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### AND THE MINIMUM WAGE:

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# Wage Rigidity, Collective Bargaining and the Minimum Wage:
## Evidence from French Agreement Data[*]

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**Abstract**

Using several unique data sets on wage agreements at both the firm- and the industry-levels in France, we examine the impact of typical European wage-setting institutions on the form and the degree of wage rigidity. We highlight different stylized facts concerning wage stickiness. First, in France, the typical duration of a wage agreement is one year. Consequently, a Taylor (1980) -type model appears to reproduce appropriately the distribution of agreement durations. Some 30 percent of settlements stipulate several predetermined wage changes during the year following the date of signature of the agreement. The frequency of wage agreements is highly seasonal, but the dates at which agreements take effect are more staggered. The date at which the national minimum wage level is revised each year has a significant impact on the timetable of wage agreements, both at the firm- and at the industry-levels. Wage increases negotiated at these two levels mainly depend on the inflation regime, the firm profitability and the proportion of minimum-wage workers in the same industry.

**Keywords:** wage stickiness, wage bargaining, minimum wage, downward nominal wage rigidity

**JEL Codes:** J31, J50, E30

**Résumé**

A partir de plusieurs bases de données originales portant sur les accords de salaire au niveau des entreprises et des branches en France, nous étudions l'impact des caractéristiques institutionnelles de fixation des salaires sur la nature et le degré de rigidité salariale. Nous mettons en évidence plusieurs faits stylisés sur la rigidité des salaires. Tout d'abord, en France, la durée d'un accord de salaire est généralement d'une année. Un modèle à la Taylor (1980) apparaît comme le plus à même de reproduire la distribution des durées des accords. Environ 30% des accords prédéterminent plusieurs changements de salaire au cours de l'année suivant la date de signature de l'accord. La fréquence des accords salariaux est très saisonnière mais les dates d'effet des accords sont plus échelonnées. La date à laquelle le salaire minimum est modifié a un impact significatif sur le calendrier des accords de salaire au niveau des entreprises et des branches. Les hausses de salaire négociées à ces deux niveaux dépendent principalement du régime d'inflation, de la profitabilité de l'entreprise et de la proportion de salariés rémunérés au voisinage du salaire minimum dans un même secteur.

**Mots-clés** : rigidité des salaires, négociation des salaires, salaire minimum, rigidité à la baisse des salaires

**Codes JEL :** J31, J50, E30

# 1. Introduction

In most macroeconomic models, the existence of contractual rigidities explains why monetary policy might have real impact on output. These models often assume that prices are rigid. They have led to recent studies examining the degree of price rigidity using individual price quotes (see for instance, Bils and Klenow, 2004, Dhyne *et al.*, 2006, and Nakamura and Steinsson, 2008). In addition to price rigidity, more recent macro-econometric models have introduced wage stickiness (see, for instance, Erceg *et al.*, 2000, and Gali, 2010, for a recent survey). Following seminal contributions by Fischer (1977), Taylor (1980) and Calvo (1983), such models are based on nominal staggered or synchronized wage contracts. Some New-Keynesian macro models (Ambler *et al.*, 1999, Huang and Liu, 2002 and Christiano *et al.*, 2005) have even emphasized that wage rigidity is much more important than price rigidity in order to replicate the dynamic impact of monetary policy on output. However, compared to price rigidity, research on nominal wage rigidity is still scarce.[1] We provide here new empirical evidence on the form and on the degree of wage rigidity in France using data on wage contracts.

European labor markets are characterized by complex institutions governing collective wage bargaining, but, to our knowledge, very few empirical papers link nominal wage rigidity with this institutional framework. However, wage bargaining institutions may play a key role in explaining to which extent wages adjust to various economic shocks (see, e.g., the conclusions of the ECB Wage Dynamic Network (WDN hereafter) final report, 2010). In this paper, we use a unique administrative data set containing precise information on collective wage agreements observed at the industry- and at the firm-levels in France over the period 1994-2005. Using this information, we are able to draw a more precise picture of how wages are set at the different levels of the wage bargaining process, and to which extent typical European institutions of wage-setting may have an impact on the degree and the form of wage rigidity.

Our contribution is threefold. First, our paper presents new results on wage rigidity and expands previous findings obtained with survey data for other countries. Most studies on wage rigidity use survey data collected once a year and they are not able to provide direct evidence on the average duration of wage contracts. Our data on collective agreements allow us to observe wage changes at a higher frequency since we observe the exact dates of signature of the contracts. Many studies have provided indicators of wage rigidity using such data on collective agreements in the United States or in Canada (see, e.g., Taylor, 1983, Vroman, 1984, Cecchetti, 1987, Christofides and Laporte, 2002 and Christofides and Stengos, 2003). Taylor (1999) concludes from those studies that the average duration of a wage contract is close to one year in the United States. However, this result cannot be easily extrapolated to other countries for two reasons: i) this finding is obtained for North-American countries where the wage bargaining process is highly decentralized and where a small proportion of workers is covered by wage agreements; ii) these studies use data collected in the seventies. More recent papers have examined the distribution of wage changes, and especially the degree of downward wage rigidity in European countries (see, for instance, Fehr and Goete, 2005, Biscourp *et al.*, 2005, and Dickens *et al.*, 2007), but it is sometimes difficult to reconcile their results with the main features of the wage bargaining system prevailing in these countries. Moreover, this literature has focused on downward rigidity rather than on wage contract durations. One objective of our paper is to assess the degree of wage stickiness using actual wage contract data both at the firm- and at the industry-levels. We aim at providing some micro estimates of wage rigidity patterns that may be compared to the ones computed by Bils and Klenow (2004), Dhyne *et al.* (2006), and Fougère *et al.* (2007) for prices. Our

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[1] Recent exceptions include papers by Heckel *et al.* (2008) for France, and Barattieri *et al.* (2009) for the United States.

main findings are the following. The typical duration of a wage contract at the firm- or at the industry-level is around one year. There is some heterogeneity across industries but it mainly reflects firm size effects. Some settlements stipulate predetermined wage increases but a majority of agreements cover only one year. Thus the main patterns of collective wage agreements appear in line with the predictions of the models proposed by Fisher (1977) and Taylor (1980). We also find that inflation has a significant positive effect on the negotiated wage increases at the firm level; this may support the presence of implicit indexation mechanism in wage agreements. Moreover, firm profitability has a significant positive impact on the size of wage increases whereas local unemployment has a negative effect on negotiated wage increases at the firm-level.

Second, our paper also examines the timetable of wage agreements. Whether wage change decisions are staggered or synchronized may be a key issue to improve our understanding of the effects of the monetary policy (see, e.g., Taylor, 1999). Recently, a small but growing literature has assessed the seasonal effects of monetary shocks. For the United States, Olivei and Tenreyro (2007) show that monetary shocks that occur in the first quarter of the year have quicker and larger impacts than the ones arising during the fourth quarter because wage changes are bunched during the first months of the year. Olivei and Tenreyro (2008) expand these conclusions to the euro area and to Japan; they find that an uneven staggering of wage contracts across quarters in Europe can explain the delayed and persistent effects of monetary policy shocks on output. Nevertheless, their two studies rely on anecdotal evidence on wage change seasonality. Here we provide more systematic evidence on the synchronization of wage change decisions. Using survey data, Druant *et al.* (2009) actually find that wage changes are more likely to occur at the beginning of the year in many European countries. Besides, De Walque *et al.* (2010) have examined the impact of wage change seasonality on the effects of monetary policy and obtain results close to the findings of Olivei and Tenreyro (2007). In our paper, using data on collective agreements, we examine in detail the seasonality of the dates of signature and of the dates of effect of wage contracts in France. We find that the seasonality of wage changes may be directly linked to the bargaining process. The frequency of wage agreements is seasonal: industries first bargain on wages between October and January, whereas firms negotiate during the first months of the following year. The dates at which wage agreements take effect are actually more staggered over the year than their dates of signature. From this viewpoint, the minimum wage plays a key role in staggering wage changes over the year.

Finally, our paper contributes to the literature on industrial relations. To our best knowledge, we build for the first time a data set containing information on collective agreements both at the firm- and at the industry-levels in France. Consequently, our study provides some new useful results on how wages are set at the different levels of the wage bargaining process. Recent macroeconomic models show that the way wages are negotiated has a strong impact on the real effects of the monetary policy (see, e.g., Cukierman and Lippi, 1999, and Acocella *et al.,* 2008). More generally, a long strand of the literature has emphasized the importance of the degree of centralization and coordination of wage bargaining on macroeconomic performance (see, for instance, Calmfors and Drifill, 1988, and Nickell, 1997). Some macroeconomic indicators on wage bargaining are indeed available (see, e.g., Elmeskov *et al.*, 1998, and Ebbinghaus and Visser, 2000) but microeconomic studies are still scarce, especially for European countries.[2] For instance, no quantitative evidence has been made available for France, although the French labor market is typical of a European system of wage bargaining: almost all workers are covered by a wage agreement, different levels of wage bargaining coexist, and a significant proportion of workers are paid at the national minimum wage level, which is binding. In addition, Aghion *et al.* (2010) have recently pointed out the role of public institutions on the quality of

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[2] Exceptions include studies by Hartog and Teulings (1998) and Hartog, Leuven and Teulings (2002) for Holland, Izquierdo *et al.* (2002) for Spain, Hartog, Pereira and Vieira (2002) for Portugal, and Fregert and Jonung (2008) for Sweden.

labor relations and shown that a binding national minimum wage might crowd out the possibility for agents to negotiate. In this paper, we show that the higher the percentage of minimum-wage workers, the less frequently firms negotiate, their wage increases being then set automatically by the industry-level agreement for the majority of their workers. [3] We also find that industry-level agreements are more likely to cover small firms and to be binding for low-paid workers, whereas firm-level agreements concern larger firms and higher paid workers. Consequently, systematic links between industry- and firm-level agreements are hard to observe but we show that the national minimum wage plays a key role in shaping collective bargaining on wages.

Our paper is organized as follows. Section 2 presents the main institutional features of wage-setting in France. Our data sets are described in Section 3. Section 4 discusses some basic results on the elapsed time between successive agreements, and examines some determinants of the occurrence of wage agreements in France. Section 5 provides results on the timing of wage agreements. Finally, the distribution of wage changes in collective agreements and its determinants are examined in Section 6. Section 7 concludes.

## 2. Institutional features of collective bargaining in France

We describe the main institutional principles governing collective bargaining in France, namely the existence of a hierarchy between the different levels of wage bargaining, the very wide coverage of collective agreements through extension procedures, and the significant regulatory role of the government.

### 2.1 Hierarchy of wage bargaining levels

Wages are bargained or set at three different levels: (i) at the national level, a binding minimum wage is set by the government according to an official formula (see below); (ii) at the industry level, employers' organisations and unions negotiate pay scales and wages are negotiated occupation by occupation; (iii) at the firm level, employers and unions usually negotiate wage increases. The majority of industries negotiate agreements at the national level. However, the metalworking industry (around 2 million workers covered by agreements) negotiates at the *département* level[4] for blue-collar workers and white-collar workers and at the national level for managers, while the construction industry (around 1.2 million workers covered by agreements) negotiates at the regional level.[5] On average, around 65 percent of workers are potentially covered by industry agreements in economic sectors excluding the metalworking and construction industries. Around 2 percent of workers are covered by a statute or a specific agreement, and some 5 percent are not covered by any industry-level agreement. Thus, almost all workers are potentially covered by an industry-level agreement.

The principle of a hierarchy in bargaining levels was introduced in November 1950. It implies that a collective agreement must set forth, broaden or enhance an agreement previously signed at a higher bargaining level. This feature is very common across European countries (see Du Caju *et al.,* 2008) and often leads to the predominance of industry-level agreements. In France, workers are only covered if an agreement is signed in a given year. At the industry level, if the wage bargaining process fails, the previous pay scale prevails until a new agreement is signed. At the firm level, if there is no collective agreement on wages in a given year, there is no collective wage increase but individual wage increases are possible. On average, around 66 percent of workers are covered by an industry-level wage agreement each year (see Table 1). The coverage rate is higher in the metalworking (80

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[3] On the effect of the minimum wage on prices, see for instance Fougère *et al.* (2010).

[4] A *département* is an administrative zone. There are 96 *départements* in France. Each has approximately the same geographical size (6,000 km², i.e. four times an American county and three times an English county), but different populations.

[5] A *région* is an administrative zone consisting of 2 to 8 *départements*.

percent) and construction industries (around 75 percent), whereas the rate is closer to 65 percent in other industries. Firm-level wage agreements cover a smaller proportion of workers: on average, a bit more than 20 percent of workers are covered by a wage agreement each year from 1994 to 2005 (see Table 1). In Portugal, by comparison, fully decentralized bargaining concerns only some large companies (see Hartog, Pereira and Vieira*,* 2002), while 13 percent and 14 percent of workers are covered by a firm-level agreement in Spain (see Izquierdo *et al.,* 2001) and in Holland (see Borghans and Kriechel, 2007), respectively.

However, different laws have strengthened the decentralization of the wage bargaining process in France over the last thirty years. Three channels have been used to promote firm-level agreements: i) the obligation for firms to negotiate on wages each year, ii) more possibilities offered to firms to deviate from industry-level agreements, and iii) fiscal incentives. The Auroux Law in 1982 introduced two significant changes in the legal framework of wage bargaining: each year, a firm must negotiate wages with unions (even if they do not reach an agreement at the end of the bargaining process) and, for the first time, some escape clauses were introduced for very specific topics. The legislation concerning the working time reduction (Robien's laws in 1996, the first Aubry's law in 1998, the second Aubry's law in 2000) reinforced the trend towards decentralization since escape clauses became possible for working hours. Moreover, in firms with less than 50 workers, a representative employee chosen by all workers in the firm could negotiate with the firm's managers. Finally, fiscal incentives were also introduced to promote negotiations at the firm level. In 2008, the reduction of social security contributions paid by the employers became conditional upon wage negotiations occurring within the firm. However, over our sample period, we do not observe a strong trend towards decentralization (see Table 1). The main variation observed in the coverage rates between 1998 and 2002 is due to the legislation concerning the working time reduction.

## 2.2 Extension procedures

As in many European countries, the unionization rate is very low in France (less than 10 percent), but the coverage rate of wage agreements is very high (close to 100 percent). On the contrary, in countries like the United States or the United Kingdom, unionization is equal to the coverage rate since only unionized workers are covered by wage agreements. In France, the difference between the unionization rate and the coverage rate by agreements may be explained by the two following factors.

First, at the firm level and until recently, the legitimacy of unions does not stem from elections. Five large unions are considered as representative by law. Their representativeness cannot be disputed by employers. Moreover, until 2004, the signature of only one union was sufficient for an agreement to apply to all the workers employed in a firm. More recently, new laws have introduced majority principles into wage agreements, but a firm-level agreement still covers all workers within the firm.

Second, at the industry level, extension procedures allow agreements to apply to all workers employed within an industry. At first, an industry-level wage agreement applies to all firms represented by the employers' associations signing the text. Then, an extension of the agreement to the whole industry can be requested either by the government, by employers' associations or by unions. Once extended, the agreement applies to all workers within the industry. Extension procedures are common in France (as in most European countries) and no specific criterion is needed to obtain an extension.[6]

## 2.3 National minimum wage

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[6] In Germany, to obtain an agreement extension, 50 percent of employees must be covered by the initial agreement. In Spain, by contrast, extension is automatic (see Du Caju *et al.*, 2008).

Beyond its role in agreement extensions, the government sets the national minimum wage (NMW hereafter) level and promotes wage bargaining at the different levels.

In France, the NMW (called *Salaire Minimum Interprofessionnel de Croissance*, or SMIC) is set at the national level. It applies to all workers and to all types of firms. Minimum wage increases are binding. Until 2010, the NMW was raised each year in July according to a legal formula based on partial indexation to past inflation and to past wage growth. In addition to these indexation procedures, the government may decide, on a discretionary basis, to increase the raise. Over the sample period, the NMW was modified most often in July, except in 1996 when it was also increased in May. Over our sample period, the NMW increases were on average higher than overall wage growth. On average, 13 percent of workers were paid the NMW whereas in most countries where a NMW exists, less than 5 percent of workers are paid the minimum wage (see Du Caju *et al.*, 2008).

The French central government also provides specific mediation services for the private sector, mostly in cases of disputes. Mediation is offered by a specific commission ("*Commission mixte paritaire*") for bargaining at the industry level (88 cases in 2005). More recently, the government has promoted wage bargaining in industries where the industry minimum wage is below the NMW (84 industries in 2007).[7]

## 3. Data

Our paper makes use of three original data sets containing precise information on the agreements signed at the different levels of the wage bargaining process and on the share of minimum wage earners at local and sectoral levels. A fourth data set helps us to provide a full characterization of firms and to identify firms which are not covered by a firm-level agreement. In our study, the statistical unit is the firm.

### 3.1 Industry-level agreements

In France, at the aggregate level, the bargaining system is made up of about 700 "*branches*". These *branches* do not exactly or systematically match industries of the usual classification of economic sectors or products.[8] Some of them cover a very limited number of workers while others cover thousands of workers.[9] Moreover, a single firm may include workers covered by one *branche* and others by another one. However, we often observe that the majority of workers in a firm are covered by only one *branche* and that *branches* often cover a whole economic sector. So, in the rest of text, we will use the term sector or industry for "*branche*".

We have collected data on industry-level agreements from the annual reports on bargaining (*Rapports annuels sur la négociation*) published by the Ministry of Labor over the period 1994-2005.[10] These reports list all wage agreements signed in a given year in sectors with more than 10,000 workers.[11] A little less than 2,000 wage agreements are reported, which corresponds to 206 industries. 123 industries have nationwide coverage, while 83 cover regional or local areas. Metalworking industry agreements concern local areas (*départements*) while the coverage is regional (*regions)* for the construction industry. All in all, the agreements contained in our data set cover around 12 million workers in 2005, which represent approximately 75 percent of workers employed in the private sector.

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[7] In that case, the NMW applies.

[8] For instance, due to historical reasons, collective agreements in the metalworking industry signed at the local level may cover workers that are not actually working in metalworking industries.

[9] For example, collective agreements in the leather industry cover around 3,000 workers whereas collective agreements in the bakery industry cover a little less than 115,000 workers.

[10] Olivei and Tenreyro (2008) mention this source of data and uses annual French data on industry-level wage agreements for the year 2003 only in order to provide some insights on the seasonality of wage bargaining at the industry level in France.

[11] Since 2003, the French Ministry of Labor systematically reports wage agreements in industries with more than 5,000 employees. Nevertheless, we restrict our analysis to industries which are observed all along the observation period (i.e. those with more 10,000 employees).

The main variables used in our statistical analysis include an indicator of the industry, the geographical coverage of the agreement and the number of workers in the industry. Some variables provide details on the agreement, including its date of signature (day/month/year), the date at which it takes effect (the so-called date of effect), and, for the period 1999-2005, the average wage increase contained in the agreement.[12] One of the limitations of this data set is that the whole pay scales are not available. These scales may be very different across industries, and their comparison is difficult to undertake.

### 3.2 Firm-level agreements

We also use an administrative data set containing information on all firm-level agreements collected by the Ministry of Labor from 1994 to 2005. By law, firms must report to the Ministry of Labor all agreements they conclude. About 350,000 agreements (covering different topics) were collected by the Ministry of Labor over the period 1994-2005.

The main variables available in this data set are the following: the main scope of the agreement (wages, bonuses, workweek reduction, employment, discrimination, etc) and the date of signature of the agreement (month/year). The date of effect and the wage increase negotiated in the firm are also available but only for the period 1994-2001.[13] Because of important methodological changes in the collection of information concerning agreements, all the variables are not available for the whole period.

To match this data set with the industry-level wage agreements, we assume that all workers of a firm are covered by only one industry wage agreement. We also assume that all workers are covered by a firm-level agreement.

### 3.3 National minimum wage

On average, over the sample period, 13 percent of workers are paid the NMW in France. It is thus clear that the NMW may play a significant role in the bargaining process. To assess the role of the NMW in France, we also use a data set containing the proportion of workers paid around the NMW both in a given industry and a given *département*. For that purpose, we use exhaustive administrative files on wages (*Déclarations Annuelles des Données Sociales, DADS*) which contain base wages and number of days paid each year for each worker. These data sets enable us to compute the proportion of days paid around the minimum wage (between 0.9 and 1.2 the hourly minimum wage) in a given *département* and in a disaggregate industry (classification NES 114) each year over the period 1994-2005. We thus compute an indicator of the importance of the NMW in the wage distribution considered at a very disaggregate level.

### 3.4 Firm data

Finally, we use a data set containing firm-level information to identify firms which negotiate, but also firms which never reach an agreement. These latter firms are by definition not reported in the firm-level agreement data set. This data set, called *Fichier Bancaire des Entreprises* (*Fiben* hereafter), is produced by the *Banque de France*. It contains annual information on the balance sheet of firms for hundreds of thousand firms. Some economic sectors - like financial activities, education, health and administration - are excluded from this data set. Information like the number of workers within the firm, its geographical localization, its economic performances, is available for all firms – those which negotiate on wages but also those which do not sign any agreement. Using this information, we can in particular compute profitability indicators. Following Guertzgen (2009), we measure firm profitability as quasi rents per capita:

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[12] In a large majority of industries, pay scales deal with monthly or annual base wages.

[13] In most firm-level wage agreements, collective wage increases refer to monthly base wage increases.

$$\pi_{it} = \frac{Y_{it} - Mat.Costs_{it} - N_{it}\overline{w}_t}{N_{it}}$$

where $Y_{it}$ is annual sales of firm $i$ in year $t$, $Mat.Costs_{it}$ annual material costs for firm $i$ in year $t$, $N_{it}$ the number of employees in year $t$ in firm $i$, and $\overline{w}_t$ the average labor cost per capita at the sectoral level. This average sectoral wagebill is introduced to tackle a possible endogeneity issue due to the presence of an accounting relationship between profit and wages. We use two digit sectoral producer price indices to deflate all monetary values. For the analysis of wage changes and agreements, we compute the annual log variation of this performance indicator.

Our final data set come from the matching of the four data sets presented above. It contains all the firms present in the *Fiben* data set, excluding firms belonging to industries not reported in our data set concerning industry-level wage agreements. Our sample contains around 1.5 million of observations (i.e. 230,000 firms). The distribution of firms according to their size or to their economic activities is very similar to the one in the whole economy (see Appendix, Table A).

## 4. Durations of wage agreements

We now assess the degree of nominal wage stickiness using data on collective agreements. In macro models, the time interval over which the individual wage remains fixed is often used as a key parameter for modelling labor markets. Some previous studies have computed the average wage contract duration using wage agreement data (see for instance Taylor (1983), Cecchetti (1987) and Vroman (1987) for the United States, and Christofides and Laporte (2002) and Christofides and Stengos (2003) for Canada). Taylor (1999) finds that one year is a good approximation of the average wage contract. However, few studies have measured wage contract duration in European countries where bargaining takes place at several levels and where wage collective agreements cover more workers than in the United States.

### 4.1 Durations of wage agreements

For each firm and each industry, we calculate a weighted average duration (in months) between two successive agreements, the weight being equal to the number of covered workers in each firm. Note that in France, there is usually no expiry date in wage agreements since firms have to negotiate by law each year on wages. In a given year, if no agreement is signed at the firm- or industry-level, workers are not covered by any contract and there is no collective wage increase. Consequently, the duration of an agreement is here computed as the difference between two successive agreements.[14]

Table 2 reports some descriptive statistics on the duration of wage contracts at the firm- and at the industry-levels. The average elapsed time between two agreements at the industry level is slightly over one year (16 months) but the median of the distribution is close to 12 months. At the firm level, the average duration between two agreements is slightly greater than 18 months. However, the assumption that agreements are signed at the firm rather than at the plant level may lead to marginal changes in this statistic, since in large firms, it is more common for certain plants to sign independent agreements. All in all, the typical duration of a wage contract in France is close to one year. These results appear to be consistent with the ones obtained on U.S. data (see, for instance, the survey by Taylor, 1999).

There is some heterogeneity in the wage duration across firms. It mainly depends on the size of the firm (see Table 2). In firms with more than 100 workers, the average duration ranges between 18 and 24 months. In firms with less than 100 workers, it ranges between 36 and 60 months, which implies

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[14] For the same reason, it is difficult, but maybe not very relevant, to compute and to analyze delays in renewal of labor contracts, as in Gu and Kuhn (1998) or Danziger and Neuman (2005).

that negotiations are less frequent in these firms. Unlike what happens in the United States, the fact that in France the elapsed time between two successive agreements is often larger than 12 months does not necessarily mean that the agreements come into force for more than one year. At the industry level, wage scales are revised annually and contracts do not contain an automatic clause for an annual wage increase, even in the absence of an agreement the following year. These durations do reflect the length of time for which the negotiated wages remain actually fixed.

Figures 1 and 2 plot the distributions of durations between two successive agreements at both the industry- and the firm-levels. Those two distributions show a peak at 12 months, which reflects both the legal obligation in France to negotiate wages each year and the regularity of the bargaining calendar (see the next section). In 33 percent of industries, the average length of time between two successive agreements ranges from 11 to 13 months. In the metalworking and construction industries, there is a higher proportion of 12-month durations since wage agreements occur more regularly in those sectors. There are two other – but less pronounced - modes around 24 and 36 months. They reflect the failure of negotiations in a given year (see Figure 1). At the firm level, the 12-month peak corresponds to the significant proportion of firms that negotiate successfully (i.e. that sign an agreement) the same month each year. Note that, in the case of firm level agreements, nearly one fourth of the durations between two successive agreements are between 11 and 13 months (see Figure 2). The 24-month peak corresponds to firms that negotiate often but reach an agreement less regularly. Finally, the significant proportion of durations which is lower than one year might correspond either to measurement errors due to plant-level agreements, to amendments to agreements in the course of the year, or to less frequent bargaining occurrences. Those findings are in line with predictions of a Taylor (1980) model where firms set their wages for a given and constant period of time (i.e. 12 months). We can also note that this evidence is not consistent with the Calvo (1983) model where the probability of wage bargaining is assumed to be exogenous and the distribution of durations between two successive wage agreements is predicted to be more widespread.

### 4.2 Durations between two successive dates of effect

Firms or industries may decide to predetermine wage changes in the wage agreement. Wage agreements can come into force at several dates, called dates of effect, and those dates are predetermined in the agreement. Thus, an agreement may stagger wage increases over the year. Conversely, it may also stipulate a retroactive application of pay rises. At both the industry- and the firm-levels, there may be a gap between the signature date and the date at which the agreement actually comes into force.[15] This section is devoted to the analysis of the duration between the signature date and the date of implementation of the agreements. We also focus on the different dates of wage changes occuring between two successive agreements.

In Table 3, we compute the proportion of agreements stipulating a given number of dates of effect. Very few agreements contain more than one date of effect in the metalworking industry. In other industries, 75 percent of agreements have one date of effect and they all have at most two dates of effect. So within the same industry, wages changes are not frequently staggered and the delay between the signature and the implementation of the agreement is quite short. Table 4 contains descriptive statistics on the duration between the date of signature and the different dates of effect. At the industry level, the average duration between the agreement date and the date at which it comes actually into force is always less than one year. As a result, agreements usually are implemented during the year following their signature. In the construction industry, the date of effect is often the agreement date. In the metalworking industry, agreements are generally signed at the end of the year but are retroactively

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[15] For taking into account this fact, Christofides and Laporte (2002) analyse what they call "intra contract wage profile".

applied at the beginning of the same year. The interval between the agreement and its implementation is somewhat longer in all other sectors covered by national agreements. On Figure 3, we plot the distribution of durations between two successive dates of effect for agreements signed at the industry level. This distribution exhibits high peaks at 6, 12 and 24 months. Dates of effect are highly regular in the metalworking industry. This finding is fully in line with a Taylor contract equal to one year, even if the Taylor model predicts that firms increase their wage more regularly. We also observe durations lower than 12 months, which are due to predetermined wage increases in the same wage agreement. These short durations occur most often when a single agreement stipulates more than one date of effect, and therefore that wage increases must be staggered over the course of the year. Those predetermined wage increases are consistent with the predictions of the Fisher (1977) model where firms set a full sequence of wage increases over a given period.

At the firm level, information on the date of effect is only available for the period 1994-2001. More than 75 percent of firm-level wage agreements cover only one year (often the year in which the agreement is signed). 13 percent of firm-level wage agreements cover two consecutive years while three-year contracts account for 11 percent of wage agreements between 1994 and 2001. Again, this statistic reflects the obligation for firms to negotiate wages on a yearly basis.

A collective wage agreement may have several application dates, leading to predetermined wage increases. Less than 45 percent of firm-level agreements stipulate more than one date of effect (see Table 3). As for industry-level agreements, 35 percent of firm-level agreements have two dates of effect and less than 10 percent have at least three dates of effect. The interval between the date of signature and the date of implementation is even shorter than in industries. The average duration between the signature date of the agreement and the first date of effect is often very short, close to zero. Moreover, firm-level agreements may be backdated and therefore they apply immediately. In such cases, which are fairly uncommon, the corresponding periods are negative. The average duration between the first and the second dates of effect is around 5.5 months and the average duration between the second and the third dates of effect is about 3 months. Overall, the length of time between the signature date of agreement and the last date of effect rarely exceeds 12 months: it is most often around 9 months when the agreement stipulates at least two dates of effect. For this reason, staggering usually occurs over the course of the year. This finding is less consistent with the main predictions of the Fisher (1977) model.

### 4.3 Some determinants of wage agreements

We now highlight some determinants of the probability that a wage agreement is signed at the industry- or at the firm-level in a given year. The dependent variable $y_{it}$ is a dummy that takes the value 1 if an agreement is signed in a given year *t*, 0 otherwise. We estimate binary response models of the form:

$$y_{it} = 1 \text{ if } y_{it}^{*} > 0, \ y_{it} = 0 \text{ otherwise,}$$

$$\text{with } y_{it}^{*} = \beta x_{it} + u_{i} + \varepsilon_{it}$$

where $x_{it}$ is a set of covariates including i) for an industry *i*, the elapsed duration since the last signed agreement, the proportion of days paid the NMW in this industry the same year, the proportion of firms with less than 50 workers in this industry, a dummy variable indicating whether the agreement concerns the working time reduction, dummies for services/manufacturing sectors, year dummies, and ii) for a firm *i*, the annual growth of profitability, the variation in the local unemployment rate at the *département* level, the proportion of days paid the NMW the same year in firms belonging to the same

industry and localized in the same *département*, dummy variables indicating whether an industry level agreement has been signed the same year, the year before, etc., the size of the firm, industry and year dummies. The $u_i$ terms are industry- or firm-specific effects. For industry-level agreements, the preferred model (on the basis of corresponding pseudo-$R^2$ values) is a probit model with random effects (rather than a logit model with fixed effects).[16] Consequently, for industry-level agreements, the idiosyncratic random shocks $\varepsilon_{it}$ are assumed to be normally distributed with mean 0 and variance 1, while the random industry-specific terms $u_i$ are assumed to be normally distributed with mean 0 and variance $\sigma_u$. For firm-level agreements, the preferred model (on the basis of corresponding pseudo-$R^2$ values) is a Logit model with fixed effects. Consequently, the idiosyncratic random shocks $\varepsilon_{it}$ have an extreme value distribution , while the terms $u_i$ are treated as fixed firm effects.

Table 5 reports estimates of probit models applied to industry-level agreements. First, it appears that the probability of observing a new agreement decreases with the time elapsed since the last signed agreement or the last date of effect. There is a fairly strong dichotomy between industries that negotiate very rarely and those that negotiate more regularly. The proportion of days paid the NMW has a positive but not significant effect on the probability of an industry-level agreement a given year. This positive effect may seem counter-intuitive. In fact, some studies show that the existence of a minimum wage reduces the level of social dialogue between workers and employers (see, for instance, Aghion *et al.*, 2010). The causality seems to be reversed in some sectors where bargaining occurs frequently because the NMW quickly overtakes the bottom of the wage scales. This catching-up phenomenon forces industries to renegotiate rapidly, but new agreements merely adjust the lower end of wage scales to the new value of the minimum wage (see below). Finally, the occurrence of an industry agreement depends on the size of the firms belonging to that industry: the higher the proportion of small firms within the industry, the more likely an agreement. Small firms may find it difficult and costly to negotiate on wages each year; thus they prefer a common agreement at the industry-level which is less costly to obtain. Annual revisions of the NMW level allow smaller firms for which cost of negotiation is large to have longer and less frequent firm agreements as their wages are partly determined by the NMW changes (see below): this finding is consistent with a result obtained by Gray (1978) who shows that contract length is positively correlated with the cost of contracting and indexation.

Table 6 reports estimates of logit models applied to firm-level agreements. The larger the firm, the more likely it is to sign an agreement with its workers in a given year. Therefore, the coverage rate of firm-level agreements is very high in large firms (41 percent in firms with more than 500 workers), whereas firms with less than 50 workers are rarely covered by this type of agreement (less than 1 percent). This firm-size effect can be linked to the frequent absence of unions in firms with fewer than 50 workers. In small firms, less than 20 percent of workers are represented by a union, compared with 80 percent in firms with more than 500 workers (see Amossé and Pignoni, 2006). This disparity is observed in most European countries. In Portugal, for example, almost all firm-level agreements are signed in firms with more than 750 workers (see Hartog, Pereira and Vieira, 2002). In Spain, the average number of workers in firms that sign an agreement is 300, versus 15 only for provincial sector agreements (see Izquierdo *et al.*, 2002). Borghans and Kriechel (2007) make the same observation in Holland. In France, this firm-size effect is less pronounced at the industry level. However, firms with

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[16] We recall that in the conditional logit model (see Chamberlain, 1984) we keep only the subsample of "movers" (i.e. only those firms for which the variable $y_{it}$ takes both the values 0 and 1 over the observation period), whereas the random effect probit model is estimated using the whole sample.

less than 20 workers are still less well covered by industry-level agreements than large companies (see Appendix, Table C).

The degree of heterogeneity of wage agreement coverage at the industry level is rather low (see Appendix, Table B). However, at the firm level, the heterogeneity across economic sectors is more pronounced. Firm-level agreements are more likely to be observed in the car industry, in the sectors of capital and consumption goods, in the construction industry, and less likely observed in the sectors of real estate, of food goods and of personal services. In general, sectors with high (respectively, low) industry-level coverage are also those in which firm-level agreements are common (respectively, scarce). The coverage rates of the two types of agreements differ substantially in the energy and construction sectors and, to a lesser extent, in transports. In the construction industry, this reflects the importance of industry-level agreements at the regional level.

The working time reduction had a strong positive impact on the occurrence of a wage agreement because, between 1998 and 2002, many firms which rarely negotiate signed agreements dealing simultaneously with a working time reduction, with wages and their employment level but they did not negotiate more frequently after that period.

Firm-level wage agreements are also more likely in firms where we observe an increase in profitability, all other things being equal. However, the impact of this variable is small, but stronger in manufacturing than in services. An increase in the local unemployment rate significantly decreases the frequency of firm-level agreements. These last results seem to indicate that the probability of a firm-level wage agreement is also explained by state variables; they are in line with some predictions of state-dependent models of wage bargaining. However, the impacts of those variables are small. Moreover, the probability of an agreement is also lower in firms belonging to industries and localized in areas where many workers are paid the NMW. This relationship is even stronger in the manufacturing sector. Here the impact of the proportion of working days compensated at the NMW is the reverse of the impact of the same variable at the industry level (see above). When the proportion of minimum-wage workers is higher in the same industry and in the same area (*département*), firm-level agreements are less frequent. Therefore, wage increases are set at the national level for many of their workers. The negative relationship obtained in this case corroborates the hypothesis put forward by Aghion *et al.* (2010). Finally, the signature of an industry-level agreement has a negative effect on the probability of a firm-level agreement in the service sector and a somewhat positive impact in the manufacturing sector. All in all, it is fairly difficult to establish a systematic relationship between the frequency of industry-level and firm-level agreements. It seems that small firms are more likely to be covered by an industry-level agreement while larger firms are more often covered by a firm-level agreement.

## 5. The timing of wage agreements

In most macroeconomic models, wage changes are supposed to be staggered (see, for instance, the seminal models by Taylor, 1980, and Calvo, 1983). Taylor (1999) finds that wage changes in the United States are staggered. The staggering or the synchronization of wage changes is shown to have an impact on the real effects of the monetary policy. For the United States, Olivei and Tenreyro (2007) show that the output responds more quickly to monetary policy occurring in the first months of the year, and they explain this finding by the strong seasonality of wage changes. Dupor and Han (2009) challenge somewhat this finding but still obtain a timing effect for monetary shocks. According to Olivei and Tenreyro (2008), in some European countries, wage agreements are more staggered over the year and the timing effect of monetary policy shocks are less significant. More recently, using survey data from the WDN (see Druant *et al.*, 2009), de Walque *et al.* (2010) find that timing effects are significant in the euro area where a lot of wage changes are clustered at the beginning of the year.

In this section, we investigate the degree of staggering or synchronization of wage agreements by looking at the seasonality of wage agreements and the interplays between the timetables of wage bargaining occurrences at the different levels.

### 5.1 Seasonality of wage agreements

Table 7 reports the frequency of wage agreements in each month of the year. First, we show that industry-level agreements are highly seasonal. In the metalworking industry, 60 percent of agreements are signed during the last quarter of the year and 41 percent in December. A smaller frequency peak (9 percent) is observed in July, which might be explained by the annual NMW revision. In the construction industry, a large majority of agreements are signed in March, April and May (56 percent). Seasonality is not so strong in other industries, although a little less than 55 percent of agreements are signed between October and January, with peaks close to 15 percent in November and December. By contrast, fewer industry-level agreements are signed in February, March, August and September (at most 5 percent of agreements per month on average).

The timetable of firm-level agreements is rather delayed compared to the typical timetable of industry-level agreements. As shown in Table 7, firm-level agreements are most likely signed between December and April (more than 60 percent of agreements are signed during this 5-month period) with a peak between March and April (more than 25 percent of wage agreements). This proportion then decreases to reach 27.5 percent of wage agreements between May and July and only less than 15 percent between August and November.

In addition, the distribution of durations between two firm-level agreements varies according to whether the first agreement is signed at the beginning or at the end of the year. The 12-, 24- and 36-month peaks are much more pronounced for agreements signed at the beginning of the year (see Figure 4). This reinforces the idea that bargaining occurs in the early months of the year. When the agreement is signed between May and December, it is more likely to be followed by a much later second agreement in order to resynchronize the firm's bargaining timetable with the general bargaining calendar.

At both levels of the wage bargaining process, we observe a rather strong seasonality of wage agreements. Industry-level wage agreements appear to be signed before the firm-level wage agreements, which can be explained by the hierarchy between the two levels. Moreover, these two slightly different timetables make the wage agreements more staggered over the year. At the aggregate level, the typical wage bargaining period goes from October to April and, on top of that, the NMW is revised each year in July.

By comparison, in Spain, the seasonality of agreements is quite different from the seasonality of agreements in France. In fact, nearly 50 percent of agreements are signed at the various levels (firms, industries, nationwide) between May and July (see Izquierdo *et al.*, 2002). In the United States, firm agreements are often signed at the end of the year (see Olivei and Tenreyro, 2007), while, in Japan, wage bargaining seems fairly coordinated due to *Shunto* [17] which begins in April (see for instance Grossman and Haraf, 1989 or Taylor, 1999). Du Caju *et al.* (2008) note that, in most European countries, the signature dates of wage agreements are clustered at the end or at the beginning of the year.

### 5.2 Seasonality of the dates of effect

The frequency of the dates of effect of wage agreements is also very seasonal (see Table 7). Many wages changes are clustered in very specific months of the year but staggered over the year.

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[17] *Shunto* is a Japanese term designating the national industry-level wage bargaining process.

In the metalworking industry, 94 percent of agreements take effect in January. In the construction industry, dates of effect arise in the first month of each quarter. One fourth of wage agreements take effect between June and July, another fourth in October, 13 percent in January and 16 percent in April. This observation contrasts strongly with the strong seasonality of the timetable of signature dates (more than 55 percent of agreements are contracted between March and May). This would result in more staggered wage changes over the year. This would also imply some predetermined wage changes as mentioned before. In other industries, most of the agreements (i.e. excluding metalworking and construction industries) come into force in January and July (around 20 percent) and in October and November (around 10 percent in each month). Wage changes would then be more staggered than what can be inferred from the observation of the wage agreement seasonality. We may also note that, in most of the industries, the timetables of dates of effect exhibit a peak in July, in correlation with the annual NMW revision. Therefore, the centralized NMW setting process plays an important role in the coordination of wage bargaining in France (on this point, see also below).

At the firm level, the seasonality of dates of effect is close to the one observed in construction and other industries. More than 20 percent of wage agreements are implemented in January, a bit less than 25 percent between March and April, 12 percent in July and around 20 percent between September and October. Although we observe a lag between the date of signature of wage agreements at the industry- and at the firm-level, the timetables of dates of effect are highly consistent. The January effect seems substantial, but wage changes also occur in each first month of other quarters of the year. This observation results in wage changes that are more staggered over the year, with a peak at the beginning of the year.

Using survey evidence from firms in the euro area, Druant *et al.* (2009) find that a majority of firms declare that wage changes are concentrated in some specific months (i.e. January, July and, to a lesser extent, April and March). Using the French version of the same survey, Montornès and Sauner-Leroy (2009) observe that more than 40 percent of firms declare that wage changes occur in January or in July, a smaller peak being observed in March and April. Those observations are fully in line with the timetable of dates of effect we observe in wage agreements. Another noticeable finding is that the seasonality of wage bargaining also mirrors the seasonal pattern of producer price adjustments; for France, Gautier (2008) finds that 13.5 percent of producer price changes occur in January and somewhat less than 9% in July and in April.[18] This may suggest simultaneous decisions on price- and wage-setting at the firm level.

### 5.3 Interplays of timetables at the different levels of the wage bargaining process

In this section, we go deeper in the analysis of the links between the timetables of the different stages of the wage bargaining process. In theory, the links between industry- and firm-level agreements are clearly defined: according to the principle of the most favorable settlement, conflicts between norms are solved in favor of the clause that is the most favorable to workers. This principle creates a hierarchical relationship between industry and firm agreements. Firm-level agreements can only contain clauses that are more favorable than those stipulated in the industry-level agreement. This hierarchy should have an impact on the degree of synchronization of agreements since industry-level agreements should come before firm-level agreements. In practice, however, bargaining calendars are not so systematically linked.

Figure 5 represents the timetables of wage agreements in two different industries, namely the chemical and the road haulage industries. We plot on the same graph the dates of signature and the dates of implementation of industry-level agreements (vertical lines) and the number of firm-level

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[18] Similar findings are obtained at the euro area level by Vermeulen *et al.* (2007).

wage agreements (grey histograms). In the chemical industry, the link between industry- and firm-level agreements is quite clear. The majority of industry agreements are negotiated in December or November, and take effect at the beginning of the following year, often in January. In this sector, most of the firm-level agreements are signed between February and March. In 2005, the absence of an industry-level agreement leads to a higher frequency of firm-level agreements. This example is quite typical of the seasonality that we have documented in the previous section. In the road haulage industry, the majority of industry-level agreements take effect in July and August whereas firm-level agreements do not follow any regular timetable. This reflects the influence of the annual revision of the minimum wage level in this industry. So, at the end of the observation period, when the minimum wage rose significantly, the number of firm-level agreements increased, even though there were no industry agreements.

The annual increase of the NMW has also a significant impact on the industry- and the firm-level bargaining calendars. To assess the effect of the NMW on the wage agreement timetable, we use the following random-effect probit models:

$$y_{it}^m = 1 \text{ if } y_{it}^{m*} > 0, \ y_{it}^m = 0 \text{ otherwise,}$$

$$\text{with } y_{it}^{m*} = \gamma x_{it} + v_i + \varepsilon_{it}^m$$

where $y_{it}^m$ is a dummy variable taking the value 1 if an agreement is signed in the firm (respectively, in an industry) $i$ in year $t$ and in month $m$, and the value 0 if the agreement is signed in a different month ($m' \neq m$). For a given industry $i$, $x_{it}$ is a set of covariates including the proportion of days paid the NMW in year $t$ in this industry, the elapsed duration since the last agreement, and sector and year dummies. For a firm $i$, it includes the proportion of days paid the NMW in the same industry and in the same area (*département*) during the same year, and dummies for the size and the industry of the firm, for the year and for the previous signature of an industry-level wage agreement. The terms $u_i$ are industry- or firm-specific random effects and $\varepsilon_{it}$ are random exogenous shocks that are normally distributed with mean 0 and variance 1. We estimate a model for each month of the year, separately for the dates of signature and the dates of effect of agreements. We report in Table 8 the marginal effects of the proportion of days paid the NMW at the industry level.

At the firm level, agreements are less often signed at the beginning and at the end of the year if the NMW covers a large share of the labor force. When the NMW covers a large part of the labor force, the agreements tend to be signed between June and September. Further regressions show that this effect is even stronger between 2003 and 2005 when the NMW rose quickly. If we now consider the dates of effect of firm-level agreements, we get similar results, namely a higher frequency of wage agreements in July, when the NMW is revised, and a lower frequency in January and March. The results are relatively less significant for industry-level agreements, but the proportion of days paid the NMW also affects the agreement calendar: when this proportion is higher, agreements are more often signed in September and take effect more frequently at the end rather than at the beginning of the year. The recent decision to shift the date of the NMW revision from July to January is therefore likely to increase the number of agreements signed at the beginning of the year, both at the industry and at the firm levels.

## 6. The size of wage changes in collective agreements

Downward wage rigidity is defined as the inability for firms to cut wages in nominal or real terms. Numerous empirical studies have examined the degree of downward rigidity of wages. These papers

(see Dickens *et al.*, 2007) generally rely on individual wage survey data rather than data on negotiated wage changes. To our best knowledge, only Christofides and Stengos (2003) and Christofides and Li (2005) assess the degree of wage rigidity associated with negotiated wage changes using Canadian agreement data. We examine here the distributions of negotiated wage changes in France at the firm- and at the industry-levels and their determinants.[19] First, note that, in principle, by law, wage decreases are quasi impossible in France. Wage decreases can only be negotiated at the firm level in case of strong difficulties. Thus we focus here on the distribution of negotiated wage increases; if a firm does not negotiate, we consider that the negotiated wage increase is zero.

### 6.1 Negotiated wage increases at the industry- and at the firm-levels

Table 9 reports descriptive statistics on the average wage increase stipulated in industry-level agreements over the period 1994-2005. At the industry level, wage bargaining frequently deals with wage scales, so if in a given year no agreement is found, the previous pay scale still applies and the next agreement should catch up, taking into account past inflation or past NMW increases for instance. Consequently, the observed negotiated increases depend on the length of time between two successive agreements and on the catching up constraint. As a result, the annual negotiated wage increase is quite high, close to 3.5 percent (computed either with respect to the year of the agreement or to the year of its implementation) whereas the average wage increase in the private sector is closer to 2.5 percent during the same period. The average wage change increase per year since the last agreement is closer to 2.5 percent. This average is also somewhat higher in the construction and metalworking industries.

On Figure 6, we plot the distributions of wage increases adjusted or not by the number of years since the last agreement. The two distributions are somewhat different, but their modes are between 2.0 and 2.5 percent. At the industry-level, negotiated wages never decrease.

For firms, we are able to identify seven types of wage increases stipulated in wage agreements: a general pay rise awarded to all workers, a general rise combined with individual increases, a general rise that varies across different categories of workers (blue-collars, white-collars, managers or other categories), general differentiated rises combined with individual increases, individual increases only, no negotiated rise and, finally, the "other" category, these two last categories mostly corresponding to negotiations on the 35-hour workweek (see Table 10). General pay rises represent the majority of negotiated wage settlements, corresponding to around half of the increases negotiated over the entire period (with or without individual rises), and to over 60 percent of agreements which occurred during the period before agreements on the working time reduction were negotiated. General differentiated pay rises represent nearly 20 percent of agreements over the entire period; agreements concerning individual rises only rose in frequency between 1994 and 2001; negotiations on the working time reduction explain the absence of wage increases in some years. In 1999 in particular, 70 percent of negotiated agreements fall into the "no increase" or "other" categories. These two categories account for less than 10 percent of agreements in the other years.

Table 11 reports some descriptive statistics on the average wage increase according to the type of rise stipulated by the agreements (either at the general level, or by occupation). Note that at the firm level, most of the time, agreements stipulate wage increases that are expressed in percentage rather than in terms of grid thresholds specific to firms. In the case of general rises, we divide these rates by the number of years covered by the agreement to deduce an average yearly rate of increase. The average general wage increase at the firm level is around 1.6 percent. The wage increases by occupation are slightly higher, ranging between 1.6 and 1.8 percent. The medians of negotiated wage increases are all at the same level.

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[19] In our data set, information on wage increases negotiated in firm-level agreements is only available for the sub-period from 1994 to 2001. At the industry level, the only available data cover the sub-period going from 1999 to 2005. In this case, the increases are calculated as the averages of the different increases in the levels of the industry wage grid.

Figure 7 plots the distribution of wage increases negotiated at the firm level for the whole period and also by sub-periods. The distribution of negotiated wage increases shows peaks around 1, 1.5 and 2 percent. The distribution is bimodal, which corresponds to the coexistence of two distinct sub-periods.

## 6.2 Negotiated wage increases over time

On Figure 8, we plot the yearly average wage increase negotiated at the industry-level and we confront this statistic with the average base wage increase in the private sector calculated by the French Ministry of Labor. Both series show fairly strong correlation. Wages have increased at a steady rate comprised between 2.5 and 3 percent since 1999, in all industries. The construction and public works sectors exhibit a peak in 2001, which coincides with negotiations on the reduction of the working time, but the sharpest jump occurred between 2004 and 2005. The larger increases observed in 2004 and 2005 (particularly in construction and public works) can be explained by the sharp rise in the minimum wage level the same year (the NMW rose by more than 5 percent between 2003 and 2005). In several industries, the negotiated increases correspond exactly to the rises in the minimum wage level, and a catch-up phenomenon is observed in several collective agreements. For example, in the "Soil, Products and Fertiliser" or "Fast Food" industries, which negotiated fairly regularly between 2003 and 2005, the lower end of the wage scale is equal to the minimum wage level, and the negotiated increase at this lower end is equal to the rise in the minimum wage level. In both industries, moreover, the pay rise at the lowest level of the pay scale is more or less equal to the average increases negotiated across the whole wage scale. Increases in the highest parts of the pay scales are lower.

At the firm level, the average rate of negotiated wage increases seem to follow the inflation rate (see Figure 9), which ranges between 1 and 2 percent from 1994 to 2001. Thus, negotiated wage increases were relatively high between 1994 and 1997 before experiencing a more modest growth with the introduction of reduced working hours in the late 1990s. Furthermore, this average wage increase is close to 2 percent (the same level as the inflation rate) between 1994 and 1997, whereas it decreases to 1 percent between 1998 and 2001 when the inflation rate fell below 2 percent (see Figure 9). When inflation is below 1 percent, the average negotiated wage rises continue to be above 1 percent but the proportion of firms granting collective wage increases is also smaller. We should also note that the average wage increases by occupation are slightly larger than the overall rises.

### 6.3 Some determinants of negotiated wage increases

We now estimate a simple model of downward nominal wage rigidity to identify the main determinants of negotiated increases both at the firm- and at the industry-levels. Following an extensive literature on downward wage rigidity, we use a simple Tobit-1 model. The dependent variable $\Delta w_{it}$ is the negotiated wage increase stipulated by the firm- or the industry-level agreement; by definition, it is equal to 0 if there is no wage agreement or if the negotiated wage increase is equal to 0 (as in many agreements dealing simultaneously with wages and reduction in working time). We assume that the wage increase $\Delta w_{it}$ in year $t$, in the firm or industry $i$, is generated by the following latent variable:

$$\Delta w_{it}^* = \beta x_{it} + u_i + \varepsilon_{it}$$

where $x_{it}$ is a vector of covariates which includes i) for an industry $i$, the elapsed duration since the last agreement, the proportion of days paid the NMW in this industry, the proportion of firms with less than 50 workers in this industry, a dummy variable indicating whether the agreement concerns work time reduction, a dummy for services vs. manufacturing sector, and year dummies, while ii) for a firm

*i*, it includes inflation, the annual growth of profitability per worker, the variation in the local unemployment rate at the *département* level, the proportion of days paid the NMW in the industry of the firm and in the area where it is localized, dummy variables indicating if an industry level agreement has been signed the same year, the year before, etc., the size of the firm, and industry level dummies. $\beta$ is a vector of parameters associated with $x_{it}$. The term $u_i$ is a random effect specific to firm or to industry *i* which is assumed to be normally distributed with mean 0 and variance $\sigma_u^2$, while the exogenous random shock $\varepsilon_{it}$ is normally distributed with mean 0 and variance $\sigma_e^2$. Finally, $\rho$ is the correlation coefficient between $u_i$ and $\varepsilon_{it}$. The model is thus the following:

$$\Delta w_{it} = \Delta w_{it}^* \text{ if } \Delta w_{it}^* > 0$$

$$\Delta w_{it} = 0 \text{ if } \Delta w_{it}^* \leq 0 \text{ [20]}$$

Table 12 reports the estimation results for industry-level agreements. The duration since the last agreement has a large positive effect on the wage change. The size of the industry plays also a positive role. Metalworking industry and other industries negotiate smaller wage increases than the construction and public works industry, all other things being equal. Industries in the service sector negotiate lower increases. The proportion of small firms in the industry has a positive effect on the negotiated pay rise. Finally, the larger the proportion of days compensated at (or close to) the minimum wage level, the higher the increase negotiated in the industry. These last two observations reinforce our previous findings. Industry level agreements deal mostly with low wages close to the minimum wage. Most of the low paid workers are in small firms, and small firms are particularly concerned with industry-level negotiations. Moreover, it is less costly for small firms to negotiate wages at the industry level.

Table 13 reports the estimated parameters for firm-level agreements for the period 1994-2001. At this level, we have also run separate regressions for two sub-periods 1994-1997 and 1998-2001. At the firm level, negotiated wage increases are significantly dependent on inflation. The aggregate inflation rate has a statistically significant positive impact in the period 1994-1997 but appears to be statistically non-significant between 1998 and 2001, a period where inflation was lower. The degree of indexation seems to decrease with inflation but is still positive and significant on the whole period. The working time reduction has also a strong positive impact, especially during the period 1998-2001, although most agreements dealing with workweek time reduction contain no wage increases. However, this positive effect is explained by a sharp increase in the number of firms negotiating on wages and on the working time reduction at that time. To check the robustness of our findings, we have run regressions where we assume that all wage agreements are non-censored (even if the wage increase negotiated in the agreement is zero). We find that results are not modified: the effects of the workweek time reduction are still positive and significant. Another significant determinant of wage increases is firms' performances but the impact is quite weak. However, the obtained values seem consistent with the results previously obtained by Biscourp *et al.* (2005) who take into account the actual wage rises rather than the negotiated increases. The variation of the local unemployment rate has a negative and significant impact on the negotiated wage change only during the period 1994-1997 while it has an unexpected positive significant effect during the period 1998-2001. In both periods, the proportion of working days compensated at the minimum wage level has a significant negative impact on the negotiated wage increases, which confirms previous findings. Likewise, the size of the firm

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[20] We assume here that there is no measurement error as we observe the average wage increase stipulated by the agreement.

positively affects both the occurrence of an agreement and the negotiated wage increase. Contrary to industry-level agreements, firm-level agreements more likely cover higher-paid workers and large firms. The impact of an industry-level wage agreement is significantly stronger if it was signed shortly before the firm-level agreement. The older the industry agreement, the less it influences the firm-level agreement. This result is however stronger over the period 1998-2001 than between 1994 and 1997. Finally, heterogeneity across economic sectors is confirmed: wage increases that are negotiated at the firm-level are larger in the motor vehicles and intermediate goods industries, and smaller in the construction sector or services.

## 7. Conclusion

The French labor market is characterized by typical European institutions of wage-setting, namely a low unionization rate but a very large coverage of collective agreements, a multi-level wage bargaining process with a strict hierarchy among these levels, and a significant proportion of minimum-wage workers. Using unique data sets on wage agreements at both the firm- and the industry-levels, we have provided an overview on how those institutions may have an impact on the degree of wage rigidity.

We draw from our analysis different stylized facts that could be helpful for macroeconomic models to reproduce key features of the labor market. First, the typical duration between two wage agreements in France is one year both at the firm- and at the industry-levels. Thus Taylor's (1980) model appears to better reproduce the distribution of durations between two successive agreements than the standard Calvo model (1983). Another finding is that a wage agreement can stipulate more than one wage increase. Several predetermined wage changes are present in one fourth to one third of the contracts, which is in line with predictions set forth by Fisher (1977). However, these predetermined wage changes mostly take effect during the year following the signature of the agreement. Thirdly, the NMW plays a significant role for explaining the occurrence of a wage agreement, both at the firm- and at the industry-levels. Moreover, the frequency of wage agreements is highly seasonal: industries first bargain on wages between October and January whereas firms negotiate during the first months of the year, implying a quite long sequence of wage bargaining. On top of that, the dates of contract implementation are mostly concentrated in specific months, which are staggered over the year (January, April, July and October). Lastly, the distributions of negotiated wage increases appear to depend on the inflation rate for firms and on aggregate wage and NMW growths for industries. The performances of firms have also an impact on the negotiated increase, but this effect is rather small.

We also highlight some important features of the wage-setting process in France. The interactions between the different levels of this process are rather complex. It appears that the industry-level agreements are more likely to be binding for low-paid workers and for small firms. In other terms, the NMW has a positive impact on the probability of an industry-wage agreement. The firm-level agreements cover more frequently larger firms and higher-paid workers. Consequently, the NMW has a negative impact on the probability of a firm-level agreement. The NMW has also a significant impact on the timing of the wage agreements. The recent decision to revise (from 2010) the NMW level in January, rather in July, will undoubtedly modify the timing of wage changes. We could thus anticipate that, in France, wage changes will be even more clustered at the beginning of the year.

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**Table 1: Proportions of workers covered by an industry-level or a firm-level wage agreement**

|  | 1994-2005 | 1994-1997 | 1998-2001 | 2002-2005 |
|---|---|---|---|---|
| **Industry-level agreements** | | | | |
| All industries, excluding metal-working and construction | 65.5 | 69.5 | 65.5 | 62.5 |
| Metal-working industry | 80.0 | 93.4 | 66.6 | 80.4 |
| Construction industry | 74.3 | 83.5 | 64.0 | 75.6 |
| Total | 66.0 | 73.1 | 61.7 | 63.9 |
| **Firm-level agreements** | | | | |
| All types of agreements | 41.4 | 33.6 | 43.3 | 47.1 |
| Wage agreements | 21.1 | 19.5 | 22.0 | 21.7 |
| **Industry-level and firm-level agreements** | | | | |
| No firm- and no industry-level agreement | 27.8 | 22.2 | 30.9 | 29.7 |
| No firm-level agreement but an industry-level agreement | 51.0 | 58.3 | 47.2 | 48.7 |
| A firm-level agreement but no industry-level agreement | 6.2 | 4.7 | 7.4 | 6.3 |
| Both a firm- and an industry- level agreements | 14.9 | 14.8 | 14.6 | 15.3 |
| **Average annual inflation rate** | 1.55 | 1.81 | 0.90 | 1.94 |

*Remark: The proportion of workers covered by a firm-level or an industry-level wage agreement is computed as the total number of workers in firms covered by an agreement divided by the total number of workers in all the firms or in a given industry.*

**Table 2: Descriptive statistics on the duration between two successive wage agreements (in months)**

|  | Mean | 3$^{rd}$ quartile | Median | 1$^{st}$ quartile |
|---|---|---|---|---|
| **Industry-level agreements** | | | | |
| Total | 16.0 | 20 | 13 | 11 |
| Metal-working industry | 14.5 | 19 | 12 | 11 |
| Construction industry | 15.5 | 18 | 12 | 12 |
| Other industries | 16.6 | 21 | 13 | 11 |
| **Firm-level agreements** | | | | |
| Total | 18.5 | 22 | 12 | 9 |
| Less than 20 workers | 55.2 | 78 | 61 | 30 |
| Between 20 and 50 workers | 49.8 | 77 | 54 | 20 |
| Between 50 and 100 workers | 31.7 | 47 | 20 | 12 |
| Between 100 and 200 workers | 24.9 | 30 | 14 | 12 |
| Between 200 and 500 workers | 21.4 | 24 | 13 | 11 |
| More than 500 workers | 17.0 | 21 | 12 | 8 |

*Remark: Statistics are weighted by the number of workers in each firm.*

**Table 3: Number of predetermined wage increases stipulated by wage agreements (in percent)**

| Number of predetermined increases | Industry level | | | Firm level |
|:---:|:---:|:---:|:---:|:---:|
| | Metalworking | Construction | Other industries | |
| **1** | 98.6 | 76.5 | 76.2 | 56.5 |
| **2** | 1.4 | 23.5 | 19.3 | 34.8 |
| **3** | 0.0 | 0.0 | 3.4 | 7.3 |
| **4** | 0.0 | 0.0 | 1.0 | 1.4 |

*Remark: The percentage in each cell corresponds to the number of agreements stipulating a given number of dates of successive wage increases, divided by the total number of wage agreements. For firms, results are obtained for the 1994-2001 period whereas, for industries, they are obtained for the period 1994-2005.*

**Table 4: Descriptive statistics on the duration between the date of signature of the wage agreement and the date at which it takes effect (in months)**

| | | Duration between the date of signature and the date of the: | | | |
|---|---|---|---|---|---|
| | | $1^{st}$ effect | $2^{nd}$ effect | $3^{rd}$ effect | $4^{th}$ effect |
| **Firm level** | | | | | |
| | $1^{st}$ quartile | -1 | 4 | 3 | 6 |
| | Median | 0 | 6 | 3 | 8 |
| | $3^{rd}$ quartile | 1 | 6 | 5 | 9 |
| | Mean | 0.1 | 5.4 | 4.1 | 8.5 |
| **Industry level** | | | | | |
| | $1^{st}$ quartile | -9 | - | - | - |
| Metalworking industry | Median | -5 | - | - | - |
| | $3^{rd}$ quartile | -1 | - | - | - |
| | Mean | -4.9 | - | - | - |
| | $1^{st}$ quartile | 0 | 6 | - | - |
| Construction industry | Median | 1 | 7 | - | - |
| | $3^{rd}$ quartile | 2 | 7 | - | - |
| | Mean | 1.5 | 7.1 | - | - |
| | $1^{st}$ quartile | 0 | 3 | 5 | - |
| Other industries | Median | 1 | 6 | 8 | - |
| | $3^{rd}$ quartile | 3 | 8 | 11 | - |
| | Mean | 1.4 | 5.6 | 9.5 | - |

*Remark: Durations are negative when the implementation of the agreement is retroactive.*

**Table 5: Determinants of the signature of an industry-level agreement a given year between 1994 and 2005 (probit models with random effects)**

| | All industries | | Manufacturing | |
|---|---|---|---|---|
| | Agreement | Effect | Agreement | Effect |
| Intercept | 0.499[**]<br>(0.219) | -0.413[*]<br>(0.215) | 0.226<br>(0.262) | -0.644[**]<br>(0.251) |
| Duration since the last agreement: | | | | |
| - 1 year | 0.252[**]<br>(0.122) | 0.430[**]<br>(0.117) | 0.258[*]<br>(0.146) | 0.450[**]<br>(0.141) |
| - 2 years | 0.379[**]<br>(0.125) | 0.398[**]<br>(0.124) | 0.398[**]<br>(0.155) | 0.357[**]<br>(0.152) |
| - 3 years | 0.216<br>(0.150) | 0.410[**]<br>(0.149) | 0.289<br>(0.189) | 0.438[**]<br>(0.186) |
| - more than 3 years | Ref | Ref | Ref | Ref |
| Proportion of days paid the minimum wage | 0.001<br>(0.005) | 0.004<br>(0.005) | 0.003<br>(0.007) | 0.002<br>(0.006) |
| Proportion of firms with less than 50 workers | 0.005[**]<br>(0.002) | 0.003<br>(0.002) | 0.010[**]<br>(0.003) | 0.009[**]<br>(0.003) |
| Agreement concerning the reduction of the workweek duration | 0.888[**]<br>(0.132) | 0.794[**]<br>(0.136) | 0.557[**]<br>(0.161) | 0.576[**]<br>(0.166) |
| All industries excluding metal-working and construction | Ref. | Ref. | Ref. | Ref. |
| Construction industry | 0.113<br>(0.124) | 0.209<br>(0.144) | 0.011<br>(0.153) | 0.122<br>(0.139) |
| Metal-working industry | -0.203<br>(0.131) | -0.070<br>(0.124) | -0.300[**]<br>(0.136) | -0.189<br>(0.125) |
| Manufacturing | Ref. | Ref. | | |
| Services | -0.217[*]<br>(0.129) | -0.107<br>(0.121) | | |
| $\sigma_u$ | 0.498[**]<br>(0.053) | 0.466[**]<br>(0.050) | 0.464[**]<br>(0.064) | 0.408[**]<br>(0.061) |
| Number of observations | 2,436 | 2,639 | 1,608 | 1,742 |

*Remarks: In the column « agreement », the endogenous variable is equal to 1 if an industry-level agreement is signed a given year, while in the column « effect », the endogenous variable is equal to 1 if an industry-level agreement comes into force a given year. The proportion of days paid the minimum wage is calculated as the number of days paid around the minimum wage in each industry and in each département a given year, divided by the total number of days paid in the same industry and in the same département the same year, whatever the wage level. The proportion of firms with less than 50 workers is calculated as the number of firms with less than 50 workers divided by the total number of firms in the industry. Year dummies are included.*

*Symbols: \*\*: significant at the 5 percent level, \*: significant at the 10 percent level (otherwise, statistically non-significant).*

**Table 6: Determinants of the signature of a firm-level agreement a given year between 1994 and 2005 (logit models with fixed effects)**

| | All industries | Manufacturing | Services |
|---|---|---|---|
| **Annual variation of firm profitability between years *t-2* and *t-1* ($\Delta\pi_{t-1}$)** | 0.004** <br> (0.000) | 0.006** <br> (0.000) | 0.000** <br> (0.000) |
| **Annual variation of firm profitability between years *t-1* and *t-* ($\Delta\pi_t$)** | 0.001** <br> (0.000) | 0.004** <br> (0.000) | -0.001** <br> (0.000) |
| **Variation of the local unemployment rate** | -0.005** <br> (0.000) | 0.001** <br> (0.000) | -0.003** <br> (0.000) |
| **Proportion of days paid the minimum wage** | -0.021** <br> (0.000) | -0.020** <br> (0.000) | -0.005** <br> (0.000) |
| **Occurrence of an industry-level agreement** | | | |
| *- The same year* | -0.115** <br> (0.003) | 0.015** <br> (0.004) | -0.059** <br> (0.001) |
| *- Last year* | -0.167** <br> (0.003) | 0.007 <br> (0.005) | -0.078** <br> (0.001) |
| *- Two years ago* | -0.124** <br> (0.004) | 0.028** <br> (0.005) | -0.073** <br> (0.001) |
| *-More than two years ago* | Ref. | Ref. | Ref. |
| **Size of the firm** | | | |
| *-between 50 and 100 workers* | Ref. | Ref. | Ref. |
| *-between 100 and 200 workers* | 0.412** <br> (0.005) | 0.330** <br> (0.007) | 0.104** <br> (0.002) |
| *-betwwen 200 and 500 workers* | 0.893** <br> (0.006) | 0.743** <br> (0.009) | 0.209** <br> (0.002) |
| *-more than 500 workers* | 1.427** <br> (0.007) | 1.162** <br> (0.009) | 0.348** <br> (0.002) |
| **Industry** | | | |
| Food goods | -0.582** <br> (0.025) | -0.482** <br> (0.129) | |
| Consumption goods | 0.608** <br> (0.012) | 2.473** <br> (0.019) | |
| Motor vehicles | 1.221** <br> (0.015) | 0.296** <br> (0.019) | |
| Capital goods | 0.955** <br> (0.016) | 0.948** <br> (0.021) | |
| Intermediate goods | ref | ref | |
| Energy | 0.329** <br> (0.020) | - | |
| Construction | 1.966** <br> (0.027) | 0.427** <br> (0.046) | |
| Wholesale and retail trade | 0.431** <br> (0.011) | | Ref |
| Transportation | -0.259** <br> (0.021) | | -0.149 <br> (0.005) |
| Real estate | -1.256** <br> (0.075) | | -0.229** <br> (0.016) |

29

| | | | |
|---|---|---|---|
| Business to business services | 0.903[**]<br>(0.017) | | 0.296[**]<br>(0.004) |
| Personal services | -1.728[**]<br>(0.056) | | -0.230[**]<br>(0.013) |
| Agreement concerning the reduction of the workweek duration | 0.894[**]<br>(0.001) | 1.011[**]<br>(0.002) | 0.166[**]<br>(0.001) |
| Number of observations | 51,282 | 20,473 | 30,538 |

*Remarks: The proportion of days paid the minimum wage is calculated as the number of days paid around the minimum wage in each industry and in each département a given year, divided by the total number of days paid in the same industry and in the same département the same year, whatever the wage level. The local unemployment rate variation is computed at the département level each year. Year dummies are included.*

*Symbols: \*\*: significant at the 5 percent level, \*: significant at the 10 percent level (otherwise, statistically non-significant). Standard errors are in brackets*

**Table 7: Timing of industry-level and firm-level wage agreements and of their dates of implementation (proportions)**

|  | Agreement | | | | Implementation | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Industry-level | | | Firm-level | Industry-level | | | Firm-level |
|  | Metalworking | Construction | Other industries |  | Metalworking | Construction | Other industries |  |
| **January** | 6.3 | 5.8 | 11.2 | 10.6 | 93.9 | 13.0 | 19.5 | 20.6 |
| **February** | 2.7 | 3.5 | 6.0 | 12.1 | 0.4 | 0.3 | 5.4 | 6.1 |
| **March** | 3.6 | 25.8 | 4.2 | 13.6 | 1.0 | 3.0 | 6.8 | 10.0 |
| **April** | 3.7 | 17.1 | 8.9 | 13.0 | 1.4 | 15.6 | 7.6 | 13.5 |
| **May** | 3.7 | 13.5 | 6.9 | 8.7 | 0.0 | 6.7 | 3.8 | 5.1 |
| **June** | 4.1 | 5.2 | 7.5 | 9.2 | 0.0 | 12.7 | 3.4 | 6.0 |
| **July** | 9.2 | 4.7 | 7.2 | 6.6 | 0.0 | 13.7 | 20.0 | 11.7 |
| **August** | 0.2 | 0.0 | 0.3 | 1.1 | 0.0 | 0.7 | 2.9 | 1.3 |
| **September** | 6.8 | 4.8 | 5.2 | 2.8 | 0.0 | 3.8 | 4.2 | 9.6 |
| **October** | 12.6 | 7.3 | 12.3 | 5.6 | 3.3 | 26.3 | 13.1 | 10.3 |
| **November** | 6.4 | 5.4 | 16.3 | 5.3 | 0.1 | 2.9 | 9.5 | 3.0 |
| **December** | 40.9 | 7.0 | 14.2 | 11.4 | 0.0 | 1.4 | 3.8 | 2.8 |

*Remark: Each cell of the table corresponds to the proportion of wage agreements (or their dates of effect) signed during a given month at the industry- or at the firm-level. All these statistics are weighted by the number of workers in each firm.*

**Table 8: Marginal effects ($\times 10^{-2}$) of the proportion of days paid the minimum wage on the timing of industry- and firm-level wage agreements (or on their dates of implementation)**

|  | Firm-level agreement | | Industry-level agreement | |
|---|---|---|---|---|
|  | Agreement | Effect | Agreement | Effect |
| January | **- 0.08** | **- 0.22** | - 0.13 | **- 1.42** |
| February | **- 0.11** | 0.00 | - 0.05 | 0.02 |
| March | **- 0.09** | **- 0.14** | 0.11 | - 0.01 |
| April | *- 0.05* | 0.01 | 0.04 | **0.17** |
| May | 0.02 | - 0.01 | - 0.02 | *0.06* |
| June | **0.08** | *- 0.06* | 0.09 | 0.05 |
| July | **0.06** | **0.17** | 0.09 | **0.28** |
| August | 0.00 | 0.00 | - | 0.00 |
| September | **0.02** | 0.04 | **0.18** | 0.05 |
| October | 0.01 | 0.04 | 0.07 | **0.14** |
| November | - 0.01 | 0.01 | - 0.12 | 0.02 |
| December | **- 0.05** | 0.00 | - 0.07 | *0.03* |

*Remark: Each cell of the table reports the marginal effect of the share of days paid at the minimum wage on the probability of signing an agreement or on the probability that an agreement takes effect a given month. The share of days paid the minimum wage is computed in industries for industry-level agreements, and at a disaggregate sectoral and local geographical level for firm-level agreement. The estimated model is a Probit model with random effects, the endogenous variable being the dummy variable equal to 1 if an agreement is signed a given month (or an agreement comes into force a given month), 0 otherwise. Year dummies, sectoral dummies, size of the firm are included as control variables in these 12 different estimations.*

**Table 9: Average wage increases negotiated at the industry-level (1994-2005), in percent.**

| | | Mean | Standard error | 1st quartile | Median | 3rd quartile | Number |
|---|---|---|---|---|---|---|---|
| According to the year of agreement | Total | 3.54 | 2.55 | 2.00 | 2.90 | 4.30 | 826 |
| | Construction | 3.68 | 2.41 | 2.10 | 3.00 | 4.50 | 162 |
| | Metalworking | 3.68 | 1.85 | 2.40 | 3.10 | 4.50 | 197 |
| | Other industries | 3.42 | 2.84 | 1.80 | 2.60 | 4.10 | 467 |
| According to the year of implementation | Total | 3.37 | 2.41 | 2.00 | 2.80 | 4.10 | 869 |
| | Construction | 3.49 | 2.05 | 2.20 | 3.00 | 4.20 | 171 |
| | Metalworking | 3.45 | 1.64 | 2.40 | 3.05 | 4.10 | 210 |
| | Other industries | 3.29 | 2.78 | 1.80 | 2.50 | 3.98 | 488 |
| On average, by year of implementation | Total | 2.59 | 1.60 | 1.57 | 2.30 | 3.30 | 866 |
| | Construction | 2.89 | 1.84 | 1.80 | 2.60 | 3.80 | 170 |
| | Metalworking | 2.43 | 1.05 | 1.80 | 2.40 | 3.10 | 210 |
| | Other industries | 2.56 | 1.69 | 1.50 | 2.15 | 3.30 | 486 |

*Remark: Average wage increases at the industry-level are calculated using the wage grid that has been modified by the new wage agreement.*

**Table 10: Types of wage increases negotiated in the firm-level wage agreements**

| | Number | Percent | | |
|---|---|---|---|---|
| | | 1994-2001 | 1994-1997 | 1998-2001 |
| General wage increases | 10,062 | 34.0 | 45.6 | 26.5 |
| General and individual wage increases | 3,712 | 12.5 | 17.9 | 9.1 |
| General wage increases, by occupation | 3,235 | 10.9 | 12.9 | 9.7 |
| General and individual wage increases, by occupation | 2,581 | 8.7 | 11.5 | 6.9 |
| Individual wage increases | 1,604 | 5.4 | 4.4 | 6.1 |
| No wage increase | 6,820 | 23.0 | 4.2 | 35.2 |
| Other | 1,608 | 5.4 | 3.5 | 6.7 |

**Table 11: Average wage increases negotiated in firm-level wage agreements (1994-2001), in percent.**

| | Number | Mean | Standard error | 1st quartile | Median | 3rd quartile |
|---|---|---|---|---|---|---|
| General wage increases | 12,754 | 1.61 | 0.84 | 1.00 | 1.50 | 2.00 |
| Wage increases by occupation: | | | | | | |
| - blue collar workers | 3,817 | 1.78 | 0.98 | 1.00 | 1.63 | 2.25 |
| - white collar workers | 3,521 | 1.64 | 0.87 | 1.00 | 1.50 | 2.00 |
| - managers | 1,696 | 1.71 | 0.91 | 1.00 | 1.50 | 2.25 |
| - other occupations | 97 | 2.00 | 1.04 | 1.22 | 1.75 | 2.50 |
| All types of wage increases | 17,043 | 1.64 | 0.86 | 1.00 | 1.50 | 2.00 |

**Table 12: Determinants of the average wage increase negotiated in industry-level wage agreements each year between 1999 and 2005 (Tobit model with random effects)**

| | All industries | | Manufacturing | |
|---|---|---|---|---|
| | Agreement | Implementation | Agreement | Implementation |
| Intercept | -6.721** (0.740) | -6.457** (0.714) | -7.498** (0.851) | -6.950** (0.797) |
| Duration since the last agreement: | | | | |
|   -   1 year | 1.252** (0.539) | 1.217** (0.505) | 0.495 (0.614) | 0.505 (0.567) |
|   -   2 years | 1.853** (0.528) | 1.699** (0.500) | 1.425** (0.607) | 1.009* (0.568) |
|   -   3 years | 1.919** (0.585) | 1.831** (0.562) | 1.761** (0.687) | 1.067* (0.649) |
|   -   More than 3 years | Ref. | Ref. | Ref. | Ref. |
| Proportion of days paid the minimum wage | 0.033** (0.014) | 0.030** (0.014) | 0.052** (0.020) | 0.041** (0.019) |
| Proportion of firms with less than 50 workers | 0.016** (0.006) | 0.012** (0.006) | 0.030** (0.008) | 0.026** (0.007) |
| Size of the industry | 0.178 (0.137) | 0.221* (0.134) | 0.115 (0.218) | 0.165 (0.202) |
| Agreement concerning the reduction of the workweek duration | 1.797** (0.468) | 1.979** (0.444) | 1.188** (0.541) | 1.761** (0.519) |
| All industries excluding metal-working and construction | Ref. | Ref. | Ref. | Ref. |
| Construction industry | 0.778** (0.394) | 0.910** (0.386) | 0.506 (0.383) | 0.628* (0.355) |
| Metal-working industry | -0.709** (0.358) | -0.579* (0.350) | -0.917** (0.361) | -0.812** (0.337) |
| Manufacturing | Ref. | Ref. | - | - |
| Services | -0.869** (0.352) | -0.600* (0.344) | - | - |
| $\sigma_u$ | 0.750** (0.275) | 0.875** (0.224) | 0.654** (0.335) | 0.607** (0.309) |
| $\sigma_\varepsilon$ | 3.798** (0.114) | 3.643** (0.107) | 3.634** (0.129) | 3.499** (0.122) |
| $\rho$ | 0.038 (0.027) | 0.055 (0.027) | 0.031 (0.032) | 0.029 (0.029) |
| Censored observations (zeros) | 1,029 | 945 | 651 | 607 |
| Non-censored observations | 767 | 802 | 538 | 559 |

*Remark: The proportion of days paid the minimum wage is calculated as the number of days paid around the minimum wage in each industry and in each département a given year, divided by the total number of days paid in the same industry and in the same département the same year, whatever the wage level.. The proportion of firms with less than 50 workers is calculated as the number of firms with less than 50 workers divided by the total number of firms in the industry. Year dummies are included. Symbols: \*\*: significant at the 5 percent level, \*: significant at the 10 percent level (otherwise, statistically non-significant). Standard errors are in brackets*

**Table 13: Determinants of the average wage increase negotiated in firm-level wage agreements each year, between 1994 and 2001 (Tobit models with random effects)**

| | 1994-2001 | 1994-1997 | 1998-2001 |
|---|---|---|---|
| Intercept | -7.586** (0.285) | -8.876** (0.633) | -6.649** (0.341) |
| Inflation | 0.208** (0.036) | 1.059** (0.289) | -0.120 (0.082) |
| Annual variation of profitability between years *t-1* and *t* | 0.006** (0.001) | 0.007** (0.002) | 0.003* (0.002) |
| Annual variation of profitability between years *t-2* and *t-1* | 0.006** (0.001) | 0.005** (0.002) | 0.004* (0.002) |
| Proportion of days paid around the minimum wage | -0.019** (0.003) | -0.023** (0.004) | -0.024** (0.004) |
| Variation of the annual local unemployment rate | 0.008** (0.003) | -0.045** (0.005) | 0.027** (0.008) |
| Agreement concerning the reduction of the workweek duration | 0.476** (0.060) | 0.711** (0.150) | 0.831** (0.071) |
| **Size of the firm:** | | | |
| -between 50 and 100 workers | *Ref.* | *Ref.* | *Ref.* |
| -between 100 and 200 workers | 1.743** (0.080) | 1.887** (0.111) | 1.603** (0.101) |
| -between 200 and 500 workers | 3.049** (0.092) | 3.423** (0.126) | 2.681** (0.113) |
| -more than 500 workers | 4.081** (0.111) | 4.455** (0.150) | 3.636** (0.134) |
| **Occurrence of an industry-level agreement:** | | | |
| -the same year | 0.348** (0.121) | 0.199 (0.161) | 0.428** (0.161) |
| -last year | 0.233* (0.127) | 0.162 (0.172) | 0.286* (0.169) |
| -two years ago | 0.097 (0.144) | 0.385* (0.215) | 0.285 (0.188) |
| -more than two years ago | *Ref.* | *Ref.* | *Ref.* |
| **Industry :** | | | |
| Food goods | 0.378 (0.259) | 0.565 (0.346) | 0.211 (0.287) |
| Consumption goods | 0.316 (0.250) | 0.504 (0.334) | 0.039 (0.280) |
| Motor vehicles | 1.310** (0.325) | 1.555** (0.416) | 0.412 (0.376) |
| Capital goods | 0.468* (0.256) | 0.515 (0.344) | 0.182 (0.286) |
| Intermediate goods | 0.874** (0.240) | 1.016** (0.325) | 0.551** (0.267) |
| Energy | 0.266 (0.538) | -0.070 (0.661) | 0.219 (0.599) |
| Construction | -1.387** (0.277) | -1.701** (0.382) | -1.224** (0.309) |

| | | | |
|---|---|---|---|
| Wholesale and retail trade | -0.824** (0.241) | -0.853** (0.330) | -0.928** (0.267) |
| Transportation | -0.163 (0.255) | -0.326 (0.350) | -0.156 (0.279) |
| Real estate | 0.638 (0.396) | 1.003** (0.510) | 0.520 (0.438) |
| Business to business services | -1.276** (0.251) | -1.390** (0.342) | -1.348** (0.283) |
| Personal services | *Ref* | *Ref* | *Ref* |
| $\sigma_u$ | 2.605** (0.049) | 2.799** (0.065) | 2.219** (0.063) |
| $\sigma_\varepsilon$ | 2.391** (0.027) | 2.067** (0.033) | 2.577** (0.045) |
| $\rho$ | 0.543** (0.009) | 0.647** (0.011) | 0.426** (0.015) |
| Censored observations (zeros) | 91,202 | 43,101 | 48,101 |
| Non-censored observations | 6,276 | 3,406 | 2,870 |

*Remark: The proportion of days paid the minimum wage is calculated as the number of days paid around the minimum wage in each industry and in each département a given year, divided by the total number of days paid in the same industry and in the same département the same year, whatever the wage level.. The local unemployment rate variation is computed at the département level each year.*

*Symbols: **: significant at the 5 percent level, *: significant at the 10 percent level (otherwise, statistically non-significant). Standard errors are in brackets*

**Figure 1: Durations between two successive industry-level wage agreements**
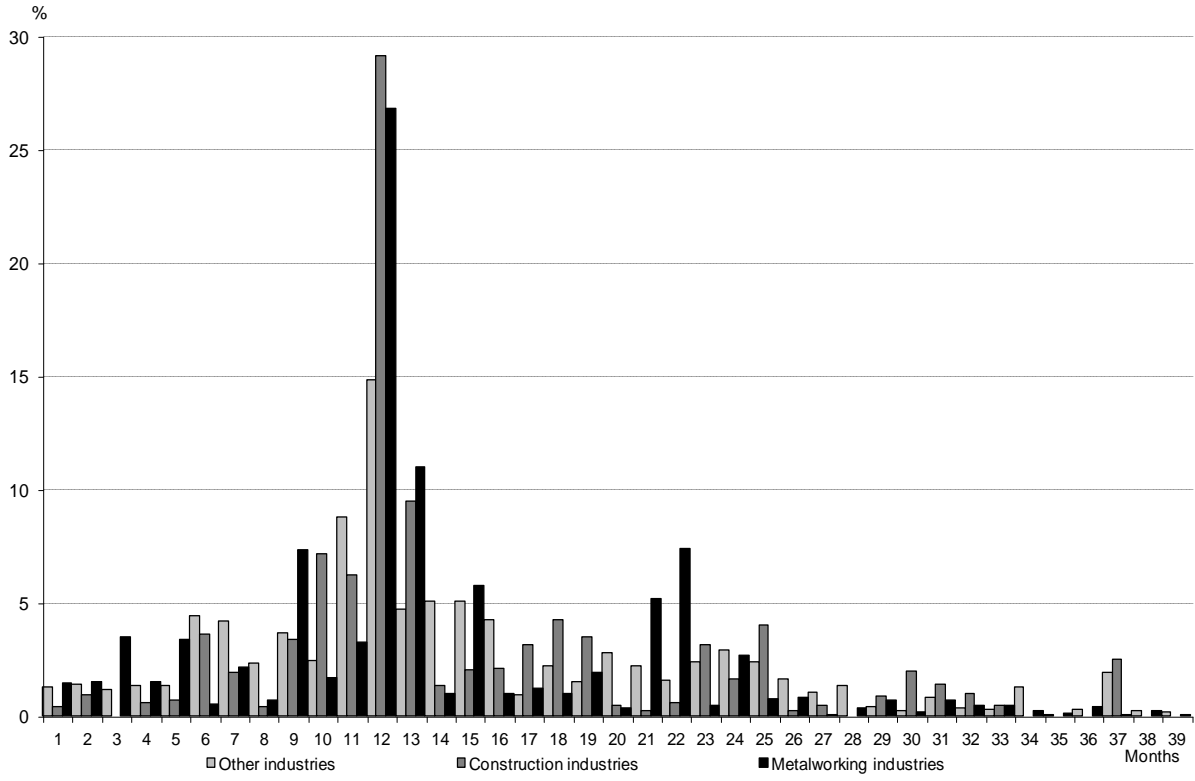


*Remark: Durations are weighted by the number of workers in each industry.*

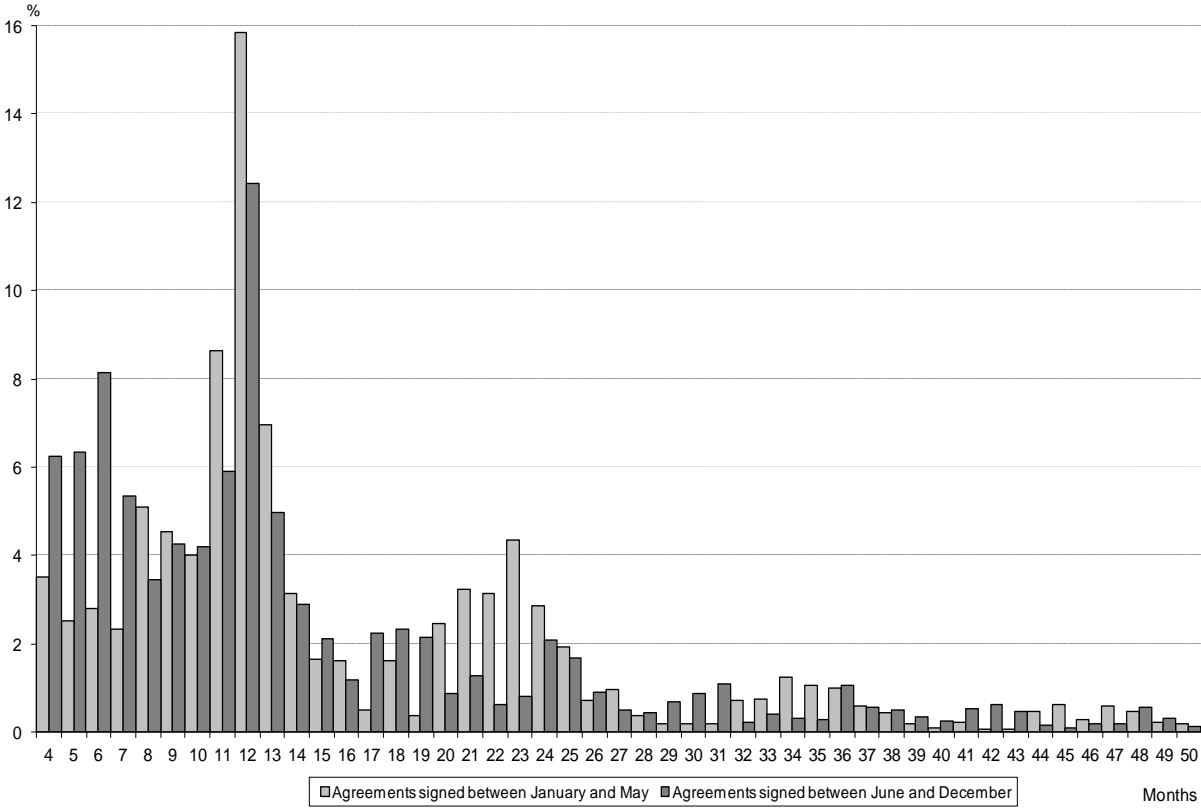**Figure 2: Durations between two successive firm-level wage agreements**
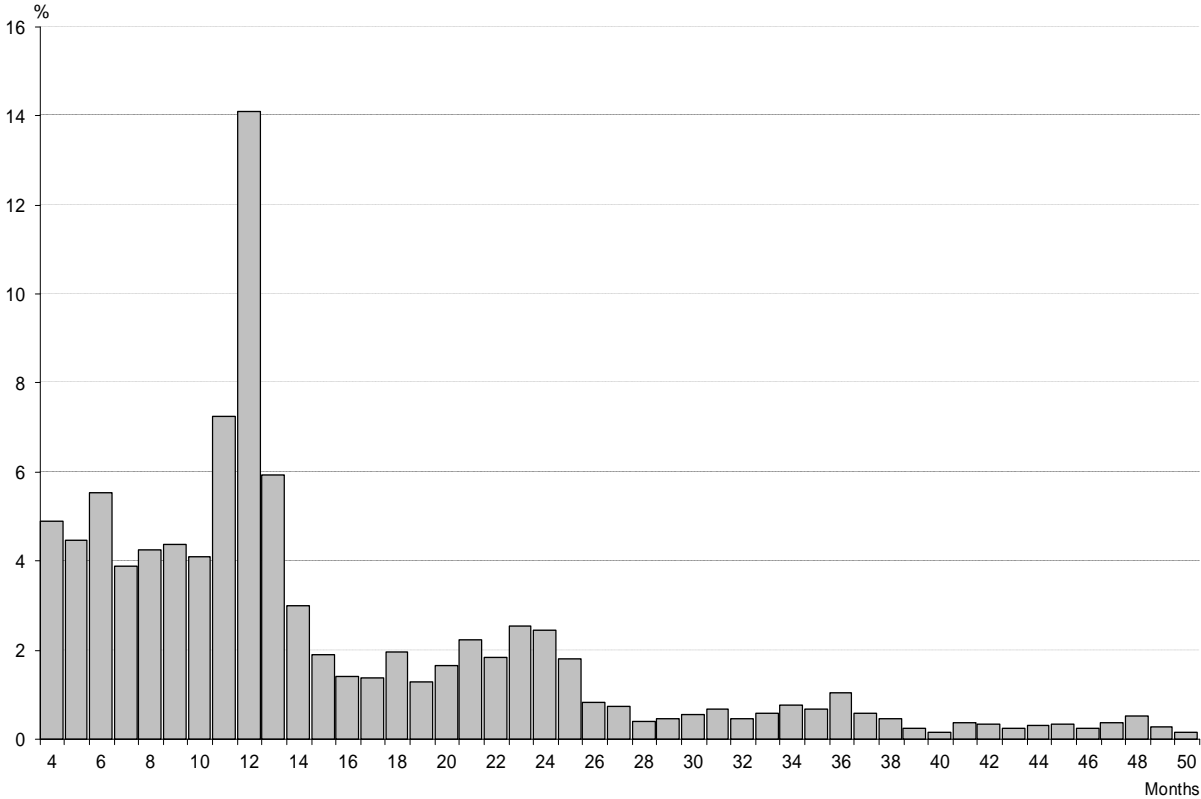


*Remark: Durations are weighted by the number of workers in each firm.*

**Figure 3: Durations between two successive dates of effect of industry-level wage agreements**
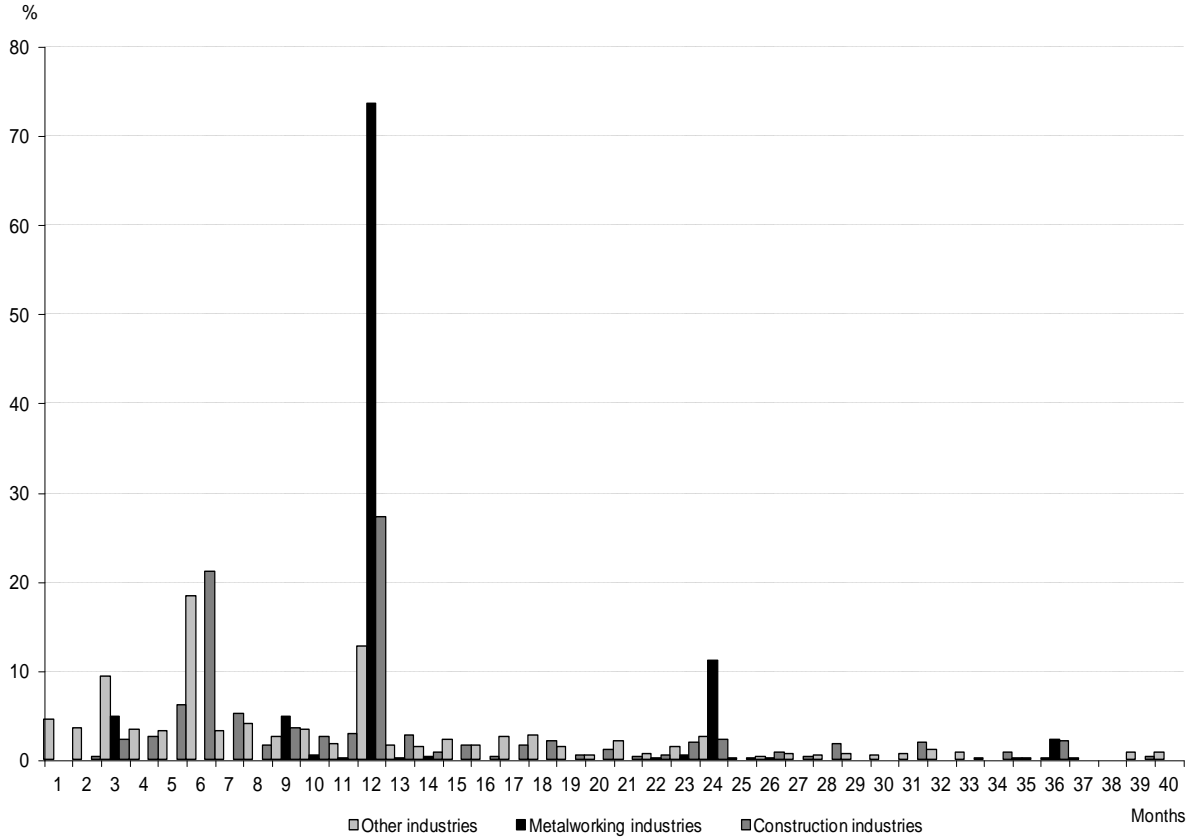


*Remark: Durations are weighted by the number of workers in each industry.*

**Figure 4: Durations between two successive firm-level wage agreements, by month of signature**



*Remark: Durations are weighted by the number of workers in each firm.*

41

**Figure 5: Number of firm-level and industry-level wage agreements**

*a)   In the chemical products industry*
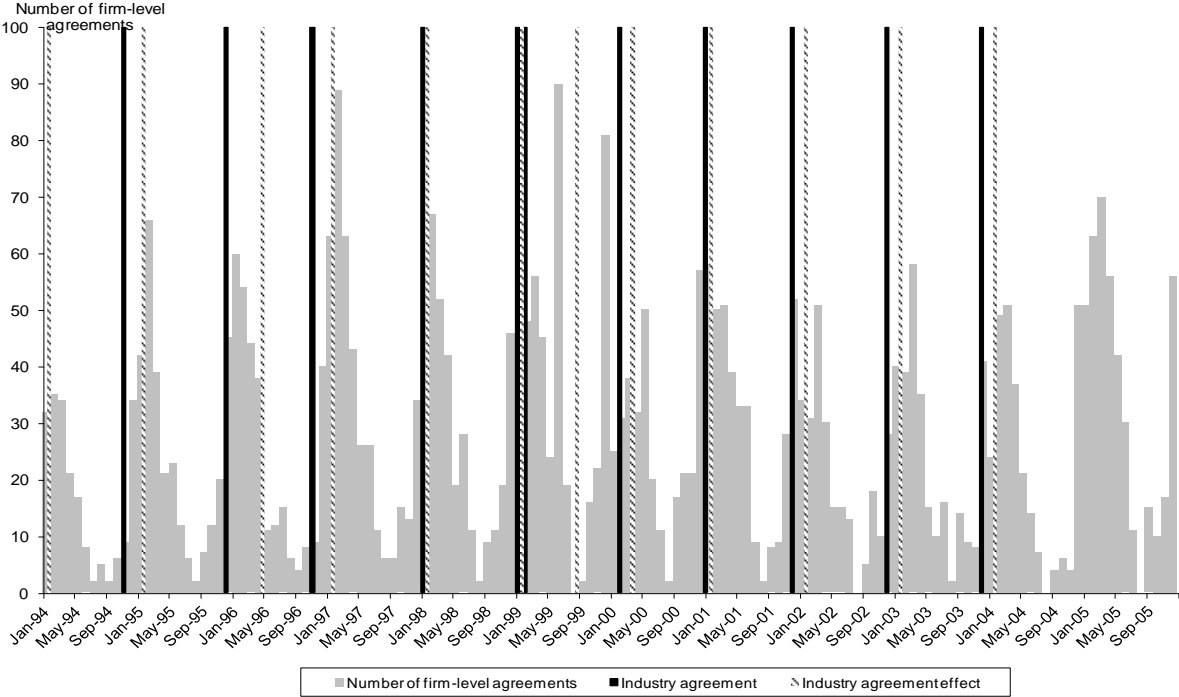


*b)   In the road transportation industry*
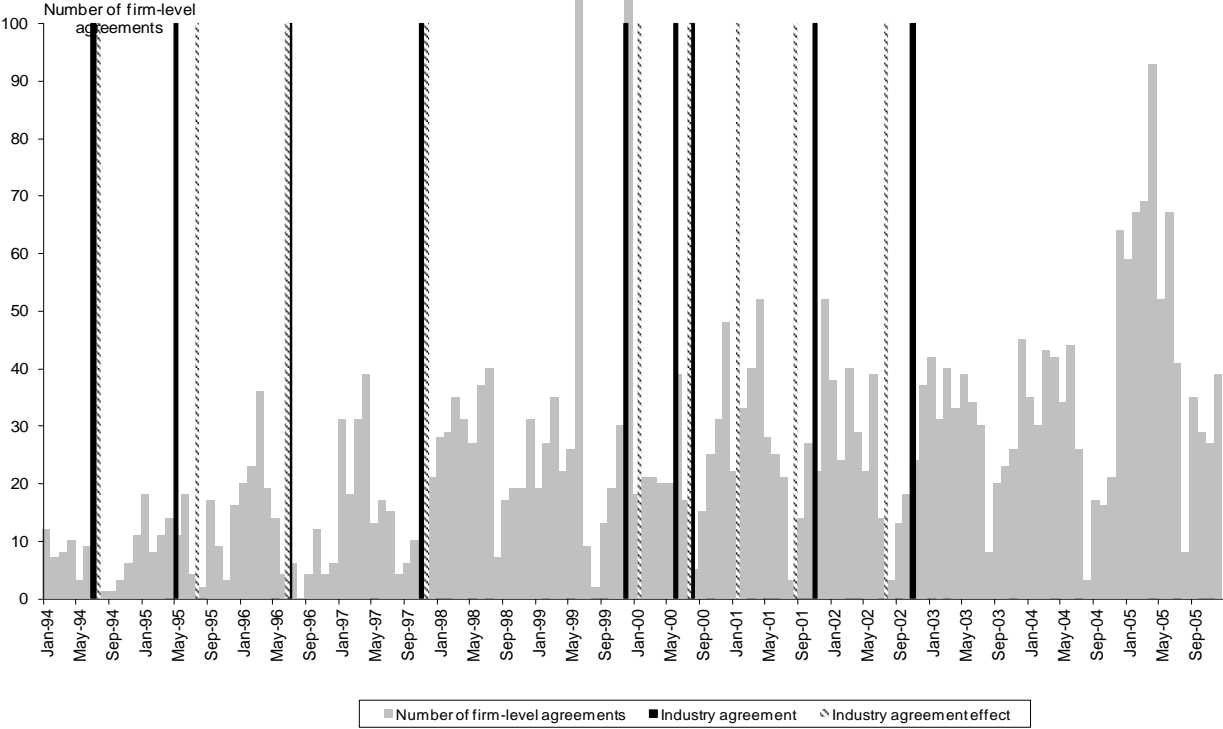


*Remarks: Grey histograms represent the number of firms signing a wage agreement in a given industry each month. Vertical black lines represent the dates of signature of industry-level agreements while vertical doted black lines correspond to the dates of effect of these agreements.*
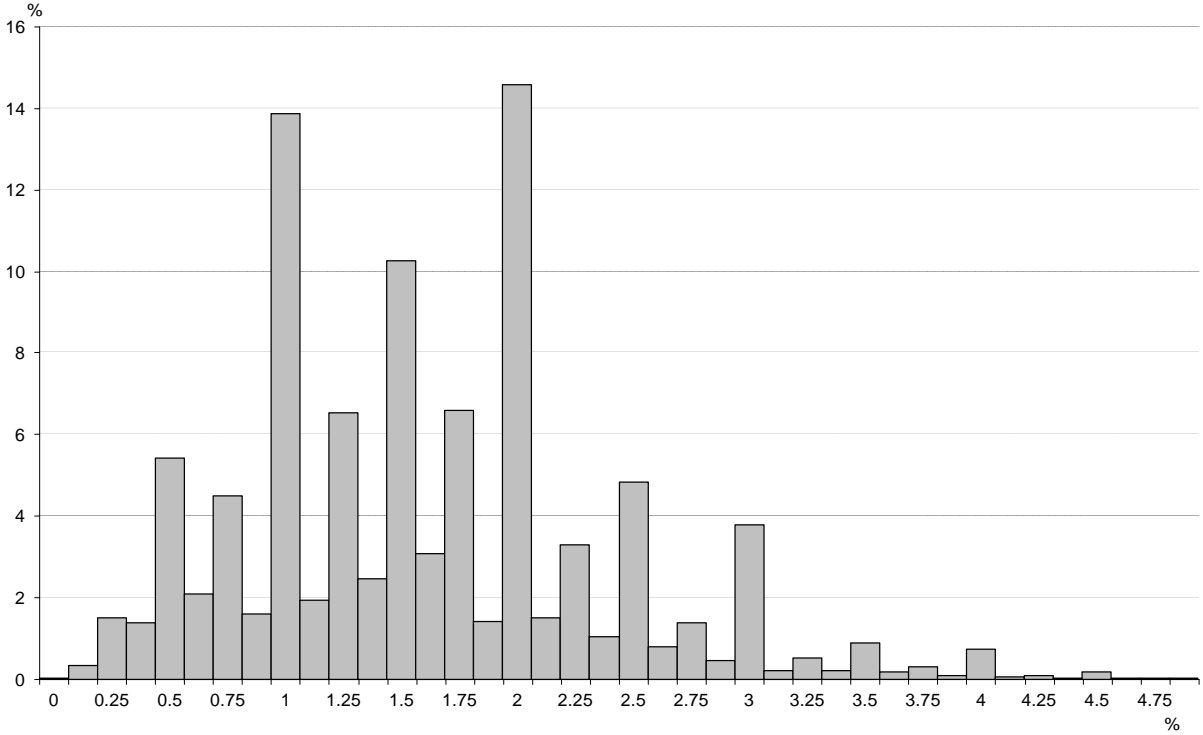
42

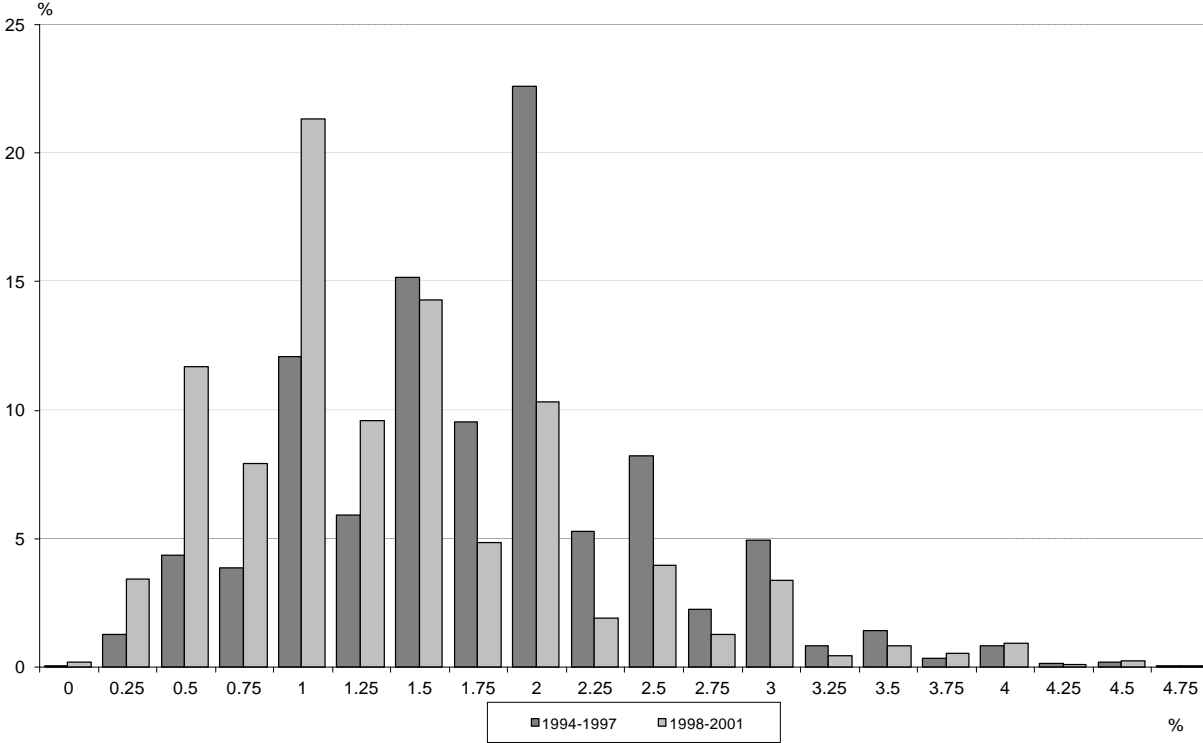**Figure 6: Wage increases negotiated in industry-level agreements**
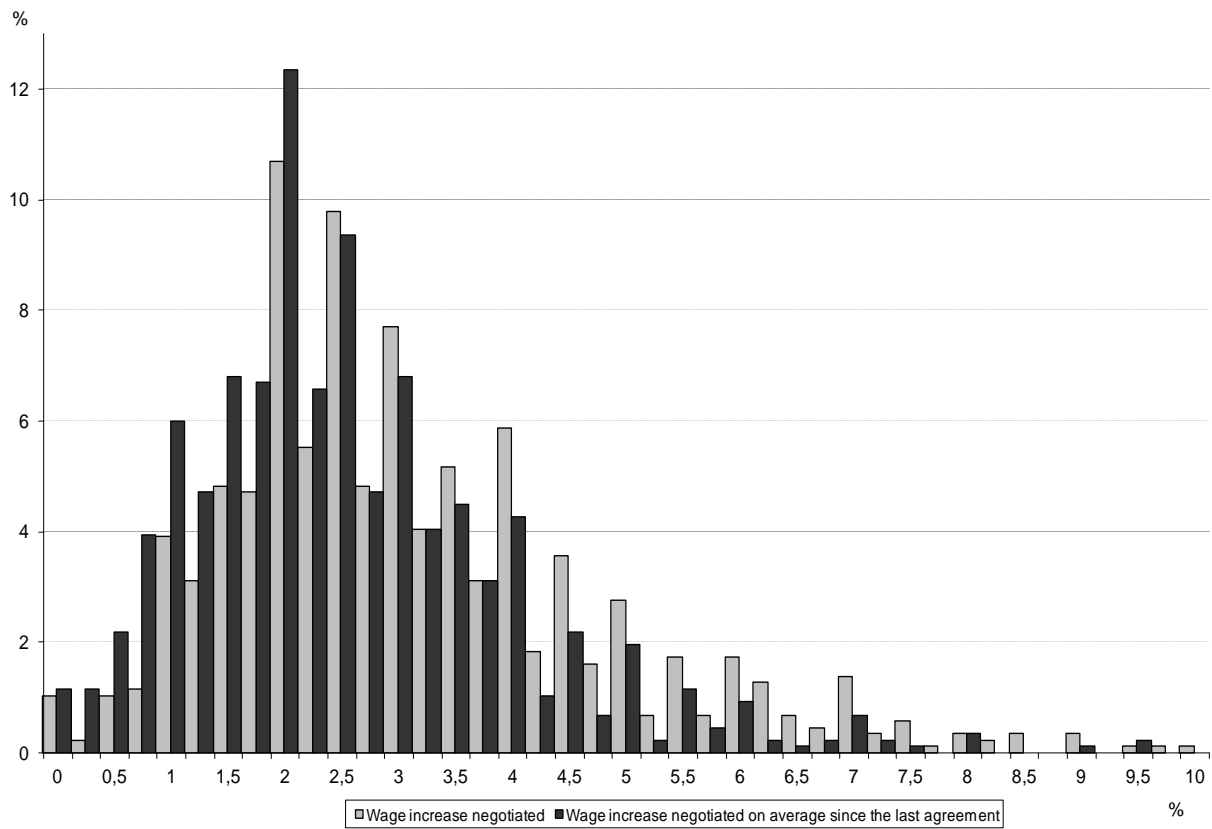


*Remark: Average wage increases at the industry level are calculated by using the wage grid that has been modified by the new wage agreement.*

**Figure 7: Wage increases negotiated in firm-level agreements**
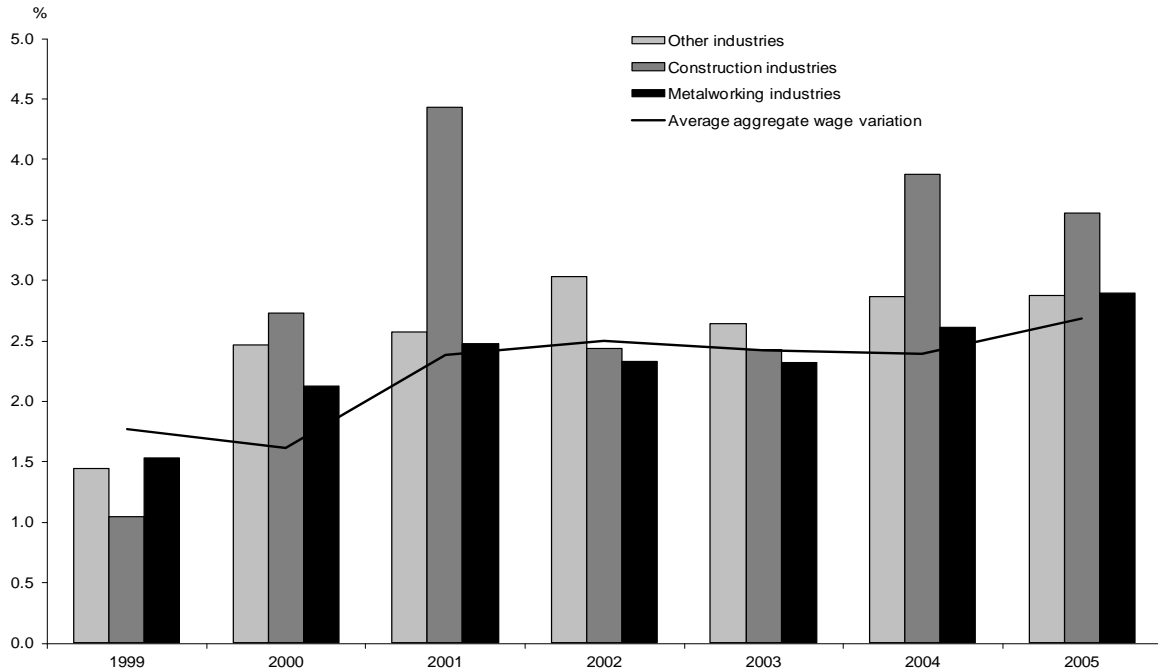
A – 1994-2001

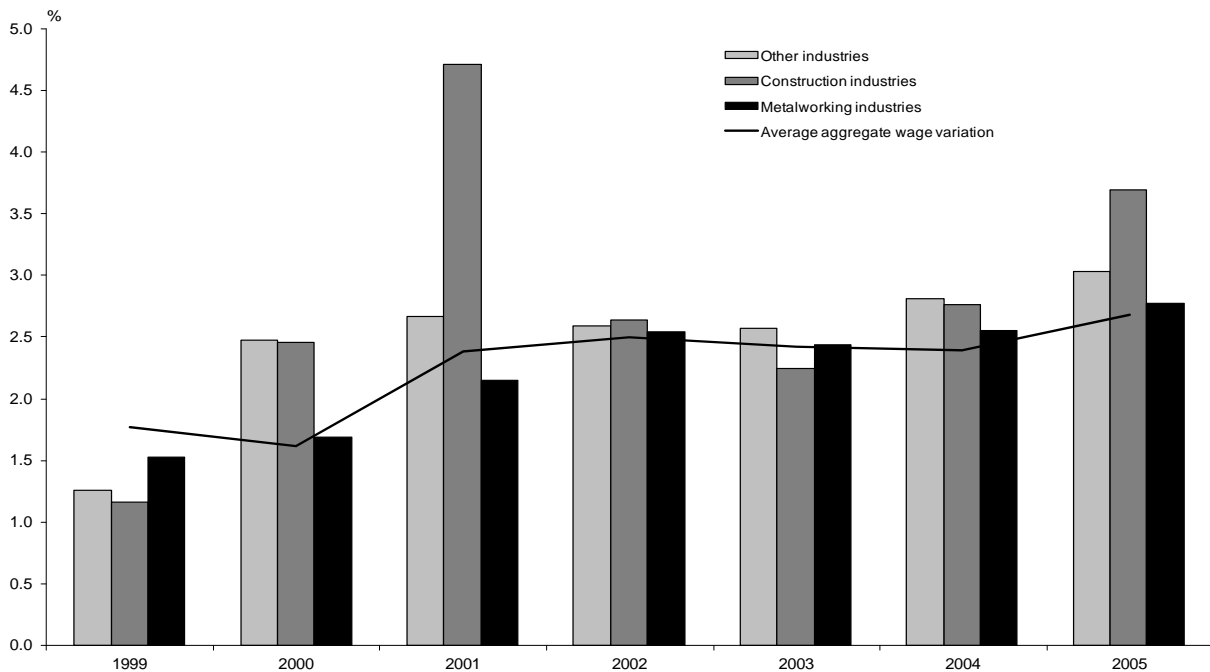

B - 1994-1997 vs. 1998-2001

**Figure 8: Wage increases negotiated in industry-level agreements, by year**

A – Negotiated wage increases negotiated divided by the number of years since the last agreement



B – Negotiated wage increases divided by the number of years since the last date of effect of the agreement



*Remark: Average wage increases at the industry level are calculated by using the wage grid that has been modified by the new wage agreement.*

**Figure 9: Wage increases negotiated in firm-level agreements, by year**



Legend: General pay rise, Blue collar, White collar, Management, Inflation
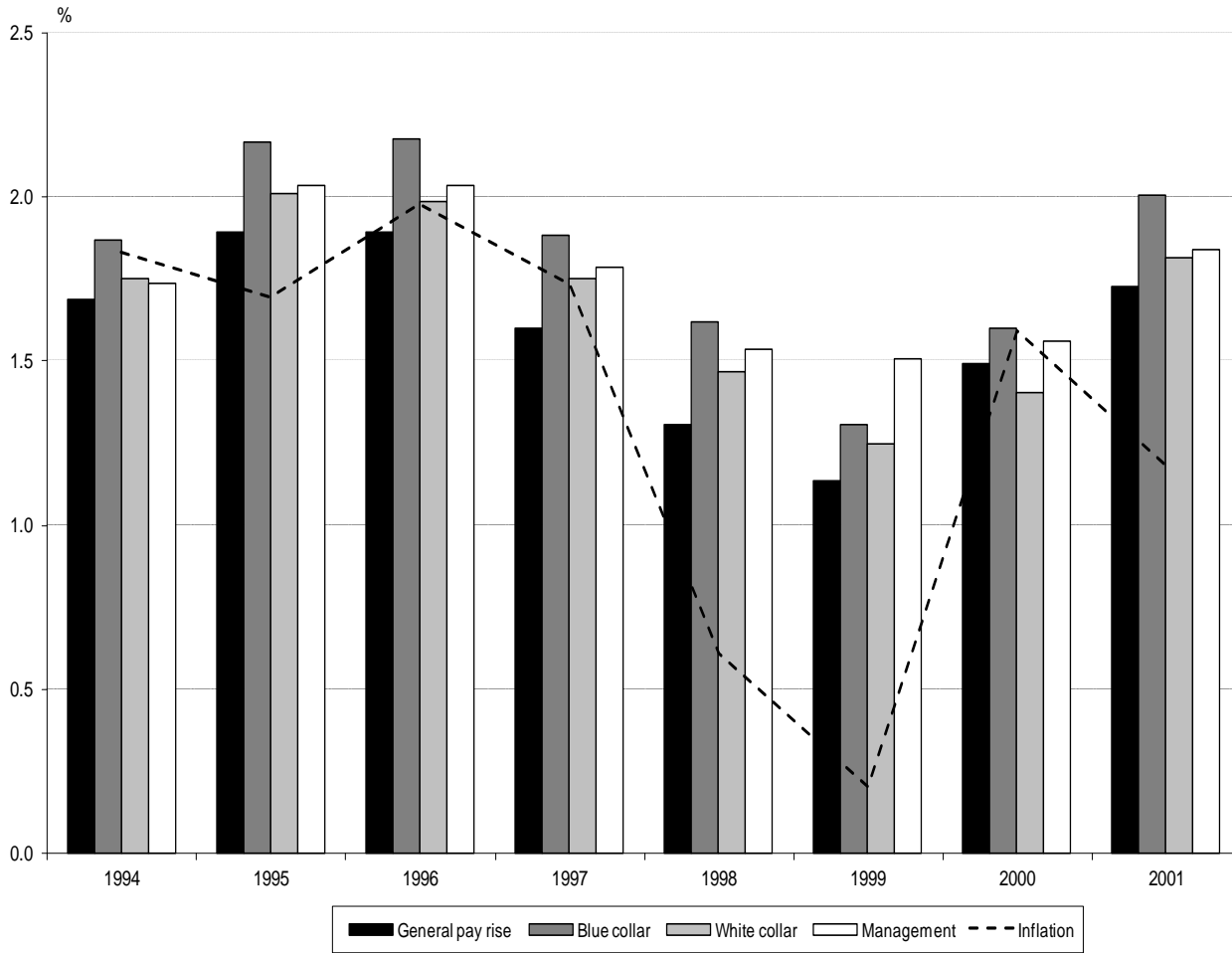
Appendix

**TableA: Summary statistics on the sample composition (in percent)**

|  | % of workers | % of firms |
|---|---|---|
| **Firm size** | | |
| Less than 20 workers | 10.5 | 57.6 |
| Between 20 and 50 workers | 16.5 | 26.3 |
| Between 50 and 100 workers | 9.2 | 8.3 |
| Between 100 and 200 workers | 10.5 | 4.4 |
| Between 200 and 500 workers | 13.3 | 2.4 |
| More than 500 workers | 40.1 | 1 |
| **Industry** | | |
| Agriculture and fishing | 0.3 | 0.6 |
| Food goods | 4.9 | 3.3 |
| Consumption goods | 6.9 | 5.3 |
| Motor vehicles | 3.8 | 0.5 |
| Capital goods | 8.3 | 5.4 |
| Intermediate goods | 15 | 9.4 |
| Energy | 1.3 | 0.2 |
| Construction | 7.8 | 12.7 |
| Wholesale and retail trade | 21.4 | 34.5 |
| Transportation | 7.2 | 6.3 |
| Real estate | 0.8 | 3.2 |
| Business to business services | 18.5 | 13.4 |
| Personal services | 4 | 5.5 |
| *« Branches »* | | |
| Construction industries | 7.9 | 13 |
| Metal-working industries | 20.6 | 10.6 |
| All industries excluding metal-working and construction | 66.6 | 74.2 |
| Other (no coverage, specific status…) | 4.9 | 2.2 |

*Remark : The proportion of workers (resp. firms) by sector, size or "branches" is computed as the total number of workers (resp., firms) of a given size/sector/branche divided by the total number of workers(resp., firms).*

**Table B: Proportions of workers covered by an industry- or a firm-level agreement, by economic sector (in percent)**

| Economic sectors | Industry-level agreements | Firm-level agreements | |
|---|---|---|---|
| | Wage agreements | All types of agreements | Wage agreements |
| Agriculture and fishing | 45.1 | 7.8 | 0.8 |
| Food goods | 84.1 | 42.3 | 23.0 |
| Consumption goods | 65.2 | 44.2 | 21.5 |
| Motor vehicles | 82.4 | 87.2 | 55.0 |
| Capital goods | 78.7 | 55.1 | 28.9 |
| Intermediate goods | 68.1 | 50.2 | 28.3 |
| Energy | 45.2 | 79.1 | 53.3 |
| Construction | 74.5 | 20.5 | 9.5 |
| Wholesale and retail trade | 59.9 | 29.9 | 13.7 |
| Transportation | 83.7 | 35.7 | 21.4 |
| Real estate | 72.9 | 24.9 | 12.4 |
| Business to business services | 53.4 | 44.0 | 16.5 |
| Personal services | 43.5 | 36.9 | 19.6 |

*Remark: The proportion of workers covered by a firm-level or an industry-level agreement is computed as the total number of workers in firms of a given sector covered by an agreement divided by the total number of workers in this sector.*

**Table C: Proportions of workers covered by an industry- or a firm-level agreement, according to the size of the firm in which they are occupied (in percent)**

| | Proportions of workers in each category of firms | Industry–level agreements | Firm–level agreements | |
|---|---|---|---|---|
| | | Wage agreements | All types of agreement | Wage agreements |
| Less than 20 workers | 10.5 | 62.6 | 2.0 | 0.1 |
| Between 20 and 50 workers | 16.5 | 66.4 | 5.0 | 0.8 |
| Between 50 and 100 workers | 9.2 | 65.4 | 15.7 | 4.5 |
| Between 100 and 200 workers | 10.5 | 65.2 | 27.7 | 11.4 |
| Between 200 and 500 workers | 13.3 | 66.2 | 44.4 | 22.8 |
| More than 500 workers | 40.1 | 66.9 | 76.3 | 40.8 |

*Remark: Each cell of the table corresponds to the total number of workers employed in firms of a given size and covered either by a firm-level or by an industry-level agreement divided by the total number of workers in the firms of this size.*

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