentive contract is feasible. The resulting maximized total quasi-rent is:

$$V^*(x_t, \Omega_t)=R^*(x_t, \Omega_t)+(w_t(x_t, \gamma_t^*)-x_t)'L_t^* \tag{18}$$

where γ_t^* and L_t^* solve equation (17) above.[8]

Which regime will determine salaries and employment?

In this section we describe the French institutional setting that constrains the process of wage determination. We model this process as a game in extensive form with at least four different players (employer confederations, union confederations, employers and employees). We show that for the simple version of the game (one category of worker) the choice of salary and employment regimes can be modelled using the maximized total quasi-rent functions from the three cases above.

In 1985 86.4 percent of all employees in establishments with more than 10 employees were covered by a collective bargaining agreement ("conventions collectives de branche", see Choffel and Kramarz 1989).[9] These conventions are negotiated at the national, regional or local level between a confederation of unions and a confederation of employers within a broadly defined industry group. The convention would normally cover virtually all employment at the establishments represented by the employer confederation. The Minister of Labor may, and often does, extend a convention collective de branche to cover employees in the same industry even if their employers were not members of the confederation. We interpret this arrangement to mean that the branch-level wage rate for all employees may be the relevant external wage for employers in that industry,[10] although it is not the external wage for employees in that industry because they cannot be assured of continued employment within the same sector. In any case, the maximum of the sector-level wage rate, w_b, and the external wage rate, x, determines the lowest possible wage rate when an establishment is covered by a convention collective de branche. In addition, the national economy has a minimum wage rate, called the SMIC ("salaire minimum interprofessionnel de

croissance"). This minimum wage is revised often and virtually all jobs covered by conventions de branche are paid according to a scale that is indexed by the SMIC. Because this indexation is absolute, not relative, the skill premia in French industries have fallen sharply in the 1980s (Choffel and Kramarz, p. 139). Furthermore, during the period we use in our data analysis, the average worker (ouvrier, qualifié or nonqualifié) earned between 33 percent (in 1978) and 15 percent (in 1987) more than the SMIC. We interpret these facts to mean that the external wage rate for an employee is strongly related to the level of the SMIC.

In addition to the conventions de branche a large and increasing number of firms negotiate with their employees, whether or not they are represented by one or more unions (syndicats), individual agreements (accords d'entreprise) covering only the employees at their establishments. This process, formalized by the Lois Auroux (passed in 1982), accelerated in the late 1980s; however, many of these accords ratified practices that were already in place at the beginning of the decade. An important feature of the accords d'entreprise is that they are voluntary agreements and, therefore, must depend upon a gain to trade that is specific to the enterprise and its workforce.

These elements suggest the following extensive form game illustrated in Figure 1. First, a bargaining game is played between confederations of employers and employees that sets wage rates for all employers in the sector, w_b. This negotiated wage rate cannot depend upon firm-specific information, although it may depend upon sector-level profitability. The resulting bargaining power, $\gamma_{jt}^{\bullet}$, for the employees, therefore, is predetermined at the sector-level and may depend on the distribution of enterprise

total quasi-rents within the sector as well as other factors external to the firm.

At the firm level, the compensation system must respect the convention de branche; however, there are two possibilities for an enterprise accord in which the resulting wage rates are greater than those in the convention. In the first case, the employees have bargaining power γ^0_{jt} greater than γ^*_{jt}, which means that on their own they could negotiate a wage rate superior to the convention. In this case we model the negotiation as a strong form efficient contract. On the other hand, the employer may be able to induce greater productivity using a γ^+_{jt} greater than γ^*_{jt} as a part of an incentive compensation system. In this second case, we model the negotiation outcome as an incentive contract.

To state the choice problem precisely, in order to supplant the convention de branche with a different system the firm must benefit (it makes the first offer) and the employees must be at least as well off as under the convention. For the case of a single skill group, we can summarize the firm, employee and total payoffs as follows:

$$\begin{array}{lccc} & LD & EC & IC \\ Firm & \left(1-\frac{\gamma^*_t}{2}\right)^2 V^0 & (1-\gamma^0_t)\,V^0 & (1-\gamma^+_t)\,V^+ \\ Employees & \gamma^*_t\left(1-\frac{\gamma^*_t}{2}\right)V^0 & \gamma^0_t V^0 & \gamma^+_t V^+ \\ Total & \left(1-\frac{\gamma^{*2}_t}{4}\right)V^0 & V^0 & V^+ \end{array} \tag{19}$$

Thus, in order for both parties to prefer the efficient contract over the labor demand model the following condition must hold:

$$\left(1-\frac{\gamma_t^*}{2}\right)^2 < 1-\gamma_t^0 < \left(1-\frac{\gamma_t^*}{2}\right)^2 + \frac{\gamma_t^{*2}}{4} \tag{20}$$

However, for condition (20) to hold γ_t^0 must be less than γ_t^*, which implies that the efficient contract is only possible when the wage rate w_t^0 is less than the branch agreement rate w_t^* (implying that employment L_t^0 is greater than L_t^*). In France efficient contracting is always dominated by labor demand when the conventions collectives de branche are binding. Since 93 percent of employees are covered by a convention collective, efficient contracting is essentially always dominated by labor demand.

To determine when incentive contracting will dominate labor demand, we use the solution to the maximized total quasi-rents in the two cases assuming the same quadratic functional form (equation 11) for revenue and continuing to maintain the single factor assumption. In the labor demand case the employer's part of the value function specializes to:

$$\left(1-\frac{\gamma_t^*}{2}\right)^2 V^0(x_t, \Omega_t) = \left(1-\frac{\gamma_t^*}{2}\right)^2 \frac{\theta}{2}\left(\frac{y(N)-x_t}{\theta}\right)^2 \tag{21}$$

While in the incentive case it becomes:

$$(1-\gamma_t^0) V^*(x_t, \Omega_t) = \left(1-\frac{H}{y(H)-y(N)}\right)\frac{\theta}{2}\left(\frac{y(H)-x_t}{\theta}\right)^2 \tag{22}$$

where the functions y(H) and y(N), defined in conjunction with equation (15) above, have been specialized to the case of one skill group. For IC to be preferred to LD equation (22) must be

greater than equation (21). When this is true, the employees will automatically be better off because the feasibility constraint (13a) is nonbinding.

3. Data sources and methods

In this section we describe the basic French microdata sources. Because of the French reliance on data reported by employers (in contrast to the much more intensive American use of data reported by individuals or unions) and because the basic surveys are exhaustive rather than probability samples, we have used enterprise level information from four different sources without significant loss of representation when the individual surveys were merged. In this section we describe the data and our methods.

BIC-EAE Basic financial information on French enterprises is collected in the form of balance sheets, income statements and flow of funds statements. In contrast to generally accepted accounting practices in the United States and within the European Community, the French enterprise data are collected using an accounting system that is very similar to national income and product accounts. Balance sheet items are recorded at historical cost; however, income statement items are recorded at actual prices during the fiscal year. Thus, for example, total salaries paid, taxes and material costs are all available at the enterprise level. In addition, many accounting results that are not reported at an enterprise level in traditional accounting data are available--for example, the proportion of sales revenue due to exports and the total cost of employment --salaries, benefits and "cotisation" (payroll taxes) are included.

The first of the sources is the BIC "Bénéfices industriels et commerciaux" [Industrial and commercial business income] (see INSEE, 1983), which is a complete set of financial statistics for

the enterprise. The second of these sources is the EAE "Enquête annuelle d'entreprise" [Annual survey of enterprises] (see INSEE, 1983), which is a detailed annual survey of tax payments, employment, investments and business structure. The EAE also includes some establishment level data for each establishment in the enterprise. Enterprises are linked using their SIREN "Système informatique pour le répertoire des entreprises" [Enterprise identification number] and establishments are linked using their SIRET [Establishment identification number] through SIRENE "Système informatique pour le répertoire des entreprises et des établissements". The SIRET numbers of the establishments of a given enterprise can all be related to the SIREN number of the enterprise.

To facilitate statistical analyses researchers at INSEE have constructed a sample of enterprises from the BIC-EAE. The basic sampling plan is described in a series of technical memos (see, in particular INSEE 1989, 1990a and 1990e). The sample covers some 12,000 entreprises with 20 or more employees in all sectors except for agriculture and non-merchant services for the years from 1978 to 1987 (with annual updates at a three year lag). The sample was constructed to be representative of all enterprises in any year (but with unequal sampling weights) and to allow longitudinal analysis of the sampled enterprises. INSEE accomplished this complex objective by sampling at known rates from all enterprises that existed in the reference year 1986. All of the years of data for a sampled enterprise in the reference year were included in the sample. Then, a complementary sample (at the same basic sampling rates) was taken for enterprises that existed in 1985 but not in 1986. All of the years of data for a complementary sampled enterprise were included in the sample. This process continued backwards until 1978 and forwards to 1987. Any enterprise that

existed during the period from 1978 to 1987 was, thus, at risk only once for inclusion in the sample and the probability of selection was controlled by INSEE.

The basic enterprise sample (l'échantillon d'entreprises, INSEE 1989) was further refined into a panel sample of enterprises (Panel de 6 000 entreprises, INSEE 1990e) that consists of 2,500 enterprises that existed for all ten years (l'échantillon cylindré) and an additional 3,500 enterprises that existed for some part of that period (l'échantillon complémentaire). Detailed cross-year consistency checks and data editing were performed on the panel sample.

Either the basic enterprise sample or the panel enterprise sample can be used with data from the BIC or the EAE through the use of a control file of cross-year identifiers that relate the enterprise/year combinations in the sample to the SIREN identifiers used on the basic surveys. To facilitate use of the BIC and EAE data, INSEE has constructed extracts from these surveys. The BIC extract, which consists of about 250 data items, is described in INSEE 1990c and the EAE extract, which consists of 620 data items, is described in INSEE 1990b. The concordance problems between data items drawn from different forms of the constituent surveys are partially resolved in the supporting documents.

ESE The second source of enterprise level data is the ESE "Enquête sur la structure des emplois" [Survey of the structure of employment] (INSEE 1987), which is an annual census (except 1982) of employment at establishments larger than 10 employees (15 employees in agriculture) that includes information on the industry of the establishment and the number of workers in each occupation in its workforce by sex. This survey includes very

detailed occupational information at the establishment level that we aggregated to the enterprise level using the SIREN.

We aggregated the basic 350 occupations, job descriptions using the Professions et Catégories Socio-professionnelles (PCS) nomenclature, into three categories: ingénieurs, cadres and techniciens (CET, below); ouvriers and employés qualifiés (skilled, below); and ouvriers and employés non-qualifiés (unskilled, below).[11]

A major change in the occupational coding scheme occurred in 1984, which would have limited comparability with earlier years. To correct for this change we used a detailed bridge developed at INSEE to reclassify the old CS codes (PCS at the 2-digit level) into the new ones (see Seys (1986)). Moreover, as differences remained because of the change in concepts, the ratio obtained by dividing the structure by skill-level in 1984 by the one in 1983 was applied to the previous years (1978 to 1981). For 1982 (all enterprises) and any other years with missing occupational structure data (selected enterprises), we interpolated or extrapolated as necessary.

DAS-DADS The DADS (or DAS) "Déclarations annuelles des données sociales" [Annual declaration of social data] (Blouard et al. 1989), which is an exhaustive survey (since 1984, establishments with 10 or more employees before) of all employees at French establishments, including household employees and small establishments in all sectors, that contains information on remuneration, taxes paid for various social benefits, qualifications, occupation, age and duration of employment (within the year) for each employee and information on employment levels and gross salaries for each establishment. Because the DADS is a census of employees, conducted annually (except 1981 and 1983) and because identifiers exist for both the individual (NNI, "Numéro

national d'identité" [National identity number]) and the economic entity (SIREN and SIRET), data can be analyzed at the individual, establishment and enterprise level. DADS data have been put into panel form by NNI in the Panel DAS (Lollivier, undated). This file contains historical information on over 800,000 French workers (four percent of the workforce) for the years 1967 to 1987. The employer is identified in this file beginning in 1976.

We used the net salary, after deductions for government-mandated health insurance, retirement plans, unemployment insurance, and miscellaneous other programs (cotisation salariale) for individuals classified into the same three occupational groups described above based on the PCS at the 2-digit level. Only full time, full year employees were used. We calculated the average full time, full year salary by skill level for each enterprise in the echantillon d'entreprises using all available employees for all available years. For the missing years (1981 and 1983) and, in general, when an average salary for one or more skill groups was missing for a particular enterprise, we interpolated the value using previous years, future years and sectorial averages at the forty industry group level. In all cases the average salaries by skill group were inflated or deflated to make the overall average salary estimated from the DAS by enterprise equal to the average reported by the enterprises in the BIC-EAE.

ESS To estimate the external salary and to determine the coverage by conventions collectives and accord d'entreprise, we used the "Enquête sur la structure des salaires" [Salary structure survey] for 1986 (see INSEE 1990). This survey of 16,000 establishments (large establishments oversampled) and 600,000 employees contains information on the pay structure and qualifications of all employees employed during the month of

October. The employer data includes coverage by conventions collectives, coverage by accords d'entreprise and enterprise identifiers (SIREN). For 56 percent of the echantillon d'entreprises firms we can establish the existence/nonexistence of an accord d'entreprise. These firms are larger on average than the typical enterprise in the echantillon d'entreprises. In all cases, when we analyzed firms conditional on their collectively negotiated pay systems, we assumed that the status in 1986 (from the ESS) was true in all years of the estimation period (1982-87).

To compute the external salary we combined data from the ESS with the national SMIC. We estimated the relationship between the log of full time salary in October 1986 (for full month workers only) and the employee's age, qualification professionnelle,[12] département (where employed) and sex. We computed the predicted value from this regression for each of the 575,000 employees. Using the three skill groups described above and the industry at the 4-digit level (APE niveau 600), we computed the average predicted log salary for each skill group within each detailed industry. The tenth percentile was selected as the base index (value=1.00 in 1986). All remaining groups were rescaled as a ratio to this base group. The external salary was defined as the SMIC (monthly, net of cotisation salariale) times the appropriate skill group index for the detailed industry. The external salaries were merged into the exhantillon d'entreprises by 4-digit industry.

Analysis Sample All data were merged into the basic echantillon d'entreprises. From this sample we selected manufacturing firms with complete data from 1978 to 1987 who had employees in each of the three skill groups. Our analysis sample consisted of 1,097 enterprises, each of which had 10 years of data. The summary distribution by industry and other statistics are shown in Table

1. Many of our analyses were conducted using only the firms with accord d'entreprise versus those known not to have such an accord. There were 273 firms with accords and 338 firms without. Summary statistics for these firms are also shown in Table 1.

4. Estimation results

We begin by characterizing the firms with enterprise accords as compared to those without accords. Table 2 shows these comparisons as regression-adjusted differences in the mean values of a variety of size, production, pay and profitability indicators. Firms with accords are larger, have large total quasi-rents, and are more profitable for both employers and employees. These statements are also true on a per worker basis.

Since we have no reason to expect efficient contracting and every reason to expect incentive contracting in the case of enterprise accords, these results indicate that the data, adjusted for sector and year, could well be consistent with such a pay system. In particular, the portion of the real quasi-rent per worker that accrues to the employees is 4,200 F (1980) for firms with enterprise accords (significantly different from the reference group--accord status unknown). For firms without such agreements, the proportion of the real quasi-rent going to the workers in only 600 F (1980), which is not significantly different from the reference group.

We next examine differences in the labor demand equations for firms with and without enterprise accords. Table 3 shows a conventional log linear labor demand system estimated for all workers (columns labelled All) and for each skill group separately. Table 4 shows the same demand systems estimated using the external wage rate in place of the actual wage rate. Tables 5 and 6 show the log linear labor demand systems restricting the wage and capital price coefficients to be equal and opposite.

Tables 5 and 6 use internal and external wage rates, respectively. All four tables were estimated for the years 1982 to 1987 using instrumental variable methods with employment levels, actual salaries, and real production endogenous. The external salaries and the price of capital are exogenous. All equations include indicators for the year and industry (NAP level 40, roughly 2-digit SIC) and were estimated with instrumental variables.[13]

Clearly the labor demand systems using the internal wage rates provide a better statistical and economic summary of the data, particularly for the firms with enterprise accords but also for those without accord. First, it is important to note that the systems estimated for the firms with accords and with aggregate employment levels (columns All in four tables) are the only estimated equations that are directly comparable to American, Canadian and British studies that have attempted to model employment demand in a variety of contracting regimes. For this case, the labor demand equations (unrestricted or unrestricted) are very similar whether we use internal or external wage rates. In the unrestricted case, the estimated substitution effects are much larger than one usually expects (the implied elasticity of substitution is around 5). The demand equations for all employees in firms without accords also have large estimated elasticities, which are nevertheless more reasonable, however, the capital price coefficient has the wrong sign in this unrestricted case.

The disaggregated labor demand equations are uniformly more reasonable when we use the internal salary (compare the unrestricted estimates of Table 3 with Table 4 and the restricted estimates of Table 5 with Table 6). Implied elasticities of substitution increase going from CET to unskilled workers. In the unrestricted estimates, the capital price elasticities have the correct sign for firms with accords (although the elasticity is

rather large in the unskilled equation). For firms without accords the Table 3 results show very reasonable own-wage elasticities but the capital price elasticities are negative. However, the restricted estimates in Table 5 are not significantly different from the unrestricted estimates in Table 3. Thus we conclude that the restricted labor demand system using internal wage rates is an acceptable statistical description of the disaggregated employment decisions of the firms as compared with the unrestricted system using internal wages and any of the systems using external wages.

Table 7 estimates the average relation between the log internal salary, the log external salary and the log real value-added per worker.[14] Because of the logarithmic specification the coefficient on log real value-added per worker is an underestimate of γ, the coefficient on the log real external salary (which is the average external salary of all skill groups) is an overestimate of $-\gamma$, and the coefficient on log own external salary should be less than unity.[15] On average, the employees receive 29 percent of the quasi-rents-per-employee (see Table 1). The estimates in Table 7 for All workers are 25 percent (with accord) and 39 percent (without accord), respectively. The logarithmic form of the wage determination equation, therefore, is a reasonable specification for the aggregate wage rate in firms with accords but over-estimates worker's share in the nonaccord case. When we disaggregate by skill group, the equation works well for unskilled workers and reasonably well for skilled workers. However, it is clear that CET salaries are determined without much reference to what we have estimated as the external salary. Since an important component of the external salary we used is the SMIC, we believe that this result shows that the SMIC is highly

correlated with the changes in external wage rates for unskilled and (probably) for skilled workers but is largely unrelated to the temporal movements in the external wage of CET employees.

Table 8 is a direct test of the incentive compensation model when the incentive compatibility constraint (15) is binding. The table shows the relation between the inverse γ's and the proportion of workers in each skill group (using the same instruments as in the preceding tables). The coefficients on the proportions represent the incremental productivity from an incentive contract (relative to the disutility of effort) compared to the normal effort level. Therefore, they should be positive. In addition, if the hypothesized structure of the matrix A is correct, in the CET equation the CET coefficient will be larger than the other two; similarly, in the skilled equation the skilled coefficient will be larger than the unskilled. Recall that these coefficients correspond to the effect of one group's effort level on the marginal productivity of the other groups. In the firms with accords, the estimated coefficients confirm all these hypotheses. In the firms without accords, the off-diagonal elements of A are all negative or zero and the relative magnitudes of the coefficients are lower than the estimates for firms with accords. The incentive contracting model, therefore, is clearly consistent in the case where firms and workers sign an explicit accord. However, in the nonaccord case the evidence for the incentive contracting is mixed.

5. Conclusion

We have considered the problem of wage and employment determination at the firm level using a model that allows for heterogeneity of the workers (in skill groups and according to their external opportunities) and of the firms (choice of

contracting regime). As applied to the institutional setting in France, one regime--efficient contracting--appears to be theoretically dominated by either labor demand or incentive compensation systems. This somewhat unusual result (from an American viewpoint, but not from a European one) stems from sector-level bargaining that precedes a firm's wage and employment decisions. Sector-level bargaining appears to preclude the use of a lower firm wage and a higher firm employment level as a means of achieving an efficient contract. Thus, French firms must find a productivity advantage from salary systems that offer more than the sector-level wage rates.

In our empirical analysis the firm level heterogeneity is measured using accords d'entreprise as an indicator of different wage/employment determination regimes. We find that a restricted system of disaggregated static labor demand equations using internal wage rates adequately describes the employment outcomes in both regimes. Using external wage rates in the labor demand equations, particularly in the disaggregated case, yields employment equations that are not as well-determined and often wrong-signed. In contrast, our results for the aggregate of all employees show that either the internal or external wage rate can be used in the labor demand equation without much difference in the estimated elasticities. Furthermore, the differences in the structure of salary determination between firms with and without accords are not particularly striking for the aggregate employment models. Finally, our direct test of the incentive compensation model also yields evidence that firms with accords benefit from a productivity gain related to the structure of their compensation systems. Thus, both dimensions of heterogeneity (workers and firms) are important in our statistical tests of the competing models.

Our paper leaves unresolved several potentially important questions. First, we have not derived a specific form for the disaggregated employment decisions in the incentive contracting model. Thus, it is difficult to contrast incentive contracting with the labor demand model. Second, we have not modelled the choice of contracting regime when the firm is allowed to use several systems at the same time (e.g. incentives for some, labor demand for others). Third, we have not used any dynamics in our models. In a dynamic framework, it is possible that the dominance of labor demand and incentive contracts with respect to efficient contracts disappears. Moreover, we expect the quality of the labor demand equations and our ability to differentiate regimes will improve when we allow for explicit dynamics.

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End Notes

1. For the U.S. see Brown and Ashenfelter (1986), Card (1986, 1991), MaCurdy and Pencavel (1986) and Abowd (1989). For Canada, see Christofides (1990), Christofides and Oswald (1991), Abowd and Lemieux (1990, 1991). For Great Britain see Nickell and Wadhwani (1988, 1991), Machin and Stewart (1990), Machin, Manning and Meghir (1991).

2. Finland: Tyrvaïnen (1991), Italy: Lucifora (1991), Netherlands: Lever (1991), Norway: Holden (1989).

3. We have written all models as one-period static decision problems. Equivalent models exist in present value form when there are no capital costs associated with changes in the employment levels. Our solutions, however, ignore real dynamics (e.g. adjustment costs).

4. In an efficient contract the resulting wealth of the union is $(w_t^0 - x_t)'L_t$ and the wealth of the firm is $R(L_t^0, y_t) - w_t^{0\prime}L_t^0$, which, in the case of a single skill group, can be shown to be $\gamma^0 V^0$ and $(1-\gamma^0)V^0$, respectively.

5. In the labor demand case the union's wealth is $(w_t^* - x_t)'L_t^*$ and the firm's wealth is $R^*(w_t^*, \Omega_t)$. In the case of a single skill group it can be shown that these are equal to $\gamma^*\left(1-\frac{\gamma^*}{2}\right)V^0$ and $\left(1-\frac{\gamma^*}{2}\right)^2 V^0$, respectively. Note that these wealth values have been expressed with respect to V^0, the maximized quasi-rent in the efficient contract case.

6. See Holmström and Milgrom (1987) for a justification of the restriction to linear compensation functions.

7. Without loss of generality the slope coefficient, γ, in the low effort state has been set equal to zero. That is, the wage paid in the low effort state is the external wage rate and does not, therefore, depend upon the performance of the firm. Hence, the choice of an effort level N by the firm is equivalent to choosing one of the other two contracting possibilities.

8. In the special case of a single skill group it can be shown that the union's wealth is $\gamma^{*}V^{*}$ and the firm's wealth is $(1-\gamma^{*})V^{*}$, where V^{*} is given by equation (18).

9. The figure is 92.5 percent for manufacturing industries, which are the only ones used in our empirical models. Only 1.7 percent of manufacturing workers are not covered by either a convention collective de branche or an enterprise level agreement.

10. We presume that the negotiated wage rate is greater than the external wage.

11. All females in PCS categories corresponding to blue collar occupations (ouvriers qualifiés) were grouped with the non-skilled occupations (ouvriers non-qualifiés) because on average the level of employer-reported qualification for these women substantially exceeds their self-reports (Cezard 1979).

12. This variable is created from classifications within conventions collectives at seven broad levels (ouvriers, employés, agents de maîtrise, techniciens, ingénieurs et cadres, apprentis, and jeunes en formation) which correspond to different categories used in French social legislation. Within each of these classifications the level of qualification was given on a scale of 1 to 7. The interaction contains 19 distinct qualification levels

which, although not exactly education and specialty, are the closest we could get to data on schooling.

13. The estimates are sensitive to the choice of instruments. In particular, the results are very different if lagged endogenous variables are included in levels, rather than as differences. We interpret this to mean that there is a strong possibility that the error terms in the demand systems include a firm-specific effect. The estimates in Tables 3 to 8 are consistent in this case (because all variables that might include the firm-specific effect enter as differences in the instrument list). We cannot estimate the equation system in first differences because all of the temporal variability in the external wage rates comes from the SMIC and not from changes in the underlying skill composition of the three employee groups. This problem occurs because only one year of the ESS was available for estimating the external wage rate.

14. See Abowd and Lemieux (1991) for a discussion of the logarithmic approximation of the wage settlement function.

15. For the equations in the All column, the coefficient on log real value added per worker is an under-estimate of γ, while the coefficient on log real external salary is an over-estimate of $1-\gamma$.

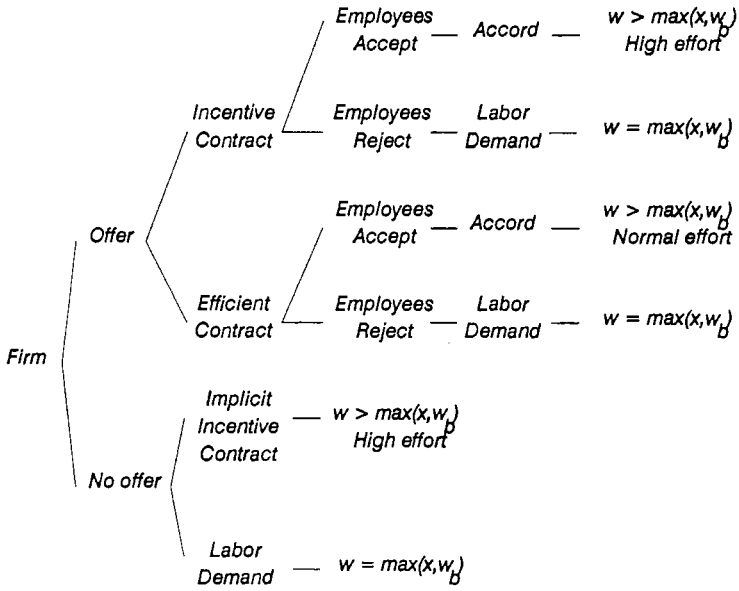

Figure 1

Choice of salary and effort regime

Table 1

Summary Statistics Contrasting All French Manufacturing Enterprises, Those with Enterprise Accords, and Those Without Accords (1978 to 1987)

	All		With accord		Without accord	
Variable	Mean	(StD)	Mean	(StD)	Mean	(StD)
Fulltime equivalent employees (1,000s)	0.920	(3.98)	2.432	(7.72)	0.657	(0.82)
Cadres, engineers and technicians	0.247	(1.12)	0.701	(2.17)	0.151	(0.25)
Skilled & administrative workers	0.384	(1.56)	1.021	(2.99)	0.268	(0.37)
Nonskilled workers	0.289	(1.53)	0.711	(2.99)	0.238	(0.34)
Proportion of workforce	1.000	na	1.000	na	1.000	na
Cadres, engineers and technicians	0.214	(0.13)	0.240	(0.13)	0.205	(0.12)
Skilled & administrative workers	0.422	(0.18)	0.430	(0.16)	0.411	(0.17)
Nonskilled workers	0.364	(0.22)	0.330	(0.20)	0.384	(0.22)
Real net salary (1,000 F 1980)	76.6	(25.7)	83.5	(28.4)	74.2	(23.1)
Cadres, engineers and technicians	124.9	(49.8)	130.4	(49.2)	121.6	(46.0)
Skilled & administrative workers	70.0	(24.2)	74.9	(25.1)	68.1	(20.9)
Nonskilled workers	57.8	(20.1)	62.2	(21.3)	56.8	(18.4)
Real external salary (1,000 F 1980)	46.8	(11.8)	48.2	(12.2)	46.4	(11.6)
Cadres, engineers and technicians	72.4	(15.6)	72.6	(15.7)	72.4	(15.5)
Skilled & administrative workers	43.2	(9.2)	43.5	(9.3)	43.0	(9.1)
Nonskilled workers	35.6	(13.0)	36.0	(7.7)	35.6	(7.6)
Real production (mill. F 1980))	459.9	(2,460)	1358.0	(4792)	250.6	(417)
Total quasi-rent	111.4	(473.4)	337.6	(1012)	62.1	(90)
Total quasi-rents to firm	82.0	(373.6)	252.2	(825.0)	44.6	(65.7)
Total quasi-rents to employees	29.4	(133.6)	85.5	(269.6)	17.5	(26.5)
Total q-r. per employee (1,000 F 1980)	99.1	(97.1)	124.4	(180.9)	85.4	(45.5)
Share q-r. per employee to employees	0.291	(0.141)	0.302	(0.142)	0.288	(0.127)
To cadres, engineers and technicians	0.550	(0.570)	0.540	(0.549)	0.528	(0.452)
To skilled & administrative workers	0.272	(0.225)	0.278	(0.190)	0.267	(0.187)
To nonskilled workers	0.214	(0.158)	0.225	(0.159)	0.220	(0.141)
Industry Group	100.0%	na	100.0%	na	100.0%	na
T02 Meat and milk industries	3.8%		2.2%		2.4%	
T03 Other agricultural and food	6.2%		5.9%		5.6%	
T05 Petroleum and natural gas	0.5%		1.5%		0.0%	
T06 Prod. electricity, gas and oil	0.4%		1.1%		0.3%	
T07 Prod. minerals, ferrous metals	1.4%		2.8%		2.1%	
T08 Prod. minerals, nonferrous	0.9%		2.3%		0.8%	
T09 Construction materials	4.5%		8.8%		3.3%	
T10 Glass industries	1.3%		3.6%		1.2%	
T11 Basic chemicals, artif. fibers	2.0%		2.2%		1.5%	
T12 Other chemicals, pharmaceuticals	5.2%		8.2%		2.7%	
T13 Foundries, fabricated metals	13.1%		9.2%		13.6%	
T14 Mechanical equipment	12.8%		8.1%		12.7%	
T15 Electrical and electronic equip.	8.3%		7.9%		10.4%	
T16 Transportation equipment, land	4.3%		6.1%		4.9%	
T17 Trans. equip. sea and air	1.6%		2.5%		1.8%	
T18 Textiles and apparel	12.1%		9.2%		12.6%	
T19 Shoes and leather products	3.7%		2.5%		5.2%	
T20 Wood products, misc. industries	6.4%		3.7%		6.8%	
T21 Paper products	3.7%		5.2%		4.0%	
T22 Printing and publishing	3.6%		2.6%		3.0%	
T23 Rubber and plastic industries	4.3%		4.6%		5.4%	
Number of enterprises	1097		273		338	
Number of years per enterprise	10		10		10	

Sources: INSEE, Echantillon d'entreprises, BIC-EAE, ESE, ESS, DAS-DADS.

Table 2

Regression Adjusted Differences in Average Characteristics for Enterprises with and without Accords as Compared to Enterprises with Unknown Status

Dependent variable	With accord Coeff. (St.Err.)	Without accord Coeff. (St.Err.)
Total real production (mill. F 1980)	956.1 (154.3)	170.9 (139.9)
Total real quasi-rents (mill. F 1980)	241.5 (31.4)	40.5 (28.4)
Total real quasi-rents to the firm (mill. F 1980)	172.0 (22.4)	33.1 (56.2)
Total real quasi-rents to employees (mill. F 1980)	69.6 (10.4)	7.5 (9.4)
Real production per employee (1,000 F 1980)	55.5 (19.5)	12.5 (17.7)
Real quasi-rent per employee (1,000 F 1980)	19.0 (4.5)	4.4 (4.0)
Real QR/L part to the firm (1,000 F 1980)	14.8 (4.3)	3.8 (3.9)
Real QR/L part to the employee (1,000 F 1980)	4.2 (0.8)	0.6 (0.8)
Total full time equivalent employees (1,000 F 1980)	2.0 (0.3)	0.3 (0.3)
Average real salary (1,000 F 1980)	6.2 (1.1)	0.9 (1.0)
Average external wage (1,000 F 1980)	1.1 (0.3)	0.2 (0.3)
γ: full time equivalent employees	0.020 (0.008)	0.001 (0.008)

Notes:

1. Coefficients reported are relative to enterprises with unknown accord status. The regression includes indicators for year (1979-87) and sector (APE niveau 40, approx. 2-digit SIC). There are 1,097 enterprises for 10 years each.

Sources: INSEE: Echantillon d'entreprises, BIC-EAE, ESE, ESS, DAS-DADS.

Table 3

Unrestricted Linear Labor Demand Systems for Enterprises with Accord and without Accord Using the Measured Real Wage Rates as the Price of Labor

	With Accord					Without Accord				
Variable	Mean (St.D.)	All Coef. (St.E.)	CET Coef. (St.E.)	Skilled Coef. (St.E.)	Non-skld Coef. (St.E.)	Mean (St.D.)	All Coef. (St.E.)	CET Coef. (St.E.)	Skilled Coef. (St.E.)	Non-skld Coef. (St.E.)
Log total FTE employment	6.652 (1.336)	dep.				5.899 (1.101)	dep.			
Log CET employment	5.139 (1.593)		dep.			4.221 (1.325)		dep.		
Log skilled employment	5.729 (1.468)			dep.		4.917 (1.199)			dep.	
Log unskilled employment	5.179 (1.427)				dep.	4.616 (1.417)				dep.
Log real salary	11.153 (0.248)	-1.447 (0.056)				11.057 (0.217)	-0.908 (0.047)			
Log CET real salary	11.576 (0.309)		-0.245 (0.041)			11.509 (0.310)		-0.180 (0.040)		
Log skilled real salary	11.043 (0.258)			-0.482 (0.064)		10.943 (0.257)			-0.296 (0.047)	
Log unskilled real salary	10.857 (0.283)				-1.182 (0.106)	10.773 (0.259)				-0.540 (0.088)
Log real price of capital	-0.012 (0.063)	1.385 (0.189)	0.069 (0.254)	0.428 (0.297)	2.128 (0.509)	-0.011 (0.047)	-0.123 (0.287)	-0.765 (0.467)	-0.827 (0.432)	-0.844 (0.816)
Log real production	12.548 (1.612)	0.924 (0.007)	0.948 (0.008)	0.882 (0.010)	0.721 (0.018)	11.603 (1.345)	0.880 (0.006)	0.918 (0.010)	0.866 (0.009)	0.803 (0.018)
Standard error of equation		0.326	0.449	0.521	0.896		0.308	0.507	0.470	0.888
R-squared		0.942	0.922	0.876	0.612		0.923	0.855	0.849	0.613

Notes:

1. The sample size for the With Accord group is 1,638 and each equation has 1,610 error degrees of freedom. The sample size for the Without Accord group is 2,028 and each equation has 2,000 error degrees of freedom. All equations contain an intercept, year indicators (1983 to 1987) and industry indicators (APE niveau 40, approx. 2-digit SIC). The equations are estimated for the years 1982 to 1987.

2. The instrumental variables were: log real external salaries (CET, skilled, unskilled) contemporaneous and two lags; log real external salary (enterprise average, differenced, lags 2 and 3); log real internal salaries (average, CET, skilled, unskilled, differenced, lags 2 and 3); log real production (differenced, lags 2 and 3); value-added as a percent of production (differenced, lags 1, 2 and 3); exports as a percentage of sales (differenced, lags 1, 2 and 3); log total employment (differenced, lags 2 and 3); log real capital stock (differenced, lags 2 and 3); log real value-added (differenced, lags 2 and 3); log price of capital (contemporaneous, lags 1, 2 and 3); industry indicators (19); year indicators (5).

Sources: INSEE: Echantillon d'entreprises, BIC-EAE, ESE, ESS, DAS-DADS.

Table 4

Unrestricted Linear Labor Demand Systems for Enterprises with Accord and without Accord Using the External Real Wage Rates as the Price of Labor

	With Accord					Without Accord				
Variable	Mean (St.D.)	All Coef. (St.E.)	CET Coef. (St.E.)	Skilled Coef. (St.E.)	Non-skld Coef. (St.E.)	Mean (St.D.)	All Coef. (St.E.)	CET Coef. (St.E.)	Skilled Coef. (St.E.)	Non-skld Coef. (St.E.)
Log total FTE employment	6.652 (1.338)	dep.				5.899 (1.101)	dep.			
Log CET employment	5.139 (1.593)		dep.			4.221 (1.325)		dep.		
Log skilled employment	5.729 (1.468)			dep.		4.917 (1.199)			dep.	
Log unskilled employment	5.179 (1.427)				dep.	4.516 (1.417)				dep.
Log real external salary	10.637 (0.138)	-1.782 (0.115)				10.599 (0.127)	-0.841 (0.089)			
Log CET real external salary	11.045 (0.084)		0.166 (0.263)			11.045 (0.068)		0.717 (0.290)		
Log skilled real external salary	10.535 (0.078)			1.462 (0.602)		10.525 (0.062)			2.786 (0.480)	
Log unskilled real external salary	10.346 (0.081)				-9.164 (0.106)	10.335 (0.066)				-4.184 (0.727)
Log real price of capital	-0.012 (0.063)	1.749 (0.229)	-0.325 (0.361)	-1.475 (0.664)	10.137 (0.938)	-0.011 (0.047)	-0.231 (0.314)	-1.675 (0.546)	-2.864 (0.646)	2.877 (1.089)
Log real production	12.548 (1.612)	0.859 (0.007)	0.938 (0.008)	0.845 (0.010)	0.697 (0.018)	11.603 (1.345)	0.842 (0.006)	0.909 (0.010)	0.835 (0.009)	0.793 (0.017)
Standard error of equation		0.361	0.454	0.529	0.895		0.328	0.509	0.470	0.889
R-squared		0.928	0.920	0.872	0.613		0.912	0.854	0.848	0.612

Notes:

1. The sample size for the With Accord group is 1,638 and each equation has 1,610 error degrees of freedom. The sample size for the Without Accord group is 2,028 and each equation has 2,000 error degrees of freedom. All equations contain an intercept, year indicators (1983 to 1987) and industry indicators (APE niveau 40, approx. 2-digit SIC). The equations are estimated for the years 1982 to 1987.

2. The instrumental variables were: log real external salaries (CET, skilled, unskilled) contemporaneous and two lags; log real external salary (enterprise average, differenced, lags 2 and 3); log real internal salaries (average, CET, skilled, unskilled, differenced, lags 2 and 3); log real production (differenced, lags 2 and 3); value-added as a percent of production (differenced, lags 1, 2 and 3); exports as a percentage of sales (differenced, lags 1, 2 and 3); log total employment (differenced, lags 2 and 3); log real capital stock (differenced, lags 2 and 3); log real value-added (differenced, lags 2 and 3); log price of capital (contemporaneous, lags 1, 2 and 3); industry indicators (19); year indicators (5).

Sources: INSEE: Echantillon d'entreprises, BIC-EAE, ESE, ESS, DAS-DADS.

Table 5

Restricted Linear Labor Demand Systems for Enterprises with Accord and without Accord Using the Measured Real Wage Rates as the Price of Labor

	With Accord					Without Accord				
Variable	Mean (St.D.)	All Coef. (St.E.)	CET Coef. (St.E.)	Skilled Coef. (St.E.)	Non-skld Coef. (St.E.)	Mean (St.D.)	All Coef. (St.E.)	CET Coef. (St.E.)	Skilled Coef. (St.E.)	Non-skld Coef. (St.E.)
Log total FTE employment	6.652 (1.338)	dep.				5.899 (1.101)	dep.			
Log CET employment	5.139 (1.593)		dep.			4.221 (1.325)		dep.		
Log skilled employment	5.729 (1.468)			dep.		4.917 (1.199)			dep.	
Log unskilled employment	5.179 (1.427)				dep.	4.615 (1.417)				dep.
Log (real salary/ real price of capital)	11.165 (0.237)	-1.446 (0.056)				11.068 (0.205)	-0.910 (0.047)			
Log (CET real salary/ real price of capital)	11.589 (0.299)		-0.245 (0.041)			11.520 (0.300)		-0.181 (0.040)		
Log (skilled real salary/ real price of capital)	11.055 (0.246)			-0.482 (0.064)		10.954 (0.250)			-0.293 (0.047)	
Log (unskilled real salary/ real price of capital)	10.869 (0.274)				-1.189 (0.106)	10.783 (0.253)				-0.537 (0.088)
Log real production	12.548 (1.612)	0.924 (0.007)	0.948 (0.008)	0.882 (0.010)	0.721 (0.018)	11.603 (1.345)	0.879 (0.006)	0.918 (0.010)	0.856 (0.009)	0.803 (0.018)
Standard error of equation		0.325	0.449	0.520	0.896		0.309	0.508	0.470	0.888
R-squared		0.942	0.922	0.876	0.612		0.922	0.855	0.848	0.612

Notes:

1. The sample size for the With Accord group is 1,638 and each equation has 1,611 error degrees of freedom. The sample size for the Without Accord group is 2,028 and each equation has 2,001 error degrees of freedom. All equations contain an intercept, year indicators (1983 to 1987) and industry indicators (APE niveau 40, approx. 2-digit SIC). The equations are estimated for the years 1982 to 1987.

2. The instrumental variables were: log real external salaries (CET, skilled, unskilled) contemporaneous and two lags; log real external salary (enterprise average, differenced, lags 2 and 3); log real internal salaries (average, CET, skilled, unskilled, differenced, lags 2 and 3); log real production (differenced, lags 2 and 3); value-added as a percent of production (differenced, lags 1, 2 and 3); exports as a percentage of sales (differenced, lags 1, 2 and 3); log total employment (differenced, lags 2 and 3); log real capital stock (differenced, lags 2 and 3); log real value-added (differenced, lags 2 and 3); log price of capital (contemporaneous, lags 1, 2 and 3); industry indicators (19); year indicators (5).

Sources: INSEE: Echantillon d'entreprises, BIC-EAE, ESE, ESS, DAS-DADS.

Table 6

Restricted Linear Labor Demand Systems for Enterprises with Accord and without Accord Using the External Real Wage Rates as the Price of Labor

	With Accord					Without Accord				
Variable	Mean (St.D.)	All Coef. (St.E.)	CET Coef. (St.E.)	Skilled Coef. (St.E.)	Non-skld Coef. (St.E.)	Mean (St.D.)	All Coef. (St.E.)	CET Coef. (St.E.)	Skilled Coef. (St.E.)	Non-skld Coef. (St.E.)
Log total FTE employment	6.652 (1.338)	dep.				5.899 (1.101)	dep.			
Log CET employment	5.139 (1.593)		dep.			4.221 (1.325)		dep.		
Log skilled employment	5.729 (1.468)			dep.		4.917 (1.199)			dep.	
Log unskilled employment	5.179 (1.427)				dep.	4.616 (1.417)				dep.
Log (real external salary/ real price of capital)	10.649 (0.121)	-1.781 (0.115)				10.610 (0.116)	-0.843 (0.089)			
Log CET real external salary real price of capital)	11.058 (0.056)		0.170 (0.263)			11.056 (0.049)		0.724 (0.290)		
Log (skilled real external salary/real price of capital)	10.547 (0.040)			1.463 (0.602)		10.536 (0.038)			2.781 (0.480)	
Log (unskilled real external salary/real price of capital)	10.358 (0.045)				-9.207 (0.807)	10.345 (0.043)				-4.179 (0.727)
Log real production	12.548 (1.612)	0.859 (0.007)	0.938 (0.008)	0.845 (0.010)	0.696 (0.017)	11.603 (1.345)	0.841 (0.006)	0.908 (0.010)	0.835 (0.009)	0.792 (0.017)
Standard error of equation		0.361	0.454	0.529	0.895		0.329	0.510	0.471	0.889
R-squared		0.928	0.920	0.872	0.613		0.912	0.854	0.848	0.612

Notes:

1. The sample size for the With Accord group is 1,638 and each equation has 1,611 error degrees of freedom. The sample size for the Without Accord group is 2,028 and each equation has 2,001 error degrees of freedom. All equations contain an intercept, year indicators (1983 to 1987) and industry indicators (APE niveau 40, approx. 2-digit SIC). The equations are estimated for the years 1982 to 1987.

2. The instrumental variables were: log real external salaries (CET, skilled, unskilled) contemporaneous and two lags; log real external salary (enterprise average, differenced, lags 2 and 3); log real internal salaries (average, CET, skilled, unskilled, differenced, lags 2 and 3); log real production (differenced, lags 2 and 3); value-added as a percent of production (differenced, lags 1, 2 and 3); exports as a percentage of sales (differenced, lags 1, 2 and 3); log total employment (differenced, lags 2 and 3); log real capital stock (differenced, lags 2 and 3); log real value-added (differenced, lags 2 and 3); log price of capital (contemporaneous, lags 1, 2 and 3); industry indicators (19); year indicators (5).

Sources: INSEE: Echantillon d'entreprises, BIC-EAE, ESE, ESS, DAS-DADS.

Table 7

Estimated Determinants of the Log Real Salary

Variable	With Accord					Without Accord				
	Mean (St.D.)	All Coef. (St.E.)	CET Coef. (St.E.)	Skilled Coef. (St.E.)	Non-skld Coef. (St.E.)	Mean (St.D.)	All Coef. (St.E.)	CET Coef. (St.E.)	Skilled Coef. (St.E.)	Non-skld Coef. (St.E.)
Log real salary	11.153 (0.248)	dep.				11.057 (0.217)	dep.			
Log CET real salary	11.576 (0.309)		dep.			11.509 (0.310)		dep.		
Log skilled real salary	11.043 (0.258)			dep.		10.943 (0.257)			dep.	
Log unskilled real salary	10.857 (0.283)				dep.	10.773 (0.259)				dep.
Log real external salary	10.637 (0.138)	0.853 (0.031)	-0.084 (0.098)	-0.292 (0.066)	0.153 (0.069)	10.599 (0.127)	0.610 (0.027)	-0.363 (0.085)	-0.273 (0.065)	-0.248 (0.062)
Log CET real external salary	11.045 (0.084)		0.494 (0.136)			11.045 (0.068)		0.072 (0.153)		
Log skilled real external salary	10.535 (0.078)			1.404 (0.114)		10.525 (0.062)			0.554 (0.164)	
Log unskilled real external salary	10.346 (0.081)				0.985 (0.113)	10.335 (0.066)				1.053 (0.142)
Log real value-added per employee	-0.012 (0.063)	0.246 (0.008)	0.163 (0.021)	0.280 (0.014)	0.250 (0.015)	-0.011 (0.047)	0.387 (0.010)	0.355 (0.026)	0.344 (0.021)	0.310 (0.020)
Standard error of equation		0.106	0.276	0.191	0.201		0.101	0.278	0.218	0.216
R-squared		0.820	0.213	0.458	0.504		0.785	0.208	0.289	0.315

Notes:

1. The sample size for the With Accord group is 1,638 and each equation has 1,610 error degrees of freedom (except the column All, which has 1,611). The sample size for the Without Accord group is 2,028 and each equation has 2,000 error degrees of freedom (except the column All, which has 2,001). All equations contain an intercept, year indicators (1983 to 1987) and industry indicators (APE niveau 40, approx. 2-digit SIC). The equations are estimated for the years 1982 to 1987.

2. The instrumental variables were: log real external salaries (CET, skilled, unskilled) contemporaneous and two lags; log real external salary (enterprise average, differenced, lags 2 and 3); log real internal salaries (average, CET, skilled, unskilled, differenced, lags 2 and 3); log real production (differenced, lags 2 and 3); value-added as a percent of production (differenced, lags 1, 2 and 3); exports as a percentage of sales (differenced, lags 1, 2 and 3); log total employment (differenced, lags 2 and 3); log real capital stock (differenced, lags 2 and 3); log real value-added (differenced, lags 2 and 3); log price of capital (contemporaneous, lags 1, 2 and 3); industry indicators (19); year indicators (5).

Sources: INSEE: Echantillon d'entreprises, BIC-EAE, ESE, ESS, DAS-DADS.

Table 8

Structural Model of the Determinants of the Inverse Share of Quasi-rents per Worker (γ) Going to Each Skill Group

	With Accord				Without Accord			
Variable	Mean (St.D.)	CET Coef. (St.E.)	Skilled Coef. (St.E.)	Non-skld Coef. (St.E.)	Mean (St.D.)	CET Coef. (St.E.)	Skilled Coef. (St.E.)	Non-skld Coef. (St.E.)
Inverse γ CET workers	3.821 (4.598)	dep.			4.098 (4.934)	dep.		
γ CET workers	0.526 (0.546)				0.513 (0.464)			
Inverse skilled γ	5.369 (4.534)		dep.		5.818 (4.933)		dep.	
γ skilled workers	0.218 (0.186)				0.256 (0.183)			
Inverse unskilled γ	6.317 (4.872)			dep.	6.353 (4.836)			dep.
γ unskilled workers	0.231 (0.159)				0.222 (0.142)			
Proportion of workers CET	0.250 (0.132)	20.829 (2.410)			0.215 (0.117)	12.298 (5.332)		
Proportion of skilled workers	0.432 (0.158)	0.350 (1.888)	18.207 (1.399)		0.413 (0.167)	-0.762 (2.943)	8.738 (1.559)	
Proportion of unskilled workers	0.318 (0.199)	2.638 (1.427)	12.340 (1.453)	20.060 (1.680)	0.372 (0.214)	-1.080 (1.601)	0.218 (1.443)	10.055 (1.438)
Error degrees of freedom		1,611	1,612	1,613		2,001	2,002	2,003
Sample size	1,638				2,028			
Standard error of equation		4.567	4.738	5.535		4.922	4.906	5.126
R-squared		0.455	0.586	0.575		0.438	0.600	0.614

Notes:

1. All equations suppress the intercept but include year indicators (1983 to 1987) and industry indicators (APE niveau 40, approx. 2-digit SIC). The equations are estimated for the years 1982 to 1987.

2. The instrumental variables were: log real external salaries (CET, skilled, unskilled) contemporaneous and two lags; log real external salary (enterprise average, differenced, lags 2 and 3); log real internal salaries (average, CET, skilled, unskilled, differenced, lags 2 and 3); log real production (differenced, lags 2 and 3); value-added as a percent of production (differenced, lags 1, 2 and 3); exports as a percentage of sales (differenced, lags 1, 2 and 3); log total employment (differenced, lags 2 and 3); log real capital stock (differenced, lags 2 and 3); log real value-added (differenced, lags 2 and 3); log price of capital (contemporaneous, lags 1, 2 and 3); industry indicators (19); year indicators (5).

Sources: INSEE: Echantillon d'entreprises, BIC-EAE, ESE, ESS, DAS-DADS.