The Heterogeneity of Employment Adjustment Across Japanese Firms. A Study Using Panel Data *

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Abstract

Since the beginning of the 1990s, the evolution of the Japanese employment system has been characterized by a micro – macro paradox. While case studies show the intensity of restructuring and downsizing, most of the studies at a macro level conclude to the absence of change. This article contributes to this debate, using a micro database, focusing on the electrical machinery sector in a panel framework and considering a long enough period to make a comparison between the 1990s and the 1970s. The first major result is a stable average speed of employment adjustment but an increasing heterogeneity of this speed at the level of the firms. The second main result is the change of the underlying model of employment adjustment, with an increasing impact of the financial characteristics of the firms, which may also be the main explanation of the increasing heterogeneity of the employment adjustment across firms.

Keywords: Employment Adjustment. Japanese Employment System. Panel.

JEL classification: C23, G30, J23, L20, L63, L68

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1 Introduction

The end of the "Japanese employment system" (JES) has recently become a widely shared idea, in a context of increasing pressures. Indeed, whereas firms responded slowly to macroeconomic and institutional changes since the beginning of the 1990s, an accelerating adjustment seems to have taken place since 1998, as the crisis is lasting and maybe worsening. The 2001 massive restructuring in the electrical machinery sector is one example of the changes affecting the JES. This is all the more important from the point of view of the analysis of the Japanese employment system that firms belonging to this sector, like Matsushita, are considered to have implemented in the most accomplished way the so-called "lifetime employment". Moreover, the electrical machinery sector is particularly affected by contemporary pressures on the employment system, such as the impact of technologies of information and communication or globalization. This change particularly concerns the compromise on employment security. However, one may note a micro-macro paradox, that is an increasing gap between the statements pronounced by the case studies at the micro level, which conclude to dramatic changes, and the macro level analyses, which insist on the global stability of the wage labor nexus (Boyer and Juillard, 2000).

In this context, studying the employment adjustment at the level of the firms is a good way to measure the current changes of the Japanese employment system and their determinants. It gives us the opportunity to empirically specify the two alternatives of the preceding debate. More precisely, the issue at stake is to verify if the characteristics of the adjustment model, especially the speed, have changed since the beginning of the 1990s. In fact, this question has already been the focus of many empirical works. More precisely, many studies have recently used firm based micro-data and have partially questioned the results obtained at the macro and industry levels[1]. The fact that *some* firms are restructuring heavily must not be automatically interpreted as the sign of the end of long term employment practices in *general*. Non negligible differences in the

[1]The number of micro studies published in Japanese increased very much recently. Noting only the studies published in English, we may quote: Chuma, 2002; Abe, 2002; Suruga, 1998; Hildreth and Ohtake, 1998

mode of adjustment are observed across firms, in terms of speed of adjustment, factors at the origin of the employment adjustment or in qualitative instruments used to adjust employment. This last result leads to put into question the idea of the uniqueness of the human resources management model in Japan. Then, the question is to relate these differences of employment adjustment to fundamental characteristics of the firms, to ask whether this heterogeneity across firms has recently increased or not, and, finally, to explain these evolutions.

The heterogeneity of the employment adjustment across firms is precisely at the center of our own contribution, which consists in deepening the micro type studies. More precisely, we propose to test two conflicting hypotheses: the end of lifetime employment, which can be observed through an identical acceleration of the adjustment speed for all firms, versus an increasing heterogeneity of the employment adjustment across firms. In any case, it is then necessary to analyze the roots of the current changes. For this purpose, we use a micro database, the NEEDS-FQ database (*Nikkei Economic Electronic Databank System - Financial Quest*). It gives micro-data from a sample of 126 firms of the electrical machinery sector on an annual basis from 1970 to 2001. Thus, our study is at an intermediate level by comparison with the majority of existing micro studies, some focusing on a few firms (Chuma, 2002; Suruga, 1998; Hildreth and Ohtake, 1998), and the others using numerous samples of more than 1000 firms, but strictly limited in the temporal dimension and/or in the number of the tested explanatory variables (Abe, 2002). We believe that this intermediate level provides a useful complement to the previous studies for several reasons. First, we use a panel framework to test and analyze the heterogeneity of employment adjustment patterns across firms. Contrary to the majority of empirical studies, we do not limit our analysis to the introduction of individual effects. Rather, we resort to a Bayesian estimation procedure, which yields to (firm-specific) individual forecasts of the parameters of the adjustment process. Second, we make a comparison between the 1970s and the 1990s. Third, we try to identify the factors at the root of both the level of employment adjustment and the heterogeneity of this adjustment; we especially focus on the financial factors by controlling firms' characteristics like the size or the industry.

The two main findings of this paper could be summarized as follows. First, the increasing heterogeneity of firms in the 1990s is confirmed from the point of view of their speed of employment adjustment. Moreover, no evidence can be provided about the increase of the average speed of the employment adjustment in the 1990s by comparison with the 1970s, which is clearly in opposition to the idea of the end of "lifetime employment". It may be an explanation of the micro - macro paradox. Second, the factors of the adjustment speed and of the heterogeneity have changed during the period under review. Furthermore, we suggest that the increasing heterogeneity is mainly related to financial factors, especially to the intensity of the links with the Main Bank versus the proportion of shares owned by foreign shareholders. These financial factors seem to play a increasingly discriminating role, at the expense of very classical factors like the size of the firm or the sector.

This paper is built as follows. In the next part, we present some stylized facts on the employment adjustment in the 1990s. In a third part, we introduce our database. In the fourth part, we describe the different specifications to be estimated. In the fifth part, we present the results of the estimations. A last part is devoted to concluding remarks.

2 The heterogeneity of employment adjustment at the level of Japanese firms: assessment and sources

There is no general agreement about the evolution of the employment adjustment in Japanese firms during the 1990s. Whereas some studies found a decreasing or stable speed of adjustment[2], other studies found it is more sensitive to economic cycles and to operating losses (Ministry of Labor 1999). A part of the explanation lies in the differences of data (micro/macro), period (beginning, end) and modelling of the process (continuous / discrete). These contradictory results may also be related to an increasing heterogeneity of the Japanese human resources management (HRM) model observed in

[2] The "optimal speed" is to be understood by reference to a long term target. See Hamermesh (1993) for a more precise explanation.

the same period. This increasing heterogeneity of the employement adjustment across firms is indeed a common result of many studies (Suruga, 1998; Chuma, 2002; Abe, 2002). Nevertheless, this is rarely rigourously proved or even systematically analyzed.

The remaining questions concern the nature of this heterogeneity. How can we specify this heterogeneity of the employment adjustment? Did it pre-exist or has it only been revealed by the crisis? How many categories does it encompass: is it a pure diversity or does it correspond to a kind of bipolarization? Finally, what are the underlying factors? Among the potential explanatory factors of the increasing heterogeneity of the Japanese human resources management model, it may be practical to distinguish between the financial and the non financial ones[3].

Among the latter, the most commonly acknowledged are the industry and the size. Many studies have already found significant differences of speed of employment adjustment across industries (Abe, 2002). In our study, we focus on one industry and look for other explanatory variables. However, within the electrical machinery sector, which is heterogeneous by nature, we can expect to observe different models of adjustment according to the main activity of the firm (white electronic, hardware, software, etc.). Regarding the size, it *a priori* slows down the speed of adjustment (Suruga, 1998). Indeed, the bigger a firm is, the more it can resort to internal transfers of a part of the workforce, which is not accounted in our study. This is due to our definition of the employment speed, which focuses on the external mobility.

Other non financial factors may affect the employment dynamics. First of all, the share of exports in the total sales captures the impact of the globalization of product markets on the employment from the point of view of the firms. This export ratio is expected to contribute to a more rapid adjustment (Dore and Taira, 1986). Second, the innovation effort (as captured by the ratio of R&D expenses in our study) and the capital intensity should have a negative impact on the speed. This is the main result of a "labor as a quasi fixed factor" type of analysis (Oï, 1962): the more the firm is oriented toward innovation and is capital intensive, the more the human capital is integrated to the physical capital and is the object of specific investments. Another

[3]The following list of variables is non limitative and focuses on the available data in our database.

non technological factor is the average age of the employees, which is an indication of the job tenure, when there are few mid-career recruitments and when the growth rate is moderate. Another variable allows us to characterize what could be called the "history of the firm". This is basically the duration of the existence of the firm, which *a priori* has a negative impact on the speed of adjustment: the older the firm is, the slower it adjusts the employment.

In addition to the above mentioned non financial factors, our study will bring a closer focus on the financial factors. In this paper, we propose to test if there exists a potential transmission channel of the changes, which occurred in the Japanese financial sphere, to the employment system. Then, we propose to test if the financial factors induce an increasing heterogeneity of the employment adjustment.

We will investigate the impact of different categories of financial variables. First, those "traditionally" considered as representative of the Japanese style of corporate governance as analyzed by Masahiko Aoki (1990), which are the Main Bank , the financing structure (opposition between markets and banks) and the stockholding structure; and second, those relative to the performance (e.g. the Return On Assets) and the financial status (mainly debt). We first consider the impact of the Main Bank. In fact, the intensity of the link with the Main Bank may have a more ambiguous impact than what is told in the simplest theoretical story. If, generally speaking, we expect a slower speed of adjustment in case of the Main Bank corporate governance style, a more intense adjustement may be observed in a firm close to the bankruptcy. Another important variable is the financing structure in itself. Again, the reality is much more complicated than the theoretical opposition between market-led and bank-led financing. A bank itself facing difficulties (as has been common in Japan since the beginning of the 1990s) and impatient market investors will have the same impact on the adjustment speed. In these conditions, the most appropriate criterion may be the degree of dependence on the main financing source: the firms, whose financing is more balanced between market and bank, may have a less sensitive employment situation to the financial status, and thus a slower speed of adjustment. The last variable is the stockholding structure, which can be sub-divided itself into at least three aspects (Abe,

2002). One is the cross-shareholding, which is expected to have a negative influence on the employment adjustment. Another is the concentration of the shareholding, which may also slowdown the speed, according to an argument of stability and long term perspective of the shareholders. As for the foreign owners, the bigger is their share, the stronger may be the influence of international financial markets, and the more rapid may be the speed of adjustment.

To these "classical" factors, we add two sets of variables, partly ignored by most of the empirical studies on the link between finance and employment. The first one is the performance, for which we have many indicators. Even if it is difficult to evaluate the direction of the causality, convergent results indicate a significant and negative sign: in other words, good performances go hand in hand with a slow employment adjustment (Suruga, 1998). The second one concerns the financial status, that is, mainly, the debt, which has to be distinguished from the financing structure. The Bubble period lead to over-investment and over-debt behaviors for some firms. After the burst of the Bubble, the consequences of such strategies were dramatic, especially in a deflationary context, which increased the burden of the debts. In fact, according to a study realized by the Development Bank of Japan (2000), the debt equity ratio (DER) accelerated significantly the process of job destructions in Japan between 1978 and 1998. This study concludes that the influence of the financial status of the firms on the employment adjustment decisions had certainly increased since the 1970s.

To summarize, conditionally to a specification of the dynamics of employment adjustment at the micro level, we will answer three questions. First, did the average speed of employment adjustment increase in the 1990s? Second, do we observe an increasing heterogeneity of the firms' speeds of adjustment? Third, what is the underlying model of adjustment? This last question can be subdivided in two other questions. What are the financial and non-financial variables, which could explain the differences of adjustment speed across firms? Has the impact of financial and non financial variables varied over time? The answers to these questions are based on the use of a micro database.

3 Presentation of the micro database

In this paper we use a balanced panel of 126 firms, classified in the electrical machinery sector and observed over the period 1970-2001. This sample is obtained from the NEEDS-FQ database, which is built from the annual reports of firms listed at the Tokyo Stock Exchange. Although NEEDS-FQ is a financial oriented database, without precise information about the workforce, except the number of regular employees in the mother-firm, it is increasingly used to study the patterns of employment adjustment and the characteristics of the corporate governance in a context of still very restrictive access to administrative surveys (Suruga, 1998). Our sample has been obtained after eliminating 152 firms from the initial sample, mainly firms with missing data during the period 1970 - 2001 (278 firms classified in the electrical machinery sector in 2001). It does not include firms listed before 2001, and which are no longer listed in 2001. Consequently we face a classical problem of survival bias. As a consequence, we do not consider the job creations and destructions through the birth and death of firms[4].

The definition of the variables is specified in table 1. We use the non-consolidated annual data, which are better than the consolidated one to study a long term evolution between 1971 and 2001 (Suruga, 1998). The database does not contain any information about the number of non-regular employees, nor about the worked hours, which are however two important features of the Japanese mode of employment adjustment. Consequently, our results concern uniquely the number of regular employees. A price index for the electrical machinery sector, taken from the Bank of Japan database, has been chosen to value production, understood as sales per annum rather than the value added . Finally, we use the real average wage, constructed by dividing the payroll (non including the wages of non regular employees) by the number of employees and deflating by the same price index as the one used for production. In order to introduce two vectors of variables of corporate (CG) and non corporate (NCG) governance, respectively built with financial and non financial variables, we merge a supplementary database with the original one. In addition to the NEEDS-FQ, we use the following sources: the

[4]The number of births and deaths of firms is much more important in the 1990s than in the 1970s (Ministry of Labour, 2001). Therefore, our study could be characterized by an underestimation of the heterogeneity in the 1990s, which is not a problem, as we expect to find an increasing heterogeneity in the 1990s in comparison to the 1970s.

Spring issues of the *Japan Handbook Company* (JCH), which correspond to the end of the fiscal years, *Keiretsu no Kenkyu* (KNK) and the database of *Denki Rengo*, the main umbrella organization for the electrical machinery sector enterprise-based unions. As for the electrical machinery sector, we refer to the usual classification made by the Tokyo Stock Exchange. This is not without ambiguity because the scope of the production of the firms classified in this sector is very wide, from devices to software or white electronics. Another point is that the main activity could have changed during the 31 year long period. That is why our benchmark is the year 2001. We found equivalent classifications by the Japanese Ministry of Labor and by the Denki Rengo.

The basic features of our data are summarized in table 2. It is possible to highlight the following points. First of all, an increasing heterogeneity of the performances in the 1990s, both in terms of productivity and of profitability, can be observed: the standard deviation of the productivity (*PRODUCTI*) has been multiplied by almost 2 between the 1970s and the 1980s and by more than 2 in the 1990s in comparison to the 1980s, while the standard deviation of the ratio of ordinary profit to sales (*PERFO2*) has been multiplied by 3 in the 1990s. Concerning other financial variables, the average debt, as measured by the *DER*, increased slightly in the 1990s, while the ratio of the bank debt owned by the Main Bank (*MB1*) surprisingly slightly increased from the 1970s to the 1990s. As for the shareholding structure, one notes decreasing trends for the concentration ratio (*SHARECON*), the cross-shareholding (*CROSSHAR*), and increasing trends for the shares owned by financial institutions (*INSTIFI*) and foreign firms (*FORE1*). In this last case, the standard deviation has more than doubled in the 1990s by comparison to the 1980s. Finally, two important non financial variables can be analyzed as follows: the average exports ratio (*XPROD*) increased from 18,8% in the 1970s to 25,5% in the 1990s, while the average age of employees (*AGEMOY*) increased slightly from the 1970s to the 1990s (+ 7 years).

We now specify the evolution of employment. The average size of the firms (*SIZE1*) was 5,206 employees in 1970 and is 4,800 in 2001: most of the firms are very large. This is not a problem for our purpose, which is to show an increasing heterogeneity within

a same sector for firms of similar size[5]. This change is the result of an evolution in three stages. Between 1970 and 1979 the average size decreased. Then, up to 1992 it increased, before decreasing again. On average, during the whole period, the sample covers 600,000 employees. Finally, some typical patterns of employment adjustment are reproduced in figure 1.

The following comments can be made. First, one can observe a huge variety of adjustment patterns by comparison with the average industry pattern. Second, the profile of adjustment is very much more discontinuous at the micro level (with the exception of very big firms like Hitachi), with annual variations of more than 20% (e.g. Togami between 1975 and 1976). Finally, the sensitivity of employment to losses varies during the period and across firms: for example, it is less important for Yasukawa in the 1970s in comparison to the 1990s, while it is always lower for Nihon Inter Electronics.

4 Specifications of the employment adjustment

The choice of the specification is determined by the answers given to two problems: the form of the employment adjustment (continuous versus discrete) and the modelling of the heterogeneity. Our contribution focuses on the second problem.

The form of the dynamic labor demand depends on the specification of the adjustment costs. A first way to specify them is to consider a quadratic and symmetric function defined as:

$$C\left(\Delta L_t\right) = \frac{c}{2}\left(L_t - L_{t-1}\right) \qquad c > 0$$

where L_t denotes labor and $\Delta L_t = L_t - L_{t-1}$. This far from perfect specification allows us to easily derive the analytical form of labor demand. Indeed, assuming a quadratic form for the production function,

$$F\left(X_t, L_t\right) = X_t L_t - \frac{b}{2} L_t^2 \qquad b > 0$$

where X_t denotes a vector of inputs, we can show that in an uncertain environment, under the assumption of rational expectations, the maximization of an expected stream

[5] Moreover, it is well-known that the smaller are the firms, the higher is the heterogeneity.

of discounted profits leads to the following form of employment dynamics:

$$L_t = \lambda L_{t-1} + \sum_{i=0}^{\infty} \gamma_i E_t \left(X_{t+i} - w_{t+i} \right) \tag{1}$$

where w_t is the real wage at time t and where the autoregressive parameter λ is a non linear combination of the structural parameters.

$$\lambda = \left[\frac{c + (1+r)(b+c)}{2c} \right] - \frac{1}{2c} \left\{ \left[c + (1+r)(b+c) \right]^2 - (1+r)\, c^2 \right\}^{\frac{1}{2}}$$

Adding the assumption of a first-order autoregressive form for the exogenous factors and for the real wage, the conditional expectations of these variables are then proportional to the current observed level. We can deduce a labor dynamic demand shown by:

$$L_t = \lambda L_{t-1} + \beta X_t + \phi\, w_t \tag{2}$$

where the parameters β and ϕ are non linear combinations of the autoregressive parameters of exogenous processes and the parameters γ_i. In this case, we get the same specification as Hamermesh (1993):

$$L_t = \lambda L_{t-1} + \beta Z_t + \varepsilon_t$$

where ε_t is an *i.i.d.* process and Z_t designs a vector of variables influencing the long-run labor demand, including the real wage. In such a specification, all the explanatory variables are observable; moreover, the estimation of the parameter gives a measure of the speed of employment adjustment, through the median lag defined by $-\log(2) / \log(\lambda)$. Then we can show that the speed of employment adjustment is inversely proportional to the level of adjustment costs represented by the parameter c. From this general specification, it is possible to derive several models based on alternative assumptions on the adjustment cost structure, the nature of expectations and the form of the production function. Here, we adopt a framework with one production factor, labor, which is not split into workforce and work hours, because of a lack of data. Finally, we use a log linear approximation (denoted as model 1) of the model:

$$\Delta \log(L_t) = a_0 + a_1 \log(Q_t) + a_2 \log(w_t) + a_3 \log(L_{t-1}) + \mu_t \tag{3}$$

where Q_t and w_t denote respectively the level of production and the real wage.

In this log-linear model, we can define clearly what we mean by "speed of adjustment": it corresponds to the opposite value of the autoregressive parameter a_3 as it can be shown quickly. Let us assume that the labor dynamics is given by:

$$L_t = a_0 + a_1 \log(Q_t) + a_2 \log(w_t) + \rho \log(L_{t-1}) + \epsilon_t$$

where ρ, with $|\rho| \langle 1$, denotes the autoregressive parameter. The so-called "adjustment speed of labor" is defined by the quantity $1 - \rho$ and denotes the persistence of the shocks in the labor dynamics. This adjustment speed corresponds to the opposite of the parameter a_3, since we have $a_3 = \rho - 1$. Of course, this results also hold

From now, let us consider the preceding specifications in a panel framework including N firms observed on T periods. For firm i and year t, the simplest model is the following:

$$\Delta \log(L_{i,t}) = a_0 + a_1 \log(Q_{i,t}) + a_2 \log(w_{i,t}) + a_3 \log(L_{i,t-1}) + \mu_{i,t} \tag{4}$$

In this specification, we assume that the dynamics of employment is strictly identical for all the firms of the sample. Implicitly, it is equivalent to assume the homogeneity of the production structure and of the adjustment costs function (b and c parameters in the above specifications). In this case, the average median lag is identical for all firms. Such an assumption is in fact very restrictive and has to be tested (Hsiao, 1986). On the contrary, we can assume that the structure of production and the functions of adjustment costs vary across firms, so that there is nothing common between them, except the general specification of the functions. In that case, the model is:

$$\Delta \log(L_{i,t}) = a_{0,i} + a_{1,i} \log(Q_{i,t}) + a_{2,i} \log(w_{i,t}) + a_{3,i} \log(L_{i,t-1}) + \mu_{i,t} \tag{5}$$

where the parameters $a_{j,i}$, $j = 0, 1, 2, 3$ are *a priori* different across the firms and residual $\mu_{i,t}$ are independently distributed across firms. As a result, these parameters have to be estimated firm by firm.

Between these two extreme assumptions, some specifications provide a better and more general modelling of the heterogeneity of the employment adjustment paths. First of all, we shall consider that the introduction of individual effects is sufficient to take

into account the heterogeneity of the dynamics:

$$\Delta \log (L_{i,t}) = a_{0,i} + a_1 \log (Q_{i,t}) + a_2 \log (w_{i,t}) + a_3 \log (L_{i,t-1}) + \mu_{i,t} \tag{6}$$

In this case, we assume the heterogeneity across firms of the structural rate of growth of employment $a_{0,i}$, under the restrictive assumption that the speeds of adjustment and the long term parameters are homogenous. In this case, the specification, fixed or random, of individual effects has to be tested by a usual Hausman's test. However, such assumption is *ad hoc,* because we have seen above that the constants and the coefficients of this specification are non linear combinations of the same structural parameters, if we assume the existence of quadratic adjustment costs and rational expectations. Under these last two assumptions, it is difficult or even impossible to identify any heterogeneity concerning the average levels, without this heterogeneity affecting the autoregressive parameter of the conditioning variables. In the former example, with quadratic production and adjustment costs functions, the constant and the autoregressive parameter are functions of the parameters b and c (see equation 1): if one of these two structural parameters varies across firms, we cannot derive a specific constant for each firm, while keeping the assumption of the same adjustment speed $-a_3$.

In these conditions, a panel specification providing an effective capture of the heterogeneity of the employment dynamics (coming either from the production structure or from the adjustment costs) consists in assuming the existence of random coefficients, as in Swamy (1970):

$$\Delta \log (L_{i,t}) = a_{0,i} + a_{1,i} \log (Q_{i,t}) + a_{2,i} \log (w_{i,t}) + a_{3,i} \log (L_{i,t-1}) + \mu_{i,t} \tag{7}$$

$$a_i = (a_{0,i}\, a_{1,i}\ a_{2,i}\ a_{3,i}) \ \ i.i.d.\ (\overline{a}, \Omega) \tag{8}$$

where the parameters $a_{j,i}$ and in particular the adjustment speed $-a_{3,i}$ are assumed to be real random variables with $cov\left(a_{j,i}\mu_{i,t}\right) = 0, \forall i, j, t$. Since this specification is not restricted by assuming the equality of the parameters, it allows taking into account the heterogeneity of the adjustment dynamics. However, we assume that these variables have a common distribution, or, at least, two identical first moments. We

then have to estimate the expected value and the second order moments associated to these distributions. Here the second advantage of this approach appears : it gives the possibility to make the estimation on the basis of a distribution of adjustment speeds. For example, it is possible to evaluate the mean and the variance of the distribution from the sample. Doing so, we can precisely measure the increasing or decreasing trends of the heterogeneity of the adjustment median lag across firms.

Nevertheless, this specification with random coefficients raises several problems. First of all, it is necessary to justify the stochastic nature of the parameters of the reduced form. If we come back to the initial model, this hypothesis is equivalent to the *ad hoc* assumption of adjustment costs or production functions with stochastic parameters. However, it is important to note that the general solution for such kinds of functions is no longer defined by the equation (1). The second issue with this specification is that we do not have an *a priori* forecast of the adjustment speed for one particular firm. We can just estimate the first two moments of its distribution. We will solve this problem in proposing a Bayesian estimator of the individual parameters (Hsiao, 1996). We will *a priori* assume a distribution on these parameters, by using the GLS estimators of the two first moments. The Bayesian predictor we then obtain is a combination of the information specific to each firm i (time series information) and of the prior information on the first two moments $\overline{a}$ and Ω of a distribution, which is assumed to be homogenous for the set of N firms. These moments are estimated by using the Swamy (1970) GLS two steps procedure.

Thus, for a given firm, the less precise the individual information on the adjustment speed is (that is the higher the variance of the individual estimator is), the closer the individual predictor will be to the mean of the common distribution, estimated by GLS, given the whole sample. On the contrary, in the case of a firm, on whose adjustment speed we have precise individual information, the individual predictor will give a small weight to the information given *a priori* on the expected value of the distribution common to the firms. More formally, if we note $\widehat{a}_i$ the Bayesian individual predictor of the vector of parameters a_i for the i^{th} firm we have:

$$\widehat{a}_i = \left(\widehat{\Omega}^{-1} + \frac{1}{\widehat{\sigma}_i^2} X_i' X_i\right)^{-1} \left(\widehat{\Omega}^{-1}\widehat{a} + \frac{1}{\widehat{\sigma}_i^2} X_i' Y_i\right) \tag{9}$$

In this definition, $\widehat{a}$ corresponds to the GLS estimate of the mean of the distribution of parameters a_i, and $\widehat{\sigma}_i$ denotes the estimate of the variance of residuals for the firm i. The Swamy's estimate of the matrix of variance covariance of the parameters a_i, denoted $\widehat{\Omega}$, is defined as:

$$\widehat{\Omega} = \frac{1}{N} \sum_{i=1}^{N} (\widetilde{a}_i - \widetilde{a})' (\widetilde{a}_i - \widetilde{a}) \tag{10}$$

where $\widetilde{a}_i$ is the OLS estimate of individual parameters a_i and $\widetilde{a} = (1/N) \sum_{i=1}^{N} \widetilde{a}_i$.

These Bayesian predictors will be particularly useful in the second step of the study, when we try to explain the differences of the adjustment speed by financial and non financial variables characterizing the firms. Two alternative methods are then possible. The first one is to introduce directly the vectors of financial and non financial variables in the equation of employment adjustment. This is the route followed by Abe (2002) for instance. In this specification, it is necessary to identify *ex ante* all the explanatory variables of the heterogeneity of the adjustment speed $a_{3,i}$ and to know the functional form linking this speed to the explanatory variables. Consequently, this method is sensitive to the specification mistakes. This limit is overcome when we consider a second method, whose principle is to regress the Bayesian predictors on the financial and non financial variables vectors, respectively denoted CG_i and NCG_i:

$$\widehat{a}_i = \theta_{0,i} + \theta_{1,i} CG_i + \theta_{2,i} NCG_i + \xi_i \tag{11}$$

where $\widehat{a}_i$ denotes an individual predictor of the parameter a_i and where $\theta_{1,i}$ and $\theta_{2,i}$ are two vectors of real parameters. The advantage of this method is to get results on the influence of financial and non financial variables not only on the adjustment speed but also on the heterogeneity of this speed and of the underlying model. It is then possible to distinguish different groups of firms.

Finally, we should mention a third issue, for which we cannot propose any solution. Exogeneity may not hold for the output variable, since output depends on employment and may be therefore correlated with the residual in the labor demand equation. However, as far as we know, there is no way to solve this problem in a random coefficient model (Hsiao and Pesaran, 2004).

5 Results

5.1 No acceleration of the average speed but an increasing heterogeneity of the individual speeds of adjustment in the 1990s

The first hypothesis to be tested (conditionally to our specifications of the dynamics of employment adjustment at the micro level) concerns the increase of the average speed of employment adjustment in the 1990s. We consider several estimates of the adjustment speed of labor for the complete sample 1971-2001 and two sub-periods, 1971-1980 and 1992-2001. This choice can be justified as follows. First, we exclude the Bubble period, which is exceptional, especially as concerning financial variables. Second, both periods correspond to a decrease of the average size. Furthermore, they both include the same number of years. Given these sub-samples, we propose five estimates of the autoregressive parameter of employment to point out the importance of the heterogeneity specification. The results are reported in table 3. As a benchmark, we propose a comparison between two extreme assumptions: the *pooled* specification (same model for all the firms) and the mean of the estimates obtained from individual data, firm by firm (*Indi*). In this last case, we report the average of the N individual OLS estimated autoregressive parameters and the corresponding variance. Given that this average does not take into account the accuracy of the individual estimates, we also consider a weighted average (*Pond*) of the individual estimates, in which the weights are defined as the inverse of the individual variances. The less accurate estimates are then under-weighted in the total average. Between these two extreme assumptions about the heterogeneity (*Pooled* versus *Indi* or *Pond*), we consider OLS estimates in a homogenous model with individual fixed effects[6] (*Within*) and GLS estimates in a heterogenous model with random coefficients (Swamy, 1970).

Whatever the assumption made on the homogeneity of the underlying data generating process, we observe that the adjustment speed ($-a_3$), which is a decreasing function of the parameter a_3, is constant or slightly decreasing between the two sub-periods. The GLS estimates of the mean of the distribution of individual parameters

[6] It is well known that, the introduction of fixed individual effects in a dynamic specification induces a small sample bias (Nickell 1981). However, these estimates are presented here for comparison purpose.

$a_{3,i}$ in the random coefficient specification is 0.48 in the 1970s and 0.47 in the 1990s[7]. Such results do not confirm the standard view of the end of the "Japanese employment system". It seems that firms responded to macroeconomic and institutional changes at least at the same speed in the 1990s and in the 1970s. Besides, these results are more pronounced if we consider the rolling estimates of the employment adjustment speed, as we can observe in figure 2. With a fixed 15 year long Bartlett, we can observe a decrease in the average speed, even if an acceleration is observed at the end of the 1990s. From these results, we can conclude that the adjustment speed is basically lower in the 1990s in comparison to the 1970s despite an acceleration at the very end of the 1990s.

Then, we consider the second question, relative to the evolution of the variance of the firms' adjustment speeds. Basically, one confirms that the labor dynamics is heterogenous across firms in our micro database. In the case one considers the complete sample, as in the case the study is done by sub-periods, the standard homogeneity tests (Hsiao, 1986) largely reject the homogeneity hypothesis, even if individual effects are introduced. For instance, the value of the Fisher test associated to the central hypothesis that all parameters a_i are equal for all firms (under the assumption of fixed individual effect) is 4.39. Then, for a 5% risk level, the null hypothesis of homogeneity of the parameters a_i given fixed individual effects is strongly rejected. The same result is obtained in the case of the two sub-periods used in our study. As we can observe in table 3, the better the heterogeneity is modelled, the closer to the expected value are the estimated coefficients. Indeed, according to several studies (e.g. Suruga 1998), in this linear specification, the estimated value of parameter a_3 is around 0,3 in Japan (30% of the optimal speed, half of what is observed in the US) in the case of a continuous specification and annual data. In our panel, we obtain similar values, only when heterogeneous autoregressive parameters are introduced (*Indiv*, *Pond* and *GLS* estimates: columns 4, 5 and 6 of table 3). It means that, with panel data, a heterogeneous specification of the labor dynamics is essential to evaluate the speed adjustment

[7]Note that the results are quite similar when the average (weighted or unweighted, *Pond* or *Indi*) of individual estimates are considered.

of labor.

Then, the issue is to test if this heterogeneity, and particularly the heterogeneity of the autoregressive parameters $a_{3,i}$, has increased. For that purpose, we can consider individual estimates firm by firm. However, it raises unsolvable problems for estimations by sub-periods, because of a lack of observations. This is the main reason to justify the choice of a panel frame with random coefficients, which is the less restrictive assumption from the point of view of the heterogeneity[8]. We calculate the variance of the distribution of the individual parameters $a_{3,i}$ in the cases of the estimation firm by firm and of the estimation with random coefficients. In both cases, it is increasing between the 1970s and the 1990s (respectively from 0.39 to 0.42 and from 0.0225 to 0.0484)[9]. From this, we can conclude to an increasing heterogeneity of the adjustment speed across the firms in the 1990s, by comparison with the 1970s.

5.2 A changing model of adjustment and the factors of heterogeneity

We finally turn to the analysis of the determinants of the adjustment speed and of the increasing heterogeneity, which has been stated. We regress the estimated individual firms' speeds (individual Bayesian predictors issued from the random coefficient model) on the set of explanatory variables (NCG and CG vectors) for different periods (tables 4, 5 and 6). For each period, we present the results for four alternative models, a, b, c, d. The d model, different for each period, is selected as the best. For the whole period (1971-2001), we obtain the following results[10]. Concerning the non financial variables, we find significant results, with the expected sign, for the size (*SIZE1*), the R&D expenses ratio (*RDRATIO*), the export ratio (*XPROD*): this sign is negative for the two former and positive for the latter. As far as the average age of employees

[8] Concretely, the parameters of the random coefficients specifications (mean and variance-covariance matrix of the distribution of the coefficients) are estimated by following the method proposed by Swamy (1970). An estimator of the variance-covariance matrix of the coefficients is first built based on N individual estimators of the parameters obtained equation by equation. Then, by using this estimator of the variance-covariance matrix of the parameters, we build a variance-covariance matrix of the residuals, thanks to which we construct a *GLS* estimator of the expectation of the distribution of the parameters.

[9] Recall that the first two values correspond to the variance of the OLS individual estimates obtained equation by equation, whereas the last two values are the variance of the common distribution of the parameters in a random panel model. Both statistics are not comparable, but represent the heterogeneity of the individual adjustment speeds.

[10] All the variables, which are not reported in the tables, are non significant.

(*AGEMOY*) and the capital ratio (*INTENSK1*) are concerned, their effects are both significant but contribute to a higher speed, which was not expected. Concerning the financial variables, we find the good signs and significant results for the performance (*PERFO2*), which has a negative impact, and for three among four variables characterizing the shareholding structure: the share of foreign owners (*FORE1*), which accelerates the speed; the share of the financial institutions (*INSTIFI*) and the cross-sharing (*CROSSHAR*), which contribute to a lower speed. As far as the impact of the Main bank (*MB1*) is concerned, we find a negative sign: the more effective the link with the Main Bank is, the lower the adjustment speed is. Finally, results concerning the debt are ambiguous: the Debt Equity Ratio and the interest rate paid by the firm (*DER* and *DEBPAST*) have a negative impact on the speed, while the debt as a percentage of the sales (*DHK*) induces a higher speed. Globally, the results are satisfactory and improve, when we introduce the financial variables, as it is shown through the comparison between model a and the three other models. The next question is to check if these results are robust when we consider sub-periods, basically the 1970s and the 1990s.

Our main finding is that the above results are modified significantly, when we estimate sub-period by sub-period. Our interpretation is that the determinants of the adjustment speed changed over time. First of all, the most striking result for the sub-period 1971-1980 is that the Main Bank variable (*MB1*) is no longer significant, whatever the specification we estimate: in the 1970s, the link with the Main bank is not discriminating across firms, from the point of view of employment adjustment. If we consider the non financial variables, the following findings can be highlighted. The size (*SIZE1*) and the export ratio (*XPROD*) are still significant with the expected signs (respectively negative and positive). It is interesting to notice that the sign of the average age of the employees (*AGEMOY*) has now become significantly negative: "lifetime employment" is not yet a problem in the 1970s and a high average age will not accelerate the restructuring. The variables characterizing the "history" of the firms (*SINCE1*and *SINCE2*) are non significant. The ratio of R&D expenses (*RDRATIO*), is not introduced in the 1970s because of a lack of data. Finally, concerning the capital ratio (*INTENSK1*) we find the same unexpected result as that for the whole period.

We turn now to the analysis of the financial variables. We have already mentioned the interesting result concerning the Main bank. The following variables are significant with a negative sign: the performance (*PERFO2*), the ratio of debt to the sales (*DHK*), the share of the financial institutions (*INSTIFI*) and the degree of concentration of the shareholding (*SHARECON*). The *DER* variable now has a significant positive impact, while the ratio of foreign shareholders (*FORE1*) is no longer significant. This is not surprising because this ratio is very low in the 1970s (3.4%) and not discriminating across firms (the standard deviation is 6.7 against 12.3 for the whole period and 17.2 in the 1990, as indicated in the table 1).

Basically, the results are less robust for the sub-period 1992-2001. Moreover, the explanatory factors are different. The changes to be highlighted are the following. The Main bank has again a significantly negative impact. As far as the size (*SIZE1*) is concerned, the results are no longer significant. We have here the confirmation of previous results, according to which the size is no longer a major factor of the heterogeneity of employment adjustment across firms in the 1990s. We have to be more precise on this point: in the models a and b, where not all the financial variables (e.g. the Main bank) have been introduced, the size is significant, but the introduction of more financial variables (and, among others, the Main bank) improves the results of the estimation, whereas the size becomes non significant. Concerning the non financial variables, another noticeable finding is the fact that the average age of the employees (*AGEMOY*) now accelerates significantly the adjustment speed. One possible interpretation is the increasing pressures on the long term employment system, in a context of the aging of the workforce in some firms and the increasing wage-related costs. Moreover, the creation date (*SINCE1*) and the ratio of R&D expenses (*RDRATIO*) are now significant, with the expected sign (respectively positive and negative). If we now turn to the analysis of financial variables, the performance (*ROA* and *PERFO2*) and the DER have both a significantly negative impact. As for the shareholding structure, the cross-sharing (*CROSSHARE*) has an unexpected sign, while the share of foreign owners (*FORE1*) has a significantly positive impact. If one considers that the export ratio is no longer significant in the 1990s, we can interpret this result as a sign that the internationalization of the Japanese firms has changed its nature, from commercial to

commercial AND financial, but continues to accelerate the adjustment speed.

Finally, among the factors we just analyzed, we distinguish between those which are robust on the whole period (with the same significant sign) and those, which might be at the centre of the changes that occurred since the beginning of the 1990s. They are potentially an explanation of the increasing heterogeneity. Among the former, the performance always has a significantly negative impact on the adjustment speed. The impact of the variables characterizing the shareholding structure is also stable, even if we noticed some changes in the details, especially the share owned by foreign firms. Among the latter, the most important are the age (negative and then positive impact), the size (significantly negative and then no longer significant), the Main Bank (non significant impact and then significantly negative) and, to a lesser extent, the debt, whose impact becomes negative after having been positive, if one considers the DER.

6 Conclusion

The present study, based on the NEEDS-FQ database, questions what has been called "the end of the Japanese style lifetime employment system", through an analysis of the employment adjustment at the level of firms during the period 1970-2001 in a panel framework. We obtained two principle findings. First, an increasing heterogeneity across firms is observed in the 1990s, while the average speed of employment adjustment is almost the same during the contemporary crisis and in the 1970s. Thus, there is no sign of the end of the Japanese employment system, but rather a differenciation among firms. It may be an explanation of the so-called micro - macro paradox : the changes, which have taken place at the micro level do not go in the same direction and may compensate each other to give an impression of stability at the macro level. Definitively, this increasing heterogeneity is not the result of a statistical artefact, due to the resort of the micro data, as shown by the comparison between the 1970s and the 1990s.

Second, we have specified the underlying model of employment adjustement and the factors behind this increasing heterogeneity. More precisely, we found it is necessary to take into account both non financial and financial variables to explain the path

of the employment adjustment at the level of the firms. But the underlying model of adjustment differs in the 1970s and in the 1990s. If some factors of the model remain stable (in terms of significance and of sign), like the performance (which always contributes to a lower speed) and most of the variables characterizing the shareholding structure, some others changed drastically. To summarize, non financial factors like the size and the export ratio plaid an important role in the 1970s but no longer in the 1990s. On the contrary, the link to the Main Bank (as measured by the ratio of debt owned by the Main Bank) and the percentage of share owned by foreign firms become significant in the 1990s, the first one contributing to a lower speed and the second one to a higher speed. To put it differently, the financial structure of the firms plays a major role in the trend of increasing heterogeneity. This is a confirmation that the financial dynamics since the 1980s had a strong impact on the whole system and that the current crisis does not only reveal a pre-existing heterogeneity. At least two differentiated models of corporate governance seem to emerge. While some firms are getting closer to their Main Bank and reduce their speed of employment adjustment, some other firms are more directly under the pressure of international investors, which contributes to a higher speed of adjustment, or less employment security from the point of view of workers. Therefore, our analysis may also be read as a contribution to the analysis of the institutional complementarities, here between financial and employment contracts. Moreover, our study also pointed out that we cannot limit the analysis to the financial dynamics and that some employment practices are increasingly raising problems, as can be stated from the analysis of the positive correlation between the average age of employees and the speed of adjustment in the 1990s.

From a technical point of view, it is important to note that the quality and the wishful originality of these results come mainly from the adoption of a panel framework and above all from the choice of the estimation method. Indeed, this method produced individual coefficients as for a firm by firm estimation, improved by correcting abnormal values using the entirely available information. It allowed rigorously analyzing the deformation of these coefficients' distribution and the determinants of the individual speeds. Another point to be underlined is the confirmation that the speed is only one aspect of the adjustment model and it is necessary to consider the underlying structure

to get a better understanding. In our view, this point is at least as much important as the discussion on the discrete / continuous nature of the adjustment process, for which we did not propose any improvement.

At this stage, we should mention important issues at stake. First, the increasing heterogeneity of the firms' employment policies may have an impact in term of (employment security and wages) inequalities from the point of view of workers. It may be an explanation of the increasing inequalities, which are observed on the Japanese labor market since at least the beginning of the 1990s. This point should be carefully studied. Second, what has been assessed here in the case of the electrical machinery sector needs to be applied to other sectors, including non manufacturing industries, to check if our observation is not due to specific industry evolution. Third, it may be interesting to check if this increasing heterogeneity concerns not only the employment policy of the firms but also their productivity: more precisly, the changes in terms of employment security may affect the productivity of the workers, in a sense which has yet to be specified.

Finally, the limits of this empirical study of the employment adjustement provide several routes for further research. This study is first limited by an important survival bias, because we focused on firms in activity between 1970 and 2001. This is all the more acutely a problem because the 1990s were characterized by an increasing number of bankruptcies, which had an important impact on employment security. In fact, this bias probably leads to an underestimation of the firms' actual heterogeneity. In addition, we took into account only one aspect of the firms' employment policies, i.e. the management of regular employees, and, due to a lack of data, were not able to analyze practices related to non-regular workers – which are also probably another source of heterogeneity.

References

[1] Abe, M. (2002), 'Corporate Governance Structure and Employment Adjustment in Japan: An Emprirical Analysis Using Corporate Finance Data', *Industrial Relations*, 41, 4, 683-702.

[2] Aoki, M. (1990), 'Toward an Economic Model of the Japanese Firm', *Journal of Economic Literature,* 28,1, 1-27.

[3] Boyer, R., and Juillard, M. (2000), 'The Contemporary Japanese Crisis and the Transformations of the Wage Labor Nexus', in Boyer R. & Yamada T. eds *Japanese Capitalism in Crisis. A Regulationist Interpretation*, Routledge.

[4] Chuma, H. (2002), 'Employment Adjustments in Japanese Firms during the Current Crisis', *Industrial Relations*, 41, 4, 653-682.

[5] Development Bank of Japan (2000), 'Job Creation and Job Destruction in Japan, 1978-1998. An Empirical Analysis based on Enterprise Data'.

[6] Dore R. & Taira K. (1986), *Structural adjustment in Japan (1970-1982)*, ILO

[7] Hamermesh, D.S. (1993), *Labor Demand*, Princeton University Press.

[8] Hildreth, K.G.A. and Ohtake F. (1998), 'Labor Demand and the Structure of Adjustment Costs in Japan', *The Journal of the Japanese and International Economies* 12, 131-150.

[9] Hsiao, C. (1986), 'Analysis of Panel Data', *Econometric society Monographs 11.* Cambridge University Press.

[10] Hsiao, C. (1996), 'Random Coefficient Models', in Matyas L. and Sevestre P. eds *The Econometrics of Panel Data: A Handbook of the Theory with Applications*, Kluwer Academic, 77-99.

[11] Ministry of Labor (2001, 1999, 1998), *White paper on Labour.*

[12] Nickell S. (1981), "Biases in Dynamic Models with Fixed Effects", *Econometrica*, 49, 1399-1416.

[13] Oi, W. Y. (1962), 'Labor As a Quasi-fixed Factor', *The Journal of Political Economy*, LXX-6.

[14] Suruga, T. (1998), 'Employment Adjustment in Japanese Firms : Negative Profits and Dismissals', in Ohashi, I. and Tachibanaki, T. eds *Internal Labour Markets, Incentives and Employment,* Macmillan Press.

[15] Swamy, P.A. (1970), 'Efficient Inference in a Random Coefficient Regression Model', *Econometrica*, 38, 311-323.

Figure 1: Profiles of employment adjustment and profit

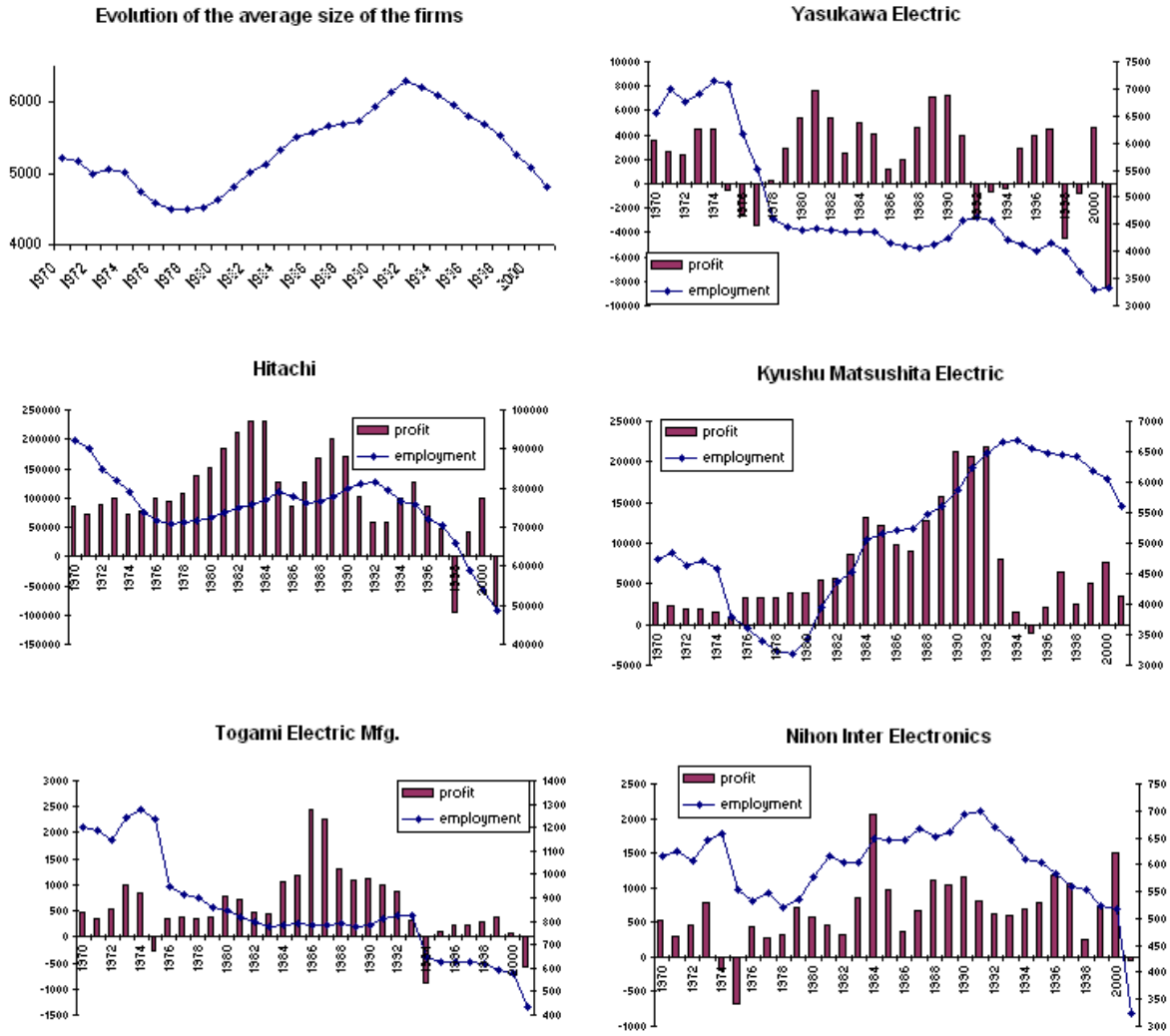

Figure 2: Evolution of the Speed of Employment Adjustment : Bartlett Estimates

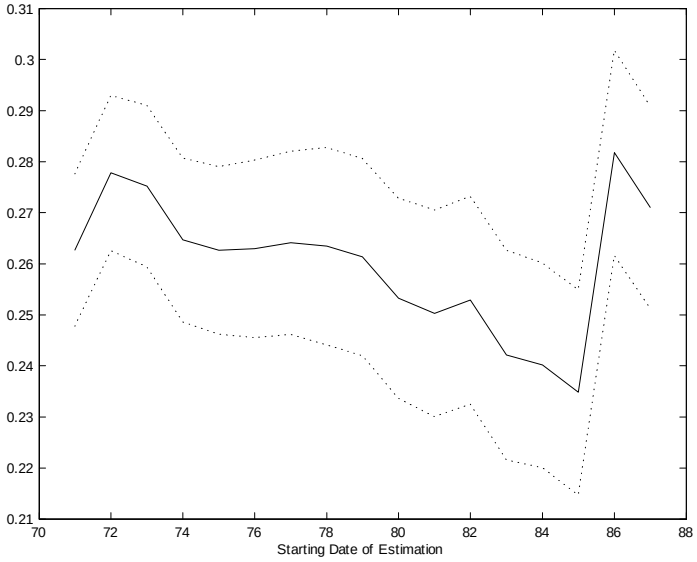

Table 1: Definition of Corporate Governance Variables

Category	Name	Source	Definition
			Corporate Governance
Performance	ROA	NEEDS	Operating profit plus interest and dividend received divised by total assets
	PERFO2	NEEDS	Ordinary profit divised by sales
	PERFO3	NEEDS	Current profit divised by total capital
Debt	DEBPAST	NEEDS	Interest expense and discount premium divised by total fixed liability
	DER	NEEDS	Total fixed liabilities / (total capital + total reserve)
	DHK	NEEDS	Total debt as a percentage of sales defined as total fixed liability and total current liability divised by sales and operating revenues
Shareholding	SHARECON	NEEDS	% of shares owned by the 10 principal shareholders
Structure	SHAREMOY	NEEDS	Average shares owned by the shareholders
	CROSSHAR	NEEDS	% of shares owned by other firms
	INSTIFI	NEEDS	% of shares owned by financial institutions
	INDIVFI	NEEDS	% of shares owned by individual shareholders
	FORE1	NEEDS	% of shares owned by foreign firms
	FORE2	JCH	% of shares owned by foreign firms
Main Bank	INDICMB1	KNK	Dummy taking the value 1 if the firm has an identified Main Bank and 0 if not
	MB1	KNK	Ratio of the bank debt owned by the Main bank
	MB2	KNK	% of shares owned by the Main Bank
	RGMB2	JCH	Rank of the Main Bank among the main shareholders
			Non Corporate Governance
Activities	SSECTOR	JCH	Dummy taking the values 1 to 7 according to the main activity of the firm
Size	SIZE1	NEEDS	Number of employees
History	SINCE1	JCH	Creation date of the firm
Export	XPROD	JCH	Exports as a percentage of total sales
Others	RDRATIO	NEEDS	R&D expenses divised by sales
	PRODUCTI	NEEDS	Real average sales per employee
	INTENSK1	NEEDS	Tangible fixed assets total plus intangible fixed asset divised by the number of employees
	INTENSK2	NEEDS	Tangible fixed assets total divised by the number of employees
	AGEMOY	JCH	Average age of employees

Notes: NEEDS corresponds to the Nikkei Economic Electronic Databank System . JCH denotes the Japan Handbook Company database, DENKI the Denki Rego database and KNK the Keiretsu no Kenkyu.

Table 2: Basic Features of the Variables

	1971-2001		1971-1980		1981-1991		1992-2001	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
SIZE1	5318	11 899	4810	11 466	5504	12 152	5671	12 076
AGEMOY	35.2	4.0	31.5	2.9	35.3	3.4	38.6	2.8
PRODUCTI	30.4	26.9	10.8	7.1	27.7	13.1	55.1	32.1
ROA	6.7	5.4	9.6	5.3	7.1	4.9	3.1	3.7
PERFO2	4.2	9.6	5.4	5.5	5.3	5.0	1.9	15.0
DER	49.0	163	49.5	253	44.2	46.5	53.5	111
SHARECON	45.6	14.0	48.1	15.4	45.9	13.5	44.0	13.4
CROSSHAR	25.3	19.6	25.6	20.6	25.6	18.3	24.8	20.3
FORE1	6.6	12.3	3.4	6.7	6.9	8.8	8.7	17.2
INSTIFI	32.7	21.1	26.5	15.8	33.5	14.6	36.7	28.3
MB1	0.27	0.13	0.26	0.13	0.28	0.12	0.28	0.15
XPROD	21.6	18.8	18.7	17.9	20.9	18.1	15.5	20.3

Table 3: Estimated Speed of Employment Adjustement[11]

	Pooled	Within	Indiv	Pond	GLS
1971-2001	0.07	0.22	0.31	0.30	0.30
	(19.88)	(34.88)	(2.02)		(1.96)
1971-1980	0.10	0.36	0.50	0.49	0.48
	(15.31)	(26.74)	(1.27)		(1.20)
1992-2001	0.03	0.36	0.49	0.48	0.47
	(4.57)	(22.51)	(1.16)		(1.09)

Notes: For all the estimated models, we report the speed of adjustment of labor - which corresponds to the opposite value of the estimated parameter a_3. Indiv. denotes the average of individual OLS estimates and Pond denotes the corresponding weighted average, where the weights are defined as the inverse of individual variances. The t-stats are in parenthesis except for GLS for which the estimators of the mean and of the variance of the coefficients distribution are reported

Table 4: The Factors of Heterogeneity of the Adjustement Speed over 1971-2001. Cross-Section Regressions[12].

	Model a	Model b	Model c	Model d
SINCE1	0.04 (3.78)	0.07 (4.57)	−0.002 (−0.14)	—
SIZE1	$-1.9e^{-4}$ (−14.03)	$-2.4e^{-4}$ (−15.02)	$-2.5e^{-4}$ (−13.24)	$-2.5e^{-4}$ (−14.36)
AGEMOY	0.42 (6.08)	0.49 (5.59)	0.32 (3.35)	0.32 (3.36)
INTENSK1	0.13 (2.56)	0.31 (4.24)	0.41 (4.53)	0.38 (4.72)
RDRATIO	−0.34 (−7.16)	−0.61 (−9.84)	−0.83 (−11.47)	−0.86 (−11.94)
XPROD	0.12 (12.29)	0.20 (14.59)	0.19 (11.56)	0.19 (12.13)
ROA	—	−0.45 (−4.08)	−0.25 (−1.81)	—
PERFO2	—	—	—	−0.26 (−2.38)
DEBPAST	—	—	—	−0.03 (−2.62)
DER	—	−0.01 (−3.55)	−0.02 (−4.18)	−0.02 (−4.73)
DHK	—	—	5.78 (3.68)	7.26 (4.53)
SHARECON	—	—	0.26 (8.02)	0.28 (8.33)
CROSSHAR	—	—	−0.21 (−7.94)	−0.21 (−8.64)
INSTIFI	—	—	−0.11 (−4.98)	−0.10 (−5.46)
FORE1	—	—	0.17 (4.75)	0.17 (4.79)
LAND	—	—	−0.09 (−0.86)	—
MB1	—	−16.99 (−9.38)	−17.98 (−8.52)	−16.30 (−7.76)
Cste	−0.77 (−3.08)	−1.16 (−9.38)	0.23 (0.67)	0.16 (4.03)
Adj-R^2	0.12	0.21	0.27	0.27
Fisher	93.5	90.7*	62.6*	67.4*
RSS	32.90	22.80	17.79	17.77

Notes: The dependent variable is the labor adjustment speed. All the continuous explanative variables correspond to the individual averages. The t-statistics are into brackets. All estimated parameters, except the constant, are divised by 100. * indicates that the global Fisher statistic is significatively different from zero at a risk level of 5%.

Table 5: The Factors of Heterogeneity of the Adjustement Speed over 1971-1980. Cross-Section Regressions[13].

	Model a	Model b	Model c	Model d
SINCE1	0.04 (1.12)	—	—	—
SIZE1	$-1.8e^{-4}$ (−4.77)	$-2.3e^{-4}$ (−5.38)	$-1.7e^{-4}$ (−4.47)	$-2.3e^{-4}$ (−5.55)
AGEMOY	−1.00 (−5.13)	−1.16 (−6.08)	−1.25 (−7.41)	−1.21 (−6.34)
INTENSK1	3.38 (7.34)	3.33 (7.38)	3.62 (8.96)	3.55 (7.73)
XPROD	0.15 (5.10)	0.15 (5.07)	0.15 (5.43)	0.15 (4.98)
ROA	−0.77 (−4.30)	−0.74 (−4.49)	−0.62 (−4.19)	—
PERFO2	—	—	—	−0.92 (−5.42)
DEBPAST	0.04 (1.33)	—	0.08 (2.80)	—
DER	0.04 (3.67)	0.02 (4.70)	0.02 (5.56)	0.02 (4.51)
DHK	−2.32 (−7.32)	−1.46 (−4.82)	−1.43 (−5.43)	−1.50 (−5.12)
SHARECON	—	−0.13 (−3.97)	—	−0.01 (−4.60)
INSTIFI	—	−0.12 (−3.64)	−0.09 (−3.23)	−0.12 (−3.40)
FORE1	—	—	−0.18 (−2.68)	—
MB1	−4.73 (−1.28)	—	—	—
Cste	−0.09 (−0.10)	0.89 (11.90)	0.81 (12.91)	0.16 (4.03)
Nobs	126	126	126	126
Adj-R^2	0.26	0.31	0.31	0.32
Fisher	35.4*	36.01*	43.84*	37.48.4*
RSS	16.42	10.39	13.76	10.26

Notes: The dependent variable is the labor adjustment speed. All the continuous explanative variables correspond to the individual averages. The t-statistics are into brackets. All estimated parameters, except the constant, are divised by 100. * indicates that the global Fisher statistic is significatively different from zero at a risk level of 5%.

Table 6: The Factors of Heterogeneity of the Adjustement Speed over 1992-2001. Cross-Section Regressions[14].

	Model a	Model b	Model c	Model d
SINCE1	0.05 (1.15)	0.16 (3.52)	0.22 (4.06)	0.24 (4.85)
SIZE1	$-2.7e^{-4}$ (−4.90)	$-1.7e^{-4}$ (−3.16)	$-7.6e^{-4}$ (−1.14)	—
AGEMOY	1.51 (6.90)	0.78 (3.49)	1.17 (5.09)	1.40 (5.91)
INTENSK1	0.52 (5.09)	—	—	—
RDRATIO	−1.02 (−5.37)	−1.33 (−7.10)	−2.22 (−9.01)	−2.19 (−8.99)
XPROD	−0.01 (−0.52)	—	—	—
ROA	—	−1.14 (−4.40)	−0.96 (−3.16)	—
PERFO2	—	—	—	−0.26 (−2.47)
DER	—	—	—	−0.04 (−4.61)
DHK	—	1.10 (4.37)	—	—
CROSSHAR	—	0.24 (7.46)	0.38 (9.24)	0.45 (10.46)
FORE1	—	0.17 (2.75)	0.68 (7.59)	0.52 (5.35)
MB1	—	—	−1.27 (−2.37)	−1.72 (−3.18)
Cste	−1.33 (−1.41)	−3.22 (−3.51)	−4.37 (−4.15)	−4.83 (−5.05)
Nobs	126	126	126	126
Adj-R^2	0.12	0.17	0.22	0.23
Fisher	29.4	34.6*	33.1*	35.4*
RSS	50.97	47.58	31.02	30.54

Notes: The dependent variable is the labor adjustment speed. All the continuous explanative variables correspond to the individual averages. The t-statistics are into brackets. All estimated parameters, except the constant, are divised by 100. * indicates that the global Fisher statistic is significatively different from zero at a risk level of 5%.