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Denis Fougère
CNRS, OSC and LIEPP (Sciences Po Paris), CEPR, and IZA

Erwan Gautier
Banque de France and Université de Nantes

Sébastien Roux
Insee, Ined and Crest

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IZA – Institute of Labor Economics

Schaumburg-Lippe-Straße 5–9
53113 Bonn, Germany

Phone: +49-228-3894-0
Email: publications@iza.org

www.iza.org

ABSTRACT

Wage Floor Rigidity in Industry-Level Agreements: Evidence from France*

This paper examines empirically the dynamics of wage floors defined in industry-level wage agreements in France. It also investigates how industry-level wage floor adjustment interacts with changes in the national minimum wage (NMW hereafter). For this, we have collected a unique dataset of approximately 3,200 industry-level wage agreements containing about 70,000 occupation-specific wage floors in 367 industries over the period 2006Q1-2017Q4. Our main results are the following. Wage floors are quite rigid, adjusting only once a year on average. They mostly adjust in the first quarter of the year and the NMW shapes the timing of industry-level wage bargaining. Inflation but also changes in past aggregate wage increases and in the real NMW are the main drivers of wage floor adjustments. Elasticities of wage floors with respect to these macro variables are 0.6, 0.4 and 0.3 respectively. Inflation and the NMW have both decreasing but positive effects all along the wage floor distribution.

JEL Classification: J31, J51, E24

Keywords: collective bargaining, wages, minimum wage, inflation

Corresponding author:
Denis Fougère
LIEPP - Sciences Po
27, rue Saint-Guillaume
75337 Paris Cedex 07
France
E-mail: denis.fougere@sciencespo.fr

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1. Introduction

In New Keynesian macroeconomic models, nominal wage rigidity is a key ingredient to explain variations of output or employment. Wages are sticky because they adjust infrequently and respond only slowly to shocks. In European countries, one reason for such wage rigidity might be the existence of wage bargaining institutions.[1] In order to increase wage flexibility and lower the unemployment rate, many countries have implemented reforms fostering decentralization of wage bargaining, in particular since the start of the 2008 crisis (see, e. g., Díez-Catalán and Villanueva, 2014, for Spain, Dahouli *et al.*, 2016, for Greece, Martins, 2014, and Guimaraes *et al*., 2017, for Portugal). A deeper look into industry-level wage agreements might be helpful to better understand how wage bargaining institutions shape wage dynamics. In all industries, unions and employers' associations bargain on wage floors defined for industry-specific sets of representative job occupations. Since industry-level agreements are often extended to all employees in an industry, all firms should comply with those wage floors which are also often used as references for firms' wage policies.[2] However, empirical evidence on the degree of wage floor rigidity is very scant.

This paper fills this gap by examining for the first time the dynamics of wage floors defined in industry-level agreements. For that, we have collected for France a large and unique dataset consisting of more than 3,000 sectoral wage agreements containing about 70,000 job-specific wage floors for 367 different industries over the period 2006Q1-2017Q4. To examine the wage floor dynamics, we rely on a flexible micro-econometric model of wage rigidity: we jointly model the decision to sign wage agreements and the resulting adjustment of several job-specific wage floors. This model incorporates usual determinants of wage rigidity models (like the elapsed duration between two successive agreements, inflation, unemployment, the business cycle…) but also variables capturing bargaining institutions like the national minimum wage (NMW) increases.

[1] For instance, Dickens *et al.* (2007) provide evidence of a cross-country correlation between the degree of downward wage rigidity and institutions of wage bargaining. Gartner *et al.* (2013) show that wage cyclicality depends on the wage bargaining regime. For other evidence on how wage bargaining affect wages, see Card and de la Rica (2006) for Spain, Cardoso and Portugal (2005) for Portugal, Carluccio *et al.* (2015) for France, or Gürtzgen (2009) for Germany.

[2] For instance, Luciani (2014) finds that industry level is the dominant level in the wage setting process for one third of French firms, whereas André (2012) obtains a significantly positive short-term elasticity of actual wages to wage floors (see also Lopez-Novella and Sissoko, 2013, for Belgium, and Dolado *et al.*, 1997, for Spain). See also Villanueva (2015) for a survey on extension procedures in Europe.

Our paper provides new empirical evidence on wage rigidity using sectoral wage floor micro data. We contribute to the literature examining wage rigidity using wage agreement data (including among others Taylor, 1983, Cecchetti, 1984, Christofides and Wilton, 1983, and more recently Christofides and Stengos, 2003, Rich and Tracy, 2004, and Christofides and Nearchou, 2007). This literature focuses on wage agreements negotiated at the firm level in the United States and Canada. To our best knowledge, little evidence is available on the patterns of wage floor adjustments stipulated in industry-level agreements while they cover a majority of employees in most European countries.[3] For France, we find that industry-level wage floors are quite rigid since only 20% of wage floors adjust each quarter on average.[4] Looking at wage agreement data can allow us to better understand the underlying determinants of actual wage rigidity (see, for instance, Le Bihan *et al.*, 2012, Barattieri *et al.*, 2014, and Sigurdsson *et al.*, 2016, for evidence using actual wage data for France, the US and Iceland, respectively).[5] Our results also shed some light on the empirical relevance of wage rigidity models frequently used in macro-models (see, e.g., Erceg *et al.*, 2000, and Gali, 2010). Macro models often incorporate wage rigidity by using a simple Calvo assumption which predicts that the probability of a wage change is independent of the duration since the last wage adjustment. On the contrary, our results suggest that the frequency of wage floor adjustments is highly time- and duration-dependent: industry-level wage agreements are much more frequent during the first quarter of the year and the usual duration between two wage agreements (and so, between two wage floor adjustments) is one year. Fixed-duration Taylor contracts would better reproduce this strong duration dependence of wage agreements. Another implication of our results is that wage contracts are highly synchronised and not staggered over time (see Olivei and Tenreyro, 2010, for macro implications of this synchronisation). We also find some evidence of state-dependence since macro variables affect the likelihood of wage agreements. However, the impact of macro variables like inflation or unemployment on the frequency of wage adjustment is relatively small. Besides, we provide new results on determinants of the size of wage floor changes. We find an ample degree of indexation to past inflation: the elasticity of wage floors

[3] Avouyi-Dovi et al. (2013) provide some empirical evidence on wage bargaining in France by combining data on firm- and industry-level agreements. However, because of data limitation, they focus mainly on the timing of firm- and industry-level wage agreements and they do not examine the economic determinants of wage floor adjustments at the job occupation level.

[4] For the United States and Canada in the seventies, Taylor (1983) and Cecchetti (1984) or Christofides and Wilton (1983) find that the average duration of contract is well above one year.

[5] This literature infers wage change decisions from actual wage data. Using observations of industry wage agreements allows us to provide direct evidence on the timing and determinants of wage adjustment decisions (Cecchetti, 1984).

with respect to inflation is 0.6 whereas unemployment or industry-specific business conditions have only a small or non-significant impact on wage floor adjustments.

Another contribution of our paper is to investigate the effects of the NMW on the dynamics of industry-specific wage floors. A large empirical literature looks at spillover effects of minimum wage on higher wages (see, e.g., Grossman, 1983, Card and Krueger, 1995, Machin *et al.*, 2003, Dickens and Manning, 2004, Neumark and Wascher, 2004, and Autor *et al.,* 2016; see also Aeberhardt *et al.*, 2016, for evidence on France). Several theoretical explanations rationalise these spillover effects at the firm level (see, e.g., Grossman, 1983, and Manning, 2003). However, in Europe, one important additional channel of transmission of NMW increases to higher wages may come from industry-level wage agreements.[6] We here provide new and direct evidence on how bargaining institutions might shape the effects of the NMW on other wages. First, the NMW has a significant and positive effect on the timetable of wage floor adjustments. Most of wage floor adjustments are clustered around the usual date of the NMW adjustment and the NMW has a significant and positive impact on the probability of a new agreement. The NMW also affects significantly the size of wage floor adjustments. On average, a 1%-increase of the real NMW raises wage floors by about 0.3 pp. Finally, wage floor adjustments are much more responsive to NMW variations when wage floors are close to the NMW. The impact of NMW variations decreases along the wage floor distribution but only slowly (from 0.5 pp for the lowest wage floors to 0.1 pp for the highest ones). Thus, the NMW has a statistically significant effect all along the wage floor distribution.

The rest of the paper is organised as follows. Section 2 presents the institutional features of collective bargaining in France. In Section 3, we describe our micro data and provide some basic stylised facts on industry-level wage floor adjustments. The empirical model is presented in Section 4. Our results are commented on in Section 5. Section 6 concludes.

2. Institutional features of wage bargaining in France

France is an interesting case to study since French institutions of collective wage bargaining are quite similar to the ones generally observed in other European countries (OECD, 2017). Wages are bargained at two different levels. At the industry level, employers' organisations and unions bargain on occupation-specific wage floors and firms cannot opt out of an industry-level agreement (this was confirmed by French Labour Laws enacted in 2017). At the firm level,

[6] Using experimental data, Dittrich *et al.* (2014) find evidence that wage bargaining is an additional channel through which NMW spillover effects might arise (even when the NMW is low).

employers and unions bargain on wage increases provided that wages are set above the industry wage floors (see Boeri, 2015, for a discussion of the effects of such a two-tier bargaining system).[7] This section presents the main institutional features of the wage floor bargaining process at the industry level.

2.1 Contractual industries and wage floors

Firms are classified into different "*contractual industries*" ("*branches conventionnelles"* in French). An initial request from employers and unions is at the origin of a new *"contractual industry"*. Thus, the definition and coverage of industries do not only depend on economic factors but also on the history of industrial relations or on local factors.[8] The French Ministry of Labour is in charge of enforcing this system and should ensure that every firm is classified into the suitable contractual industry. There are more than 700 different "*contractual industries*" in France but only about 300 of these industries cover more than 5,000 workers. For each industry, an initial collective agreement ("*convention collective*" in French) defines rules and principles governing industrial relations between employees and employers within the industry, like wage bargaining, working conditions, duration of working hours, lay-off conditions, union rights, etc. In particular, it defines an industry-specific classification of representative occupations; this classification is generally based on many criteria such as worker skills, job requirements, experience, and age or qualifications required for the job. In a given industry, every worker is assigned to one position in the industry-specific job classification. A wage floor is set for every position and workers cannot be paid below the industry-specific wage floor associated with their job position. The set of all wage floors is denoted as the industry-level scale of wage floors. In Table 1, we provide two examples of job classifications and wage floor scales in 2014 for "*Hairdressing*" and for "*Manufacture of paper and paperboard*".

[Insert Table 1]

By law, contractual industries must open bargaining discussions on wage floors at least once a year, but there is no legal obligation to reach an agreement at the end of the bargaining process. Consequently, the duration between two successive agreements can be higher than one year.

[7] We do not examine here firm-level agreements since our aim is to describe the wage floor adjustment process in industry-level agreements and because information on the size of wage adjustments in firm-level agreements is not available (see Avouyi-Dovi *et al.,* 2013, for more details).

[8] As a result, contractual industries have a different coverage than usual classifications of economic activities (for instance, the NACE classification) and they cannot be exactly matched with usual classifications of economic activities.

Obviously, industries are also free to bargain on wages several times a year, which can induce smaller durations between two agreements. One important outcome of wage bargaining is the revision of wage floors. In the absence of any new agreement, wage floors remain unchanged until the next agreement; an agreement does not define any explicit contract duration (as it may be the case in Spain, for instance). Once unions and employers' associations sign an agreement, this agreement is automatically extended by decision of the Ministry of Labour to all firms belonging to the corresponding contractual industry. Extensions are generally quickly implemented (between 2 and 3 months). One consequence is that a large majority of workers are covered by industry-level wage agreements. Contrary to some European countries (like Germany), there is no opt-out possibilities for French firms and industry-level wage floors are binding for all firms within an industry. Finally, the agreement sets the date at which this new scale of wage floors should be enforced. This date can be slightly different from the date of signature of the agreement.

2.2 The national minimum wage

At the national level, a binding national minimum wage (hereafter, NMW; in French the acronym for the NMW is *SMIC* for *Salaire Minimum Interprofessionnel de Croissance*) is set by the government; it defines a legal wage floor for all French workers. By law, the NMW automatically adjusts every year, on July 1st until 2009, then on January 1st since 2010. The Ministry of Labour decides the size of NMW increases following an explicit and legal rule:

$$\Delta \mathrm{NMW}_t = \max(0, \Delta CPI_t) + \frac{1}{2}\max(\Delta \mathrm{W}_t - \Delta CPI_t, 0) + \varepsilon_t \quad (1)$$

where ΔNMW_t is the NMW increase over the year, ΔCPI_t is the inflation rate, $\Delta \mathrm{W}_t$ is the increase in the blue-collar hourly base wage and ε_t is a possible discretionary governmental additional increase.[9] Over the period 2006-2017, only one discretionary increase (+0.6%) was implemented in July 2012 (just after François Hollande was elected as *Président de la République*). In France, changes in the NMW directly affect wages of about 10% of the labour force (versus less than 5% in most European countries; see, e.g., Du Caju *et al.*, 2009)

The NMW can interact with industry-level wage bargaining. Most often, the lowest wage floors are above the NMW. However, it might happen that some wage floors stand below the NMW, in particular when the NMW has just been updated and when industry-level bargaining has not

[9] Besides, if during the year the inflation rate is higher than 2% since the last NMW adjustment, the NMW is automatically and immediately adjusted (this was the case in May 2008 and in December 2011).

yet occurred.[10] In that case, unions and firms' representatives receive strong recommendations from the Ministry of Labour to open new industry-level wage negotiations and update their lowest wage floors. For instance, in 2008, a law introduced the possibility of financial penalties for reluctant industries. When industries have all their wage floors above the NMW, they are said to comply with the NMW.

3. Data on industry-level wage floors

3.1 Data

Our data set consists of a little more than 70,000 wage floors which are defined at the occupational level in wage agreements. For the 367 largest "contractual" industries (among about 700 industries in France), we have collected all wage agreements over the period 2006Q1-2017Q4 which are freely available on a governmental web site.[11] Our sample contains more than 3,000 wage agreements. This data set is to our knowledge the first one containing such detailed information on wage floors negotiated within industries. Table 2 provides some basic characteristics of these industries. The number of employees covered by a "contractual" industry varies a lot: in our sample, seven industries cover more than 350,000 employees (for instance, the wholesale food industry, hotels and restaurants, and car services), but 25% of industries cover less than 5,500 employees. Overall, industries of our dataset cover about 12 million employees, i.e., about 75% of workers in the private sector. Many industries included in our dataset have a national coverage (209 industries). In the metalworking sector, wage floors of non-managerial employees are bargained at the local level: about 77 local different wage scales coexist at the *département*[12] level but they all use the same classification of job occupations. In three sectors, i.e., 'public works', 'quarry and metal', and 'construction', wage floors for non-managerial employees are bargained at the regional level (an administrative *région* consists of several *départements*): about 81 different regional wage scales coexist, and within those 3 sectors job classifications are similar.

[Insert Table 2]

[10] No worker can be paid below the NMW (even if a worker is covered by an industry-level wage floor below the NMW) and actual wages below the NMW must be adjusted with no delay to the new value of the NMW.

[11] Legifrance which contains all French laws and constitutional and legal rules but also labour laws and industry-level agreements: http://www.legifrance.gouv.fr/initRechConvColl.do

[12] A *département* is an administrative area. There are 96 *départements* in France. Each of them has approximately the same geographical size (6,000 km2), but different populations.

The typical wage agreement contains the date (day/month/year) at which the agreement was signed, the date at which it was enforced,[13] unions and federations of employers signing the agreement, and the scale of wage floors (i.e. wage floors of all representative occupations in a given industry). Wage floors can be defined as hourly, monthly, or yearly base wages (gross wages in euros, i.e., excluding employer social security contributions but including employee social security contributions). They exclude bonuses and other fringe benefits. We also exclude wage levels or planned wage increases that are only based either on seniority or explicit seniority indexation rules defined in the agreement.

The number of wage floors can vary across industries since wage floor scales are specific to job classifications defined at the industry level. On average, industry-level wage floor scales contain 20 different wage floors corresponding to different job occupations (see Table 2). The average wage gap between two wage floors within a wage floor scale is about 5.7%. This average wage differential is much smaller in the first half of the wage floor scale (2%) whereas the average differential is about 10% at the top of the distribution.[14] Finally, the average monthly wage floor over the sample period is about 2,000 euros. The wage differential at the industry level between average actual wages and average wage floors is about 40% on average; wage floors and actual average wages are highly correlated across industries (Figure A in Appendix).

3.2 Stylised facts

Using our data set, we can follow wage floor trajectories over successive agreements; this allows us to calculate year-on-year wage adjustments for all wage floors over the sample period. Figure 1 plots the average annual growth of wage floors. First, over the sample period, the wage floor growth is close to but below the average growth of aggregate base wage published by the Ministry of Labour since actual wage changes may also include firm-level and individual wage increases. Second, aggregate variations of wage floors are also highly correlated to the actual aggregate wage increase. Both variables have followed a similar decreasing trend since 2009. Lastly, there is a correlation between the annual growth of wage floors and changes in the NMW. When the NMW increased by more than 2% in 2008 and 2012, the gap between the annual growth of wage floors and the actual aggregate wage growth fell close to 0.

[Insert Figure 1]

[13] There is no explicit definition of contract duration like in Spain, for instance. The new wage floor classification remains the same until the next wage agreement.

[14] The top of the wage floor scale consists of wage floors above the median of wage floors in each job classification.

Industry-level wage bargaining is not a continuous process since it involves costs of gathering and sharing information but also coordination costs between unions and employers. Thus, wage floor adjustments are infrequent and on average, only 20% of wage floors adjust in a given quarter. The typical duration between two wage floor changes is one year (see Figure B in Appendix). This frequency of wage floor adjustments can be related to usual indicators of wage rigidity: Le Bihan *et al.* (2012) find that the frequency of wage adjustments in France is 38% per quarter. Another important feature of wage floor adjustment is the strong seasonality of wage agreements (see Figure 2). A large share of agreements become effective during the first quarter of the year; this synchronisation of wage floor adjustments is even stronger after 2010 when the usual month of the NMW adjustment moved from July to January. Before 2010, 40% of wage agreements were implemented in the first quarter of the year (and 25% in the third quarter) whereas, after 2010, about 60% of wage agreements were enforced in the first quarter (and about 10% in the third quarter).

[Insert Figure 2]

Figure 3 plots the distribution of annual wage floor changes (calculated in Q4) year by year over the period 2007-2017. First, there is no nominal wage decrease in industry wage agreements, which implies a very high degree of downward nominal wage rigidity (see also Dickens *et al.*, 2007 or Holden and Wulfsberg 2014 who both relate the degree of downward wage rigidity to labour market institutions). Second, there is a large peak at zero (on average, close to 25%) corresponding to industries where there is no agreement or where some wage floors do not change. Third, the median wage floor increase is 1.5%. However, the distribution of wage floor adjustments moved a lot over the sample period: inflation and changes in the NMW seem to shape these distributions over time. When inflation is low in 2009-2010 and since 2014, the peak at zero is much higher. Moreover, since 2014, the persistent low inflation period has shifted to the left the distribution of wage floor changes, this distribution is much less dispersed, and the median wage change is close to 1%.

[Insert Figure 3]

4. An empirical model for the wage floor dynamics

Our aim is to investigate empirically the main determinants of industry-level wage floor adjustments. We rely on a flexible reduced-form model taking into account the lumpiness of wage floor adjustments. We model two joint processes describing wage floor adjustments. At the industry level, the first process generates the decision to sign a wage agreement. At the job occupation level, the second process generates the size of wage floor adjustments (once an industry-level agreement is signed). This second process consists of a set of equations associated with all job occupations within a given industry.

Our empirical model is also guided by theoretical models of wage rigidity (see, e.g., Taylor, 2016). Standard wage rigidity models typically predict that the probability of a wage adjustment depends either on variables reflecting the state of the economy, like in state-dependent models (see, e. g., Fehr and Goette, 2005), or time-dependent variables, like the elapsed duration since the last wage adjustment (as in a standard Taylor time-dependent model). To explain the sizes of wage adjustments, we consider usual determinants suggested by the literature on wage rigidity, namely inflation, unemployment and output gap (see, e.g., Blanchard and Katz, 1999, and Gali, 2011), but also NMW increases and sectoral wage increases.

4.1 The empirical model

Our empirical model is close to a type II Tobit model taking into account that wage agreements are infrequent (see, e. g., Fehr and Goette, 2005, and Le Bihan *et al.*, 2012, for similar models). Like in a standard type II Tobit model, wage floor changes are conditional to the realization of a binary event (i.e., our selection process) which is here the decision to sign an agreement. In this equation (referred as the "agreement equation" in the rest of the paper), the dependent variable is a dummy variable equal to 1 if a wage agreement is signed in industry *j* at date *t*, 0 otherwise. A key difference with the standard type II Tobit model is that once an agreement is signed in a given industry, many wage floors are updated and wage floor changes might be correlated to each other. Thus, the second stage of our model corresponds to several equations describing the nominal wage floor changes for all occupations in industry *j* at date *t*. We refer to these equations as "wage floor change equations" in the rest of the text.

We now present in more details how we specify our two blocks of equations. First, our baseline agreement equation is written as follows:

$$Y_{jt}^{*} = \alpha + \beta \Delta_{t-\tau_j,t} CPI + \gamma \Delta_{t-\tau_j,t} NMW + \delta \Delta_{t-\tau_j,t-1} \overline{W} + \theta \Delta_{t-\tau_j,t-1} \widetilde{W}_j + \varphi u_{jt} + \omega y_{jt} + \mu x_{jt} + \rho \tau_j + \lambda_t + \varepsilon_{jt} \quad (2)$$

If $Y_{jt}^{*} > 0$ then $Y_{jt} = 1$. Y_{jt} is equal to 0 otherwise. Here Y_{jt} is a dummy variable equal to one if a wage agreement is signed in industry *j* at date *t* (date in quarter/year format). $\Delta_{t-\tau_j,t}$ is the log difference operator between the date of the last wage agreement $t-\tau_j$ (where τ_j is the elapsed duration in quarters since the last agreement ratified in industry *j*) and date *t*. For instance, $\Delta_{t-\tau_j,t}CPI = CPI_t - CPI_{t-\tau_j}$. In our model, industries bargain on wages infrequently. Consequently, we assume that bargaining parties (workers' unions and employers' associations) incorporate into the updated wage floors, not the change in macro variables at the date of agreement, but rather the cumulated changes in macro variables since the last wage industry agreement (see Figure C in the Appendix).[15] The operator $\Delta_{t-\tau_j,t}$ allows us to compute cumulated variations of macro-variables between the last wage agreement observed at date $t - \tau_j$ and date *t*. The use of cumulative variables can also be justified by predictions of state-dependent models of wage rigidity (see, e.g., Le Bihan *et al.*, 2012, and Sigurdsson *et al.*, 2016). CPI is the overall French consumer price index (CPI hereafter), NMW is the NMW in real terms (i.e., divided by the CPI), and W_j is an average wage index for industry j. W_j is introduced to account for past changes in actual industry-specific wages which can affect new wage floors. For instance, a large increase in actual wages in the industry (regardless of the previous wage agreement) could lead unions to adjust wage floors upwards. This adjustment would be rationalized by fairness arguments (see, e.g., Falk *et al.*, 2006). This increase in industry-level wages may be due to productivity gains in the industry, but it can also be related to some exogenous wage increases in the largest firms of this industry (determined by a firm-level agreement, for instance). In this case, employers' federations might agree with a wage floor adjustment, in particular if they want to prevent potential competitors from maintaining low wages in order to obtain a substantial competitive advantage (see, e. g., Haucap *et al.*, 2001). The cumulated variation of W_j is taken in real terms and net of NMW effects.[16] This variation is then decomposed into an aggregate wage increase that is common to all industries and denoted $\Delta_{t-\tau_j,t-1}\overline{W}$ (which should be close to the aggregate base wage increase in France) and an industry-specific wage increase (which is calculated as $\Delta_{t-\tau_j,t-1}\widetilde{W}_j = \Delta_{t-\tau_j,t-1}W_j - \Delta_{t-\tau_j,t-1}\overline{W}$). In this case, the log-difference is calculated between date $t - \tau_j$ and one quarter before the agreement (*t-1*) to reduce the potential simultaneity bias (see the next subsection for details). u_{jt} is a measure of the local unemployment rate, y_{jt} is a measure of the industry-level

[15] Here we leave aside considerations related to expected inflation or productivity since industry-specific measures of price or wage expectations are not available.

[16] To obtain a broad estimation of the effects of the NMW on actual industry wages, we estimate an OLS equation relating industry actual wage increases to NMW increases and inflation. Estimated coefficients are close to 1 for inflation and 0.5 for the NMW.

output gap.[17] x_{jt} is a dummy variable capturing the non-compliance of wage floors with the NMW (this variable is equal to one if at least one of the industry-level wage floors is below the NMW just before the industry-level wage agreement, 0 otherwise).[18] We also include three dummy variables corresponding to durations between two successive wage agreements[19] (equal to 6 months, one year and two years). Finally, λ_t are time fixed effects; controlling for date dummies allows us to control for unobserved aggregate effects, which gives more precision in our parameter identification. However, including time dummies may also raise some interpretational issues since it may filter out aggregate time effects of some variables (like the business cycle for instance). We report results with and without time dummies and discuss how differences can be interpreted.

Conditional on observing a wage agreement, wage floor change equations relate nominal wage floor increases to macro variables such as inflation, the NMW increase (in real terms) and the industry-level actual wage increase (in real terms, net of NMW effects) since the last wage agreement. The wage-floor change equation for occupation *i* in industry *j* is written as follows:

$$\Delta_{t-\tau_j,t}WF_{ij} = a + b\Delta_{t-\tau_j,t}CPI + c\Delta_{t-\tau_j,t}NMW + d\Delta_{t-\tau_j,t-1}\overline{W} + e\Delta_{t-\tau_j,t-1}\widetilde{W}_j + fu_{jt} + gy_{jt} + hMR_{jt} + v_j + L_t + \nu_{jit} \quad (3)$$

where $\Delta_{t-\tau_j,t}WF_{ij}$ is the nominal change in the bargained wage floor in occupation *i* and industry *j* between the date of the last wage agreement $t-\tau_j$ (where τ_j is the elapsed duration since the last agreement in industry *j*) and date *t*.

This variable is observed when a new wage agreement is signed in industry j, it is missing otherwise. Most of the independent variables are the same as in the first equation. Using estimates from the first equation, we also calculate an inverse Mills ratio denoted MR_{jt} which is industry- and time-specific. Exclusion restrictions necessary to estimate the Mills ratio are described in the subsection below. v_j is an industry fixed effect. In our baseline model, we also introduce time fixed effects L_t to control for all unobserved aggregate evolutions that may affect wage-floor changes. Like for the Probit model, we also run regressions without time dummies.

[17] Average wage indices, output gap or unemployment measures are not available at the "contractual" industry level. We here compute these variables using NACE industry available variables (see Appendix A – Data for further details).

[18] We also introduce an interaction term between x_{jt} and the dummy variable indicating whether date *t* is before or after January 2010, since January 2010 is the date at which the reform modifying the adjustment date of the NMW increase was implemented (moving from July to January).

[19] In France, wage agreements do not contain any explicit definition of the contract duration. Here, we consider the durations between two successive dates of wage agreement enforcements.

In our dataset, wage floor scales are specific to each industry and the number of bargained wage floors can vary across industries. This raises a technical issue since industries with many job categories will be oversampled. To tackle this issue, we run weighted regressions by using the proportion of employees covered by each job classification within a given industry (i.e. the sum of weights equals to one within a given industry). We do not present regressions where industries are weighted by their number of employees in order to keep a sufficient degree of precision in the identification of our model's parameters. In particular, the first 30 largest industries of our sample cover more than 50% of workers (Figure D in the Appendix). Hence, using weighted regressions at the industry level would weaken the statistical power of our estimation since identification of the model's parameters relies (at least partly) on variations of exogenous variables across industries. Besides, our aim is to identify the mechanisms underlying the wage-setting behaviour of industries (rather than individual workers), industries being here our unit of observation. [20]

To investigate spill-over effects of the NMW on higher wages, we also consider further specifications where we allow NMW effects to vary along the wage floor distribution. For this purpose, we define ten wage floor categories depending on the ratio between wage floors and the NMW,[21] and we introduce interaction terms between the cumulated NMW and inflation variables and dummy variables corresponding to the ten wage categories.

Our model is estimated using a two-step estimation procedure. In Appendix B, we discuss in detail the reasons why we choose a two-step estimation procedure rather than a full-information maximum likelihood estimation. One main advantage of using a two-step procedure is that it does not require to precisely parametrize the covariance matrix of the residuals. In our case, this covariance matrix is quite complex since there are several outcomes for the same agreement equation. To overcome this complexity and also to deal with clustering issues, we use pair-cluster bootstrap simulation (by industry) to get consistent estimates of parameter standard deviations (Cameron *et al.*, 2008).

[20] As robustness check, we also run estimations restricting our sample to the largest industries in order to investigate whether our baseline results are not driven by the large number of small industries. Results of these regressions are discussed in the 'Results' section.

[21] The thresholds are chosen so that the wage categories contain approximately the same number of wage floors. Expressed as multiples of the minimum wage, the 9 thresholds defining the 10 categories are 1.01, 1.03, 1.07, 1.13, 1.21, 1.32, 1.48, 1.70 and 2.09. The first category is defined as wage floors being less than 1.01×NMW, and the 10th category as wage floors being higher than 2.09×NMW.

4.2 Identification and endogeneity issues

We now address several important identification issues, namely the lack of individual variations of some variables which are macro variables and potential collinearity among them. Our aim is here to assess the effect of some variables (for instance, NMW or inflation variations) that are not industry-specific but macro variables. Thus, the identification of the impact of such variables relies only on their temporal variability. Using the cross-section variability of cumulated changes in macro variables since the last wage agreement allows us to widen the support of the distribution of changes in macro variables. This strategy should help us to identify the effects of macro variables on wage floors because cumulated variations are now industry-specific. This line of reasoning is valid for the NMW, the CPI and the sectoral actual wage indices, for which we consider log-variations between two successive wage agreements.

Another identification issue comes from potential collinearities among macro variables. This might be particularly true for inflation and NMW increases: an increase in the inflation rate has a mechanical positive impact on the NMW increase since the formula used to adjust the NMW incorporates past inflation. Reciprocally, part of the effect of inflation might come from NMW increases. A similar issue may arise from the correlation between inflation and industry-specific wage variations. We thus consider a model in which all macroeconomic variables are taken in real terms in order to isolate the specific effect of inflation. Secondly, the growth rate of industry-specific wages (in real terms) may also capture the pass-through of the NMW into industry actual wages (through individual wage increases or firm-level agreements). To control for this, we introduce as covariates the cumulated wage increase in each industry in real terms and we control for the possible NMW effects. Here again, the aim of this variable transformation is to isolate the specific impact of each macro variable.

A third issue is the possible simultaneity bias which results from the inclusion of the growth rate of industry-specific actual wages in the list of explanatory variables. In fact, we could expect wage floor increases to be instantaneously transmitted to actual wages. We address this issue by considering the cumulated variation of industry-specific wages (in real terms) between the date of the previous agreement and date *t-1* (instead of date *t*). Doing so, we remove from the cumulated actual wage evolution the wage change observed during the last quarter (between *t-1* and *t*) because this is the quarter which is the most likely affected by the simultaneity bias when wage floors are updated at date *t*. Note that, by construction, the wage increase induced by the previous agreement is not included in the cumulated actual wage variation between this agreement and date *t-1*.

As in the standard type II Tobit model, we need exclusion restrictions to properly identify our model. First, we assume that the duration elapsed since the last agreement has no direct effect on the size of the wage floor adjustment besides the impact of cumulated macro variables incorporated into the model. Second, we argue that durations equal to one or two years and quarter dummies correspond to calendar or seasonal effects (that are related either to negotiation costs or to legal constraints), independently of the decision concerning the magnitudes of wage adjustments. Third, the NMW non-compliance is supposed not to affect directly the magnitudes of wage floor adjustments since the cumulated increase in the NMW already captures the adjustments of previous wage floors to the new ones. Compliance has no direct effect on the size of wage floor change besides the direct effect of the cumulated NMW variable. It only affects incentives to reach a new wage agreement. These arguments justify the exclusion restrictions that insure identification in our empirical model (see Le Bihan *et al.* (2012) for a similar line of reasoning). Dummy variables for durations exactly equal to six months, one year or two years, quarter dummies and the dummy variable of non-compliance with the NMW are included in equation (2) but not in equation (3) since these variables are assumed to affect only the timing of the industry-level wage bargaining process but not the size of wage floor adjustments.

5. Results

5.1 Frequency of industry-level agreements

Table 3 reports marginal effects of Probit models corresponding to the agreement equation.[22] We run two different specifications with or without time dummies (columns 1 and 2). We also report results for separate groups of industries (including time dummies, columns 3 to 6), namely national industries with a high proportion of minimum-wage workers, national industries with a low proportion of minimum-wage workers, local metalworking industries and regional construction and public works industries.

[Insert Table 3 here]

First, duration effects are substantial and statistically significant in all specifications: the probability of a wage agreement exactly one year after the previous agreement is higher by more than 30 percentage points (pp) (by comparison, the average quarterly frequency of

[22] Table A in the Appendix reports parameter estimates of agreement equations in which the dependent variable is a dummy variable indicating the date of the wage agreement signature (instead of date of enforcement). Results are broadly similar.

agreement is about 20%). A similar but somewhat smaller effect (about 20 pp) is obtained for wage agreements signed exactly two years after the previous agreement. This reflects the strong time dependence of wage agreements, which may be due to important negotiation costs and which may be related to the obligation for each industry to bargain on wages at least once a year. This result is not consistent with standard predictions of a Calvo model where the probability of a wage adjustment is independent of the duration since the last wage adjustment. By contrast, this strong duration dependence is in line with predictions of a Taylor model where wages are set for a constant period of time. Seasonal effects are other crucial factors contributing to variations in the probability of wage agreement (Figure E in Appendix plots parameter estimates associated with date dummies). We find that wage agreements are quite staggered before 2010 (with small peaks in the first and the third quarters) but highly clustered around the first quarter after 2010. This results from the 2010 reform which moved the usual month of the NMW update from July to January. This result suggests that the timetable of NMW adjustments strongly shapes the timing of wage negotiations. This is consistent with predictions of recent bounded rationality models (see, for instance, Alvarez *et al*., 2011, for price setting behaviour):[23] employers and unions may react and coordinate to salient and large observable shocks such as NMW increases which are publicly announced by the government.

In some industries, a NMW increase may lead some wage floors to become lower than the new value of NMW, which might exert some specific pressures on non-compliant industries to update their wage scales.[24] The dummy variable capturing the non-compliance of wage floors with the NMW has indeed a positive effect on the probability of a new agreement. This effect is greater after 2010 than before 2010. Besides, we find higher effects of the NMW non-compliance in industries with a high proportion of low-paid workers, in metalworking industries and in construction industries.

The NMW may also directly affect the probability of a wage agreement since it is an important reference for low-paid workers. However, the cumulated real NMW increase has a rather limited marginal effect (about 2 pp) on the probability of a wage agreement. This marginal effect is only slightly heterogeneous across industries: 2.6 pp for industries with a high proportion of low-paid workers versus 1.5 pp for industries with a low proportion of low-paid workers. Removing the time dummies has a small positive impact on the marginal effect of

[23] Alvarez *et al*. (2011) suggest that when there is a large "information cost" to observe variations in the economic environment, it is optimal to reset prices at discrete pre-set intervals.

[24] Figure F in Appendix plots over time the proportion of industries having at least one wage floor below the NMW, the frequency of wage agreements and the NMW increases.

NMW (from 1.9 pp to 2.6 pp) (see Table B in Appendix for detailed results without time dummies for the different groups of industries).

Cumulated increases in the CPI price index and in the aggregate base wage have both a larger impact on the probability of an industry-level wage agreement than the real NMW increase. This result is consistent with the fact that workers are more likely to claim for opening a new negotiation when they observe either a higher level of inflation (which reduces the workers' purchasing power) or an increase in average aggregate wages (which might induce a decrease in industry-relative wages). Marginal effects associated with inflation are about 6 pp in all specifications (Table 3). Marginal effects associated with the average aggregate wages are slightly smaller (6 pp when including time dummies but 4 pp when excluding them). This marginal effect is higher for industries with a low proportion of low-paid workers.

Industry-specific real wage increases have only a small and barely significant effect on the frequency of wage agreements, suggesting that industry-specific productivity variations (that could be captured by this variable) have no impact on the occurrence of signing a wage agreement. Similarly, the sectoral output gap and the unemployment rate have no significant effects on the occurrence of a wage agreement (including or not time dummies).

As a robustness exercize, we estimate the agreement equation by restricting our sample to the largest industries in order to check that our results are not driven by a majority of small industries (see Table C in Appendix). We find – as expected - much less precise marginal effects but they are not statistically different from the ones obtained for the rest of industries, suggesting that our baseline results are not driven by small industries.

Overall, macro variables like inflation, aggregate wage change or NMW increase affect the decision of adjusting wages at the industry level. This result is quite consistent with predictions of standard state-dependent wage rigidity models. However, these variables have only a limited quantitative impact on the frequency of a wage agreement. Moreover, the wage adjustment decision does not seem to be linked with business cycle conditions but more related with the regular calendar of wage negotiation.

5.2 Size of wage floor changes

Table 4 reports parameter estimates of the wage floor equations. The different columns correspond to the same industry categories or specifications as in the Table 3 reporting results of the agreement equation.

[Insert Table 4 here]

First, the inverse Mills ratio has a significant negative effect. This negative sign has the following interpretation: if an exogenous (negative) shock delays the signing of a wage agreement, the wage adjustment stipulated by the agreement is larger all other observable things being equal. The magnitude of the effect is however rather small, which confirms the strong time-dependence of wage floor adjustments.

The main determinant of the size of wage floor adjustments is the cumulated inflation rate. The elasticity of wage floor adjustments with respect to cumulated inflation is close to 0.6 including or not time dummies (see columns 1 and 2 in Table 4). Wage floors are quite strongly indexed to past inflation. Here, part of this indexation might stem either from a "direct" inflation effect or from more "indirect" effects due to NMW indexation or aggregate base wage indexation to past inflation. Our model cannot fully disentangle these two types of effects. The elasticity of 0.6 should be interpreted as the overall impact of inflation on nominal variations of wage floors. We also find that this degree of indexation to inflation is much larger in industries with a high proportion of minimum-wage workers (elasticity of 0.62) than in industries with a low proportion of minimum-wage workers (elasticity of 0.45). In local metalworking and construction industries, elasticities of wage floor adjustments to inflation are even higher (0.75 and 0.68, respectively).

Second, the cumulated change in NMW (in real terms) has a positive and significant effect on the size of wage floor adjustments. On average, in a given industry, a 1%-increase in the NMW (in real terms) increases wage floors by 0.26 pp when time dummies are included as covariates into the equation and 0.37 pp when time dummies are excluded. Time dummies may here capture part of the seasonality in NMW adjustment. Regarding the heterogeneity of this effect across industries, the NMW has a larger effect on wage floors in industries with a high proportion of minimum-wage workers and in construction industries (elasticities of 0.36 and 0.30, respectively) than in industries with a low proportion of minimum-wage workers (elasticity of 0.27), or in metalworking industries where the proportion of minimum-wage workers is close to 0.1.[25] However, in all types of industries, the effect of the NMW is statistically significant, even when the proportion of minimum-wage workers is very low, which suggests the existence of NMW spill-over effects.

[25] Table D reports Tobit results for the same groups of industries but excluding time dummies.

The cumulative aggregate real wage variation has also a positive effect on the size of wage floor adjustments. This effect is statistically significant, the elasticity being equal to 0.21 in the model without time dummies and to 0.37 when controlling for time dummies. The aggregate cumulated wage change plays a larger role in industries with a high proportion of minimum-wage workers than in other industries. On the contrary, industry-specific wage variations (in real terms) have a much smaller and statistically non-significant impact on the size of wage floor changes (except in the construction sector).[26] This result suggests that sector-specific wage conditions do not play a strong role on the size of wage adjustments in industry-level negotiations.

Lastly, the sectoral output gap measure and the local unemployment rate have a rather limited effect on the size of wage floor changes. When we exclude time dummies, unemployment has a significant negative effect on the size of wage adjustment whereas this effect becomes non-significant when we add time dummies. Our interpretation is that the effect of unemployment might come from aggregate variations rather than from local differences.[27] The introduction of time dummies might filter out aggregate effects of business cycle. However, removing time dummies also raises identification issues since the negative effect of unemployment can also come from other aggregate unobserved variables that could be correlated with the unemployment rate. The sectoral output gap has a small quantitative effect on the size of wage changes. This effect is significant when we include time dummies, suggesting some small cyclical variations of wage floors.

To check robustness of our estimates, we run two other estimation exercises. First, we run regressions separately on a subsample with the largest industries and on a subsample covering only smaller industries (Table F in Appendix). In our sample, a small number of industries cover a large majority of workers. However, to keep sufficient identification power, we do not account for size differences across industries in our baseline regression. We may worry that doing so, our results are driven by small industries and are not fully representative of the overall economy. Our aim is here to investigate whether very large industries differ in their wage setting with respect to the rest of the industries. We find only small differences and results are qualitatively similar for both very large industries and the rest of the economy. We find that inflation and NMW play a rather smaller role in large industries whereas the cumulated change

[26] Table E in Appendix also reports results according to the firm size composition of industries. Differences are small and not statistically significant.

[27] 40% of the overall variance in local unemployment is due to differences over time whereas 60% is due to local differences.

in aggregate wages has more impact for the largest industries than for the rest of the economy. However, parameters for the largest industries are much less precisely estimated and for most parameter estimates, results are non-statistically different. This suggests that results of our baseline regression are not driven by small industries and can be considered as quite representative of the French economy.

A second robustness exercise consists in testing whether determinants of wage floor variations differ before and after 2010 where the usual date of the NMW was modified. For this purpose, we introduce interaction terms between macro variables of our empirical model and dummy variables "before 2010" and "after 2010" (see Table G in Appendix). Elasticities with respect to inflation or aggregate wage variations are only slightly modified whereas the effects of NMW or sectoral wage variations are much more different between the two periods. Before 2010, the NMW elasticity is 0.24 and 0.34 after 2010. On the contrary, the impact of industry-specific wages is much smaller after 2010 than before. The change in coefficients is mostly due to industries with a low share of low-paid workers, in metalworking and construction industries. In these three groups of industries, this result might suggest that after 2010 (which also corresponds to a recession and to a low inflation period), industry-level wage agreements could have been more constrained by NMW increases. In other words, they might be less likely to adjust industry-specific wage floors to industry-specific conditions.

5.3 Heterogeneity of NMW and inflation effects along the wage distribution

Finally, we test whether the impact of NMW increases varies along the wage floor distribution and we examine the NMW spill-over effects along this distribution.[28] Figure 4 reports estimated parameters associated with the interaction variables between cumulated real NMW variations and dummy variables associated with positions of job occupations in the wage floor distribution. As expected, these parameter estimates decrease along the wage floor distribution, from 0.5 for wage floors close to the NMW to 0.12 for wage floors twice above the NMW. One interesting result is that the NMW effect is significant all along the wage floor distribution.

[Insert Figure 4 here]

We then test whether other macro variables have heterogeneous effects along the wage distribution. We find that only inflation has such a heterogeneous effect. Figure 5 reports elasticities of wage floor variations obtained both with respect to real NMW variations and to

[28] Wage growth varies substantially across wage floors: 25 to 30% of the total variance is explained by differences across occupations within the same industry (see Table H in the Appendix).

inflation along the wage floor distribution. We find that the elasticity of wage floor changes with respect to inflation is very high for wage floors close to the NMW (close to 0.8) and then decreases steadily (0.6 for wage floors close to $1.1 \times$ NMW, about 0.41 for wages above $2 \times$ NMW). This elasticity is positive and statistically significant for all wage floors.

[Insert Figure 5]

Separate regressions are run on distinct groups of industries. There is some heterogeneity across industries (see Figure G in Appendix). All along the wage distribution, the NMW effect is similar for all groups of industries except for metalworking industries where the impact of NMW is smaller. Regarding the elasticity of wage floor changes with respect to inflation, differences are a little more pronounced but the general decreasing pattern is found for all groups of industries (except in construction where the degree of indexation remains rather flat along the wage distribution).

6. Conclusion

Using a detailed data set of thousands of industry-level wage agreements in France over the period 2006-2017, we have provided new results on the determinants of industry-level wage floor adjustments.

These new facts on industry-level wage floor dynamics can shed some light on the empirical relevance of standard wage rigidity models used in macroeconomics. We find that French wage bargaining patterns are in line with predictions of a Taylor model: the time schedule of wage agreements is highly seasonal and depends strongly on the elapsed duration since the last wage agreement. Moreover, we find some evidence of state-dependence in wage floor changes. In particular, a reduction of workers' purchasing power or a drop in industry wages relative to aggregate wages leads to more frequent wage agreements. However, these determinants have a rather limited impact. Regarding the size of wage floor adjustments, there is a large correlation between wage floor adjustments and past inflation or past NMW increases, whereas business cycle conditions and local unemployment rates have only a small impact on wage floor adjustments. Further research linking wage floor dynamics to wage changes at the firm level would be helpful to understand to which extent wage floor rigidity translates into actual wage rigidity (see, for instance, Dickens *et al.*, 2007, for cross country correlations between downward wage rigidity and collective bargaining).

Our second important finding in this paper is that the NMW is a key factor shaping wage-floor setting in industry-level agreements. We here show that the NMW would not only affect the bottom end of the wage distribution but could possibly affect the whole distribution through wage floor adjustment. First, the NMW affects quite strongly the timing of wage agreements through different channels (seasonality, compliance and also direct effect on the probability of wage agreement). Second, the NMW affects the size of wage floor adjustments: when the real NMW increases by 1%, wage floors increase on average by about 0.3%. The elasticity of wage floors with respect to real NMW variations also decreases along the wage floor distribution but only slowly, from 0.5 for the lowest wage floors to 0.1 for the highest wage floors. One interesting avenue for further research would be then to assess how industry-level agreements shape and amplify the effect of NMW on actual wages (and not only at the bottom of the wage distribution) and possibly on employment.

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Table 1: Examples of minimum wage scales stipulated by industry-level wage agreements

a) Paper and paperboard (30,000 workers)

Salaires mensuels minima conventionnels (SMMC)

(En euros.)

NIVEAU	ÉCHELON	COEFFICIENT	SMMC (au 1er mars 2014)
I	1	125	1 446
	2	130	1 457
	3	135	1 469
II	1	140	1 489
	2	150	1 509
	3	160	1 534
III	1	170	1 568
	2	185	1 601
	3	195	1 635
IV	1	215	1 782
	2	235	1 929
	3	260	2 091
V	1	285	2 276
	2	315	2 508
	3	350	2 773

b) Hairdressing (100,000 workers)

(En euros.)

NIVEAU	ÉCHELON	CLASSIFICATION	SALAIRE minimal
I	1	Coiffeur(se) débutant(e)	1 470
	2	Coiffeur(se)	1 475
	3	Coiffeur(se) confirmé(e)	1 480
II	1	Coiffeur(se) qualifié(e) ou technicien(ne)	1 500 1 530
	2	Coiffeur(se) hautement qualifié(e) ou technicien(ne) qualifié(e)	1 620
	3	Coiffeur(se) très hautement qualifié(e) ou assistant(e) manager ou technicien(ne) hautement qualifié(e)	1 740
III	1	Manager	1 895
	2	Manager confirmé(e) ou animateur(trice) de réseau	2 270 2 680
	3	Manager hautement qualifié(e) ou animateur(trice) de réseau confirmé(e)	2 840 2 890

Notes: "*Niveau*" is the category of workers, most frequently: "I" for routine task occupations or low-skilled workers, "II" for higher-skilled workers (technicians for instance)… The highest levels usually represent "managers". "*Echelons*" are sub categories within a category of workers. The "*Coefficient*" can be used to calculate the wage rate. Classifications of occupations are specific to each industry. The NMW was set at EUR 1,446 in 2014 (Jan. 1st).

Table 2: Descriptive statistics on industry wage scales

	Mean	Q1	Median	Q3
Number of employees	32,706	5,334	11,477	27,239
Number of wage levels	20.5	12	17	28
Average wage floor (in euros)	2,052	1,530	1,664	2,253
Average wage differential (%)	5.69	3.47	5.52	7.56
Average wage differential (%) (at the bottom of the wage scale)	2.04	0.32	1.01	2.97
Average wage differential (%) (at the top of the wage scale)	9.56	5.65	8.91	11.38
Maximum/minimum wage ratio within an industry	2.55	1.91	2.32	3.15
Average gross wage / average wage floor (weighted)	1.41	1.34	1.38	1.50

Notes: The "Number of employees" is calculated using the DADS dataset which reports the number of employees in each firm and the "contractual industry" covering the firm (see data appendix). The number of wage levels is calculated as the number of different wage floors reported in wage agreements; the statistics are weighted by the number of employees by industry. The average wage floor is first calculated by industry; then statistics are computed across industries and weighted by the number of employees by industry. The average wage differential is calculated as the log difference (in %) between two successive wage floors in the wage scale of an industry; the average wage difference is computed by industry. Statistics are then weighted using the number of employees by industry. The average wage differential "at the bottom of the wage scale" is calculated using only the first half of the wage floor scale whereas 'at the top of the wage scale' we use the second half of the wage floor scale. The max/min ratio is calculated as the ratio between the minimum wage floor and the maximum wage floor in a given industry. The "Average gross wage / average sectoral wage" is calculated as the ratio between the actual average gross wage in a given industry (as reported by the Ministry of Labor in 2011) and the average weighted wage floor in the same industry (in 2011). Weighted statistics use the number of employees by industry.

Table 3: Marginal effects of covariates in wage agreement equation (date of enforcement)

Dependent variable - *Dummy variable for wage agreement enforcement*	All industries		National coverage		Local coverage	
	(1)	(2)	High prop. of min. wage workers	Low prop. of min. wage workers	Metal working	Construction and public works
Cum. inflation	6.420*** (0.466)	5.926*** (0.569)	6.108*** (1.071)	5.088*** (1.220)	5.440*** (1.028)	7.363*** (0.985)
Cum. real NMW change	2.628*** (0.364)	1.934*** (0.471)	2.579** (1.306)	1.525* (0.901)	2.899*** (1.095)	2.009** (0.896)
Cum. real aggregate wage change	3.486*** (0.737)	5.945*** (0.875)	3.806** (1.653)	6.148*** (1.860)	5.535*** (2.061)	8.531*** (1.587)
Cum. real wage change in the industry	2.640** (1.364)	2.433* (1.379)	-0.223 (1.912)	2.367 (1.588)	7.293 (4.526)	-7.146 (6.146)
Unemployment rate	0.658 (0.558)	0.221 (0.147)	1.791 (10.246)	-6.156 (8.879)	1.992 (2.341)	-1.331 (2.415)
Output gap	-0.068 (0.140)	-0.130 (0.244)	-0.325 (0.539)	0.512 (0.612)	-0.403 (0.998)	-0.281 (0.455)
Duration						
6 months	0.032*** (0.013)	0.032*** (0.013)	0.020 (0.022)	0.055* (0.030)	-0.050*** (0.017)	0.130** (0.052)
1 year	0.327*** (0.012)	0.335*** (0.012)	0.275*** (0.022)	0.341*** (0.027)	0.316*** (0.021)	0.308*** (0.042)
2 years	0.187*** (0.019)	0.196*** (0.020)	0.182*** (0.043)	0.160*** (0.039)	0.182*** (0.047)	0.139*** (0.036)
Before 2010						
Non-compliance with the NMW	0.017** (0.008)	0.012 (0.008)	0.021 (0.019)	0.021 (0.017)	0.080*** (0.029)	0.021 (0.017)
After 2010						
Non-compliance with the NMW	0.063*** (0.007)	0.055*** (0.007)	0.047*** (0.011)	0.031** (0.014)	0.108*** (0.013)	0.041*** (0.015)
Time dummies	Quarters	Date	Date	Date	Date	Date
N	14,953	14,953	4,350	4,003	3,341	3,259

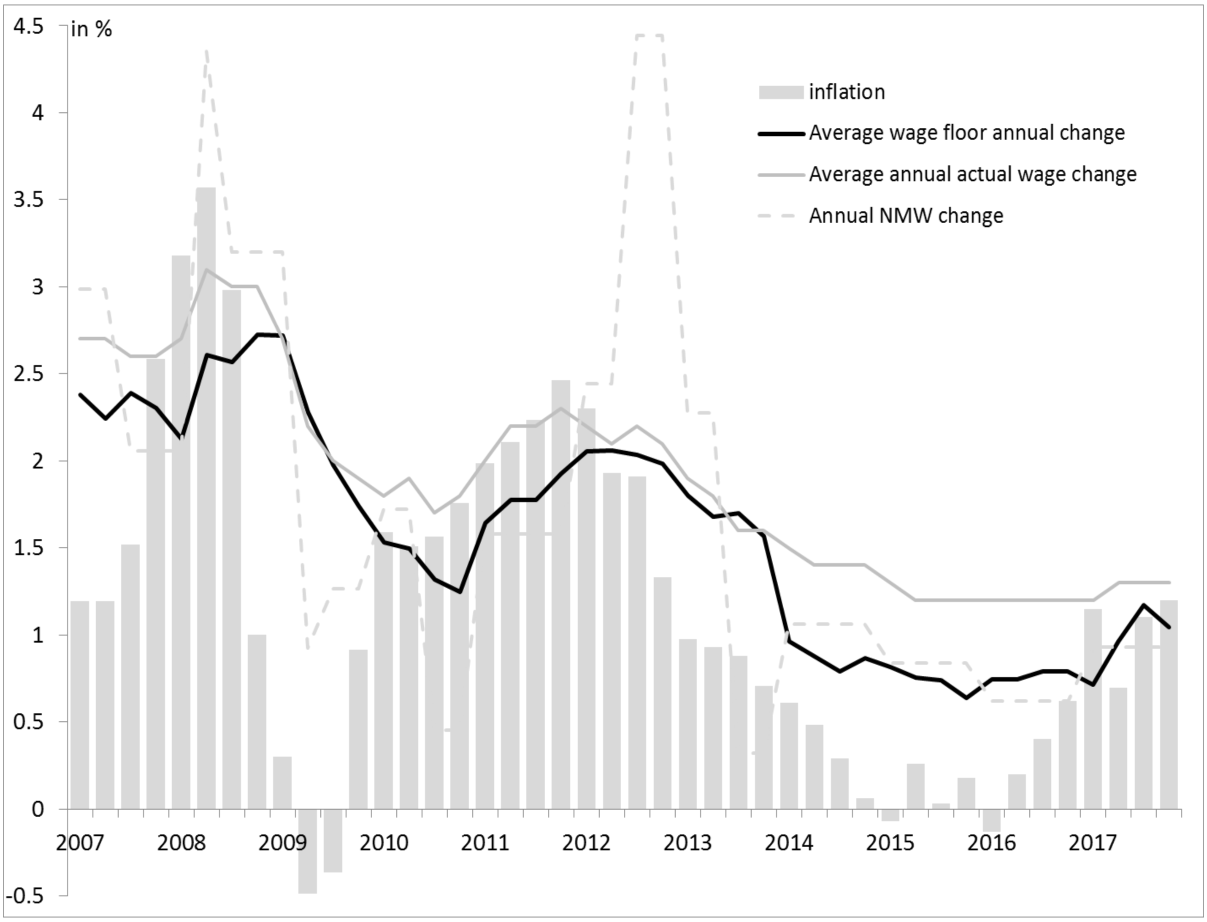
Note: This table reports marginal effects estimated with Probit models. Quarter dummies are included in specification (1) whereas date dummies are included in specification (2) (estimates corresponding to date dummies of specification (2) are presented in Figure D). Standard errors are obtained using pair-cluster bootstrap methods and are reported in brackets. The dependent variable is the dummy variable equal to 1 if there is a wage agreement in industry *j* at date *t* (quarter-year). Estimates in the column "High prop. of min. wage workers" are obtained for the subsample of industries with a national coverage and with a proportion of minimum-wage workers higher than the median among all industries. Estimates in the column "Low prop. of min. wage workers" are obtained for the subsample of industries with a national coverage and with a proportion of minimum-wage workers smaller than the median among all industries. Estimates in the column "Metalworking" are obtained for the subsample containing local metalworking industries. Estimates in the column "Construction and public works" are obtained for the subsample containing regional construction and public works industries. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 4: Parameter estimates of the wage floor change equation

Dependent variable : Nominal wage floor changes	All industries		National coverage		Local coverage	
	(1)	(2)	High prop. of min. wage workers	Low prop. of min. wage workers	Metal-working	Construction and public works
Cumulated inflation	0.567*** (0.023)	0.602*** (0.027)	0.618*** (0.044)	0.452*** (0.052)	0.752*** (0.053)	0.676*** (0.053)
Cumulated real NMW change	0.373*** (0.019)	0.262*** (0.021)	0.364*** (0.050)	0.270*** (0.056)	0.110*** (0.041)	0.299*** (0.052)
Cumulated real aggregate wage change	0.210*** (0.031)	0.370*** (0.043)	0.486*** (0.079)	0.301*** (0.105)	0.338*** (0.080)	0.354*** (0.072)
Cumulated real wage change in the industry	0.023 (0.064)	0.084*** (0.063)	-0.114 (0.094)	0.115 (0.085)	-0.020 (0.229)	0.710** (0.309)
Unemployment rate	-0.196*** (0.025)	0.061 (0.057)	0.615** (0.262)	0.526 (0.452)	0.079 (0.064)	-0.004 (0.105)
Output gap	0.009 (0.006)	0.035*** (0.007)	0.020 (0.017)	0.020 (0.028)	-0.015 (0.037)	-0.003 (0.015)
Inverse Mills Ratio	-0.001*** (0.000)	-0.001*** (0.000)	-0.001 (0.001)	-0.001** (0.001)	0.000 (0.000)	-0.002** (0.001)
R^2	0.560	0.617	0.579	0.552	0.695	0.820
N	53,526	53,526	17,591	15,430	15,451	5,054
Time dummies	No	Yes	Yes	Yes	Yes	Yes

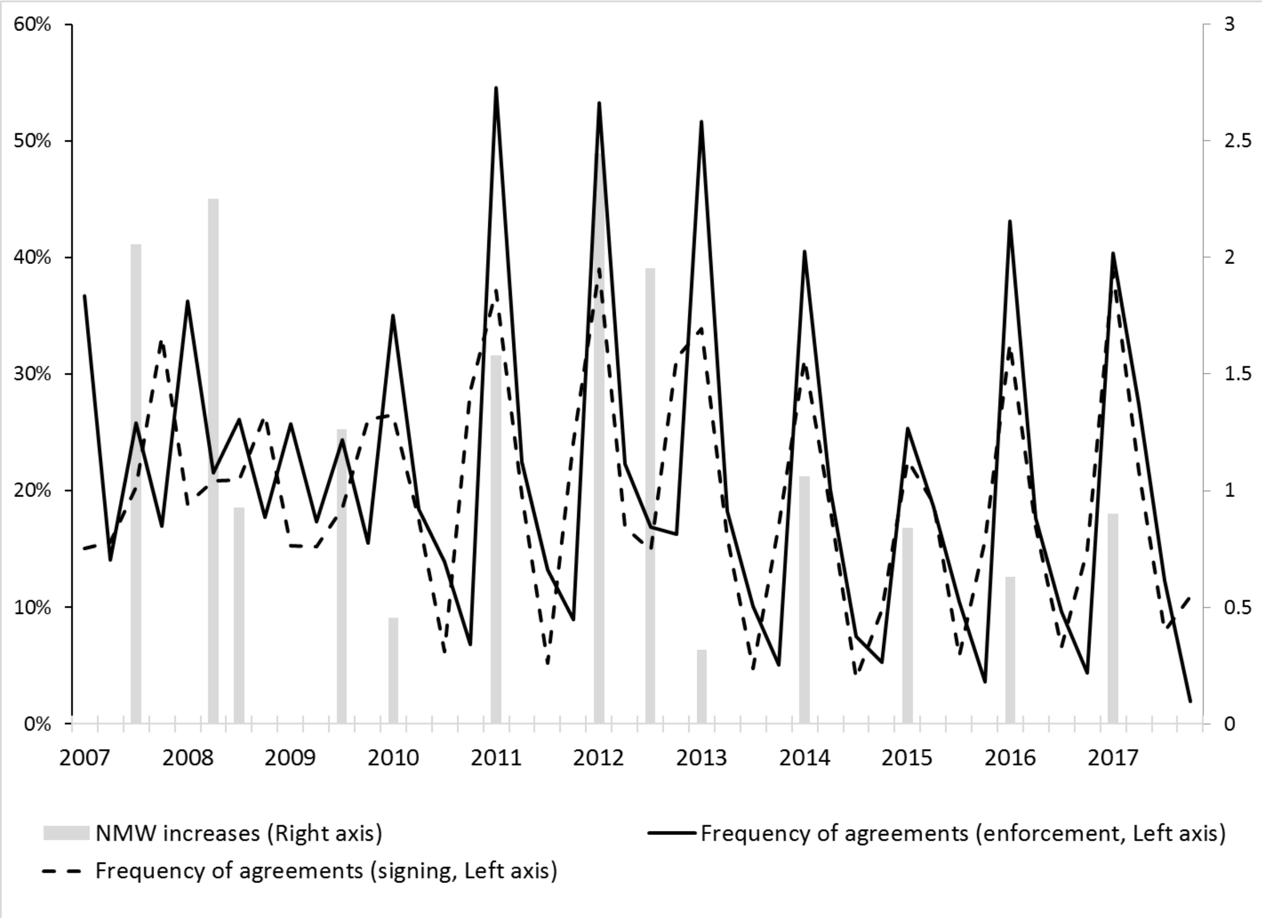
Note: The dependent variable is the nominal wage floor change between two successive effects of wage agreements in a given industry. All specifications include industry fixed effects. Specification (1) does not include date dummies whereas all other specifications include date dummies. Estimates in the column "All" concern all industries in our sample (national coverage industries, metalworking industries (with a local level coverage) and construction and public work industries (regional coverage). Estimates in the column "High prop. of min. wage workers" are based on the subsample of industries with a national coverage and with a proportion of minimum-wage workers higher than the median among all industries. Estimates in the column "Low prop. of min. wage workers" are based on the subsample of industries with a national coverage and with a proportion of minimum-wage workers smaller than the median among all industries. Estimates in the column "Metalworking" are based on the subsample containing local metalworking industries. Estimates in the column "Construction and public works" are based on the subsample containing regional construction and public works industries. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Figure 1: Average size of wage changes in industry-level wage agreements (2007-2017)



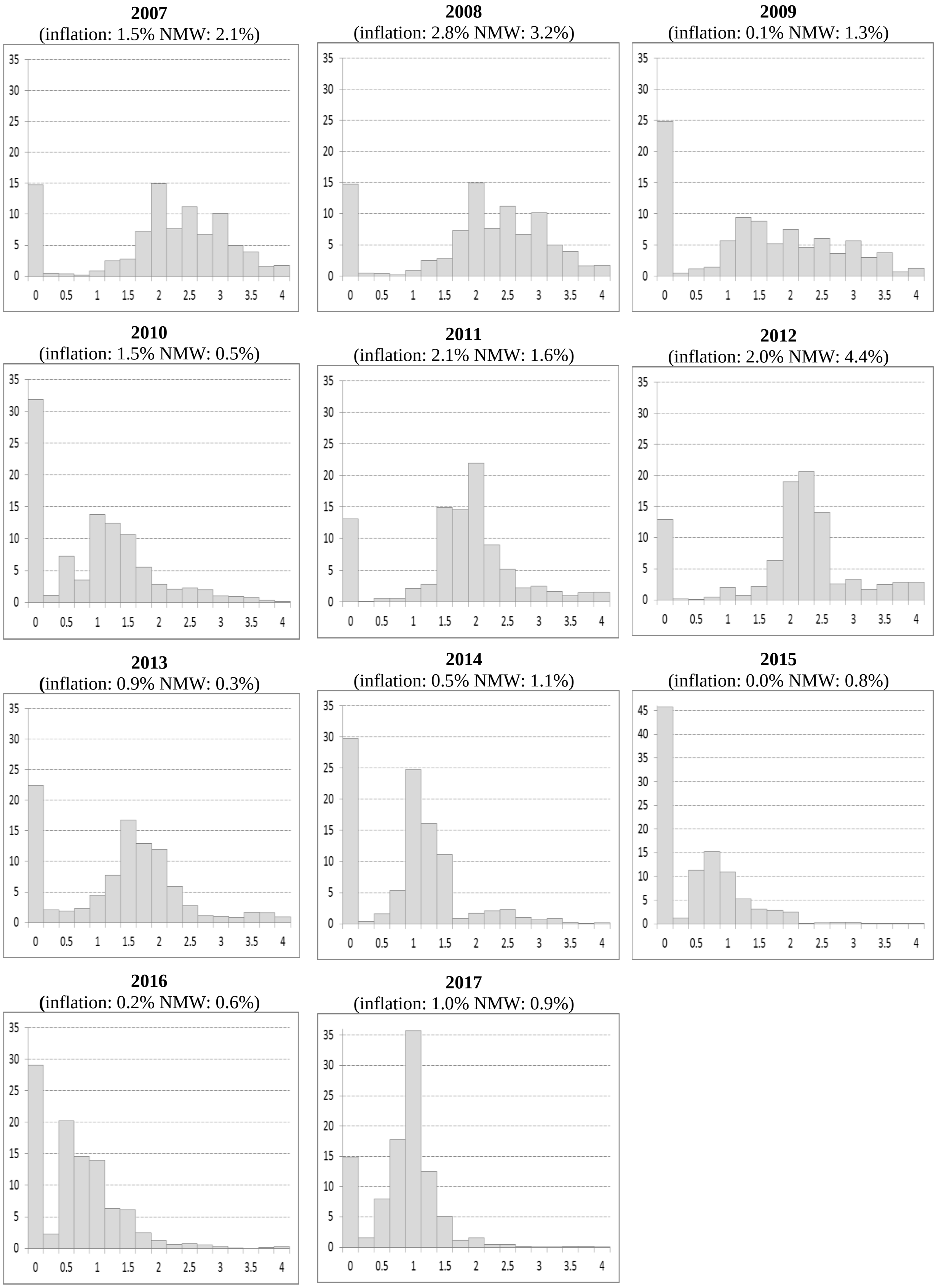
Notes: The average wage increase in industry agreement is computed as a weighted (using the number of employees by job category in each industry) average of all wage increases stipulated in industry agreement at a given date (year/quarter). The overall wage increase is the annual increase in the aggregate actual wage index (SMB – source: DARES). NMW is the NMW increase at an annual frequency (source: INSEE). Inflation is the overall CPI annual growth (source: INSEE).

Figure 2: Frequency of industry-level wage agreements



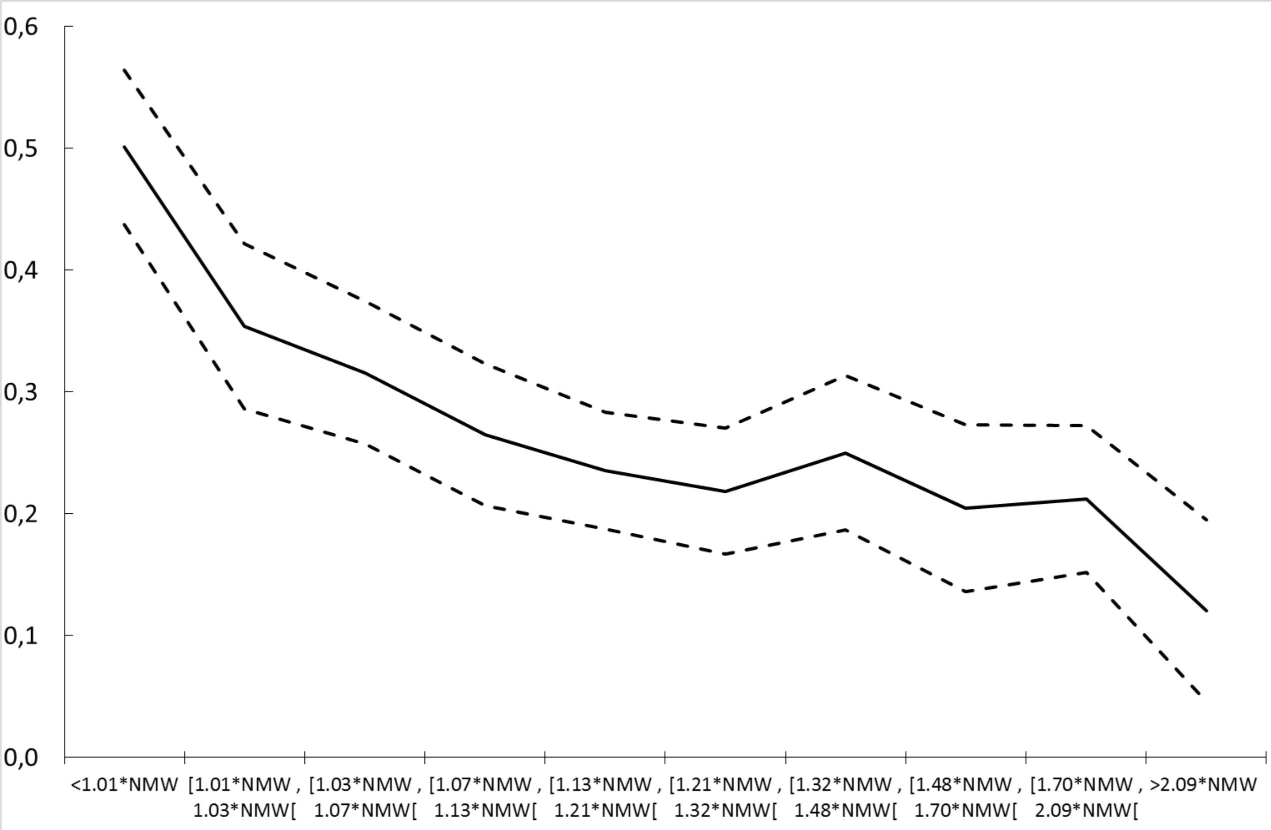
Notes: this figure plots the frequency of wage agreements over time (calculated as the percentage of employees covered by a wage agreement at a given date). We distinguish the date at which the agreement is enforcing (dashed line) and the date at which this agreement is signed (solid line). We also plot in grey histograms the NMW increase (right axis).

Figure 3: Distribution of Wage Floor Changes (2007-2017)



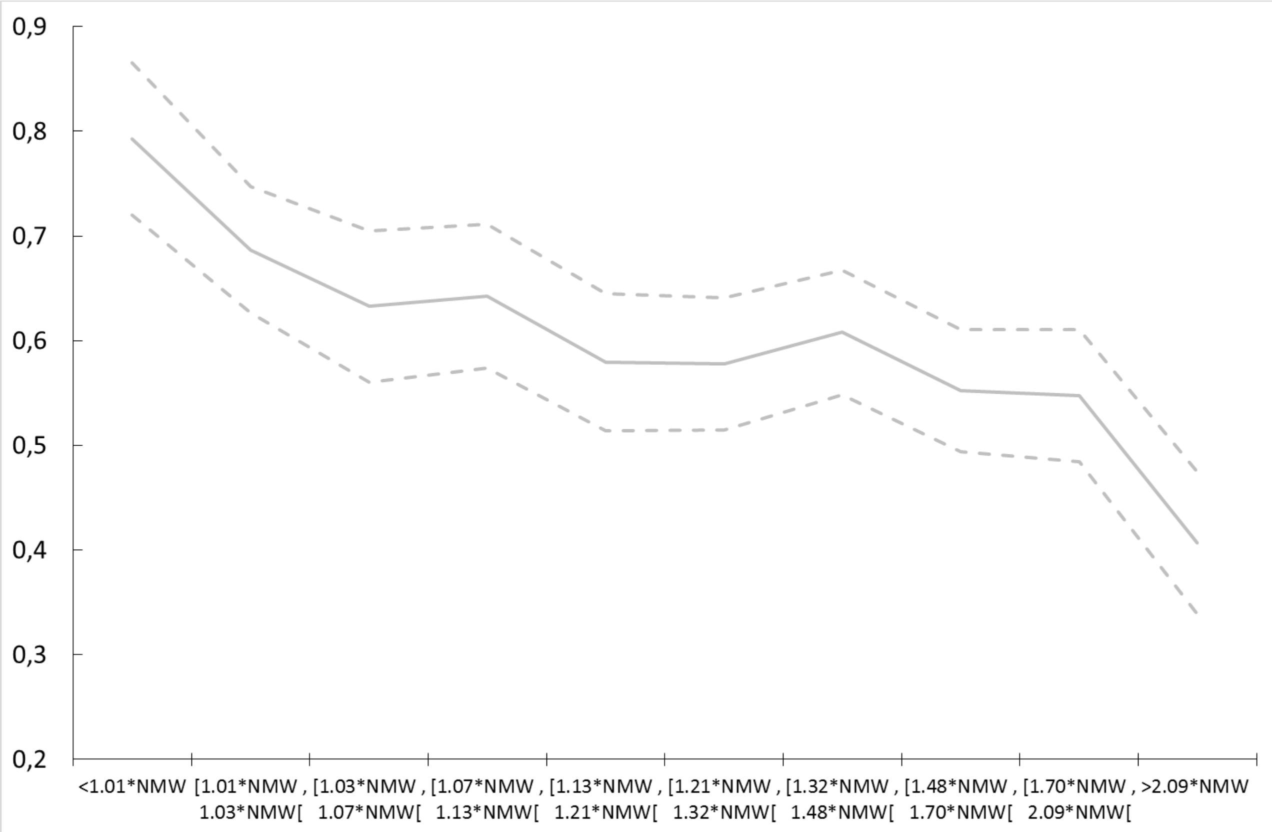
Note: This figure reports the distribution of wage floor growth year by year. We have computed the year-on-year change in all wage floors (estimated at the fourth quarter) for all industries. Statistics are weighted using the number of employees covered by each wage floor within all industries.

Figure 4: Elasticity of wage floor increases with respect to the real NMW increases along the wage floor distribution



Notes: this figure reports parameter estimates obtained by adding to our baseline wage floor change equation (including time dummies) interaction terms (dummy variables) which capture the relative position of a wage floor along the wage distribution. This relative position is calculated with reference to the NMW level. The black line reports elasticities of the nominal wage floors with respect to NMW increases (in real terms); the dashed lines represent the 95%-confidence interval.

Figure 5: Elasticity of wage floor variations with respect to inflation along the wage floor distribution



Notes: this figure reports parameter estimates obtained by adding to our baseline wage floor change equation (including time dummies) model interaction terms (dummy variables) which capture the relative position of a wage floor along the wage distribution. This relative position is calculated with reference to the NMW level. The grey lines report elasticities of nominal wage floors with respect to inflation. The dashed lines represent the 95%-confidence interval.

APPENDIX

A. Data Appendix

This appendix gives more details on how complementary industry-level variables (like the number of employees, wages and unemployment) are obtained.

- Number of employees by "contractual" industry

We compute the number of workers covered by each industry using an exhaustive administrative firm level data set ("*DADS fichier détail"*) containing for every firm, the number of employees belonging to a "contractual" industry (in year 2009). We then calculate the sum of employees by industry. We use then the number of employees by industry to compute statistics such as the frequency of wage agreements.

- Number of employees by job classification category

To compute the number of employees by job classification category, we use the total number of employees by "contractual" industry (see above) and information from the Ministry of Labor on the distribution of workers along the wage distribution in each "contractual" industry. The Ministry of Labor publishes some summary statistics for each of the biggest 250 industries,[29] in particular the share of workers whose actual wages belong to one of the 12 wage categories defined by the ratio of actual wages to the NMW (wages less than 1.05×NMW, wages between 1.05×NMW and 1.1×NMW….). Using the total number of workers per industry in year 2011, we can compute the number of employees by wage category. For industries which are not present in summary statistics of the Ministry of Labor, we use information at a more aggregate level (CRIS classification).

Then, in the wage floor data set, we calculate the average ratio between wage floors and the NMW within each job category. We multiply this ratio by 1.4 to consider the fact that actual wages are on average 40% higher than wage floors. Using the number of employees by actual wage category in each industry, we can then impute the number of employees for each job category. We compute this number of employees by job classification category, so that the sum of employees in different job classification categories is equal to the total number of employees in the industry. We use this statistic to calculate the weighted statistics such as the average wage floor, the distribution of wage floor changes…

[29] http://dares.travail-emploi.gouv.fr/dares-etudes-et-statistiques/tableaux-de-bord/les-portraits-statistiques-de-branches-professionnelles/les-250-portraits-statistiques-structurels/article/conventions-collectives-de-branche-fiches-statistiques

- Industries with a high versus a low proportion of minimum-wage workers

In some cases, we run separate regressions for industries with a high versus a low proportion of minimum-wage workers. To define industries with either a high or a low proportion of minimum-wage workers, we use the summary statistics published by the Ministry of Labor on the proportion of workers along the wage distribution (see above) and calculate the proportion of workers whose actual wage is below 1.2×NMW. If the proportion of workers paid less than 1.2×NMW in a given industry is below (respectively, above) the median of the c. d. f. of this proportion across industries, we define this industry as an industry with a low (respectively, a high) proportion of minimum-wage workers.

- Wage indices

Information on actual wages is not available at the "contractual" industry level. To construct series of actual wages W_{jt} for each contractual industry, we use hourly wage indices at the sector-specific level (there are 90 sectors in the NACE statistical classification; source: French Ministry of Labor) and the employment sectoral structure of "contractual" industries (i.e., the number of workers in each NACE sector for a given "contractual" industry). Industry-level actual wage indices are computed as the averages of NACE sectoral wage indices weighted by the number of workers in a NACE sector for each "contractual" industry. By construction, these NACE industry-level wage indices are corrected for composition effects. They reflect the average wage increase in a given industry.

- Industry-level unemployment

To obtain industry-specific measures of unemployment, we use unemployment rates at the local labor market level (i.e. "*zone d'emploi*" in French; these "*employment zones*" are defined by *Insee* so that firms can find most of their labor force within these zones) and the geographical employment structure of "contractual" industries (using the administrative "*DADS fichier détail"*). We then compute an industry-specific measure of unemployment as the weighted average of local unemployment rates.

- Industry-level output gap

We calculate the industry-level output gap by using sectoral turnover indices (i.e. "*indices de chiffres d'affaires*" in French; we consider the 90 sectors of the NACE statistical classification; source: *Insee*). Using employment structures of "contractual" industries, we compute average weighted turnover indices for each "contractual" industry. We then calculate the industry-specific output gap as the difference between the industry-specific turnover index and its linear trend.

B. Estimation issues

In the literature on Tobit models, the results of two-step procedures usually help to get starting values for the ML estimation procedure (see, for instance, Heckman, 1979, or Puhani, 2000). To estimate our empirical model, we here choose not to use a full-maximum likelihood procedure but a two-step estimation because our model is not a standard type II Tobit model. One main difference with a standard type II Tobit model is the multiplicity of outcome equations (for the same agreement equation). These outcome equations correspond to several wage floor changes corresponding to different occupations in the same industry. Hence the model consists of two blocks. The first one corresponds to the agreement equation:

$$Y_{jt} = 1\left(Y_{jt}^{*} \geq 0\right), \text{ where } Y_{jt}^{*} = X_{jt}^{*}\theta + \varepsilon_{jt}, \text{ and } \varepsilon_{jt} \sim N(0,1)$$

In this equation, the error term ε_{jt} is distributed according to a standard normal distribution and the vector X_{jt}^{*} includes covariates affecting the propensity to sign (or to enforce) an agreement at time *t* in industry *j*. Note that this vector of covariates may depend on the past realisations of Y_{jt} since it includes some cumulated variables since the last agreement.

The second block of our model consists of a set of outcome equations (referred as wage floor change equations). Here, in contrast with a standard type II Tobit model, the number of outcomes is greater than one and this number may even differ across industries since it corresponds to the industry-specific number of wage floors. Let I_j be this number in industry j. The wage floor of each occupation in this industry may evolve when an agreement is signed. The change is generated by the following process:

$$\forall i \in [\![1, I_j]\!], \Delta_{t-\tau_j,t} WF_{ij} = X_{ijt} f + \nu_{ijt}, \text{ with } \nu_{ijt} \sim N(0, \sigma^2).$$

In this generic outcome equation, $X_{ijt}$is a vector of covariates.

To fully define the model, we need to specify the covariance structure of residuals, within each industry, over time and across industries. Within industry j, we assume that $var\left(\nu_{1jt}, \cdots, \nu_{I_j jt}\right)' = \Sigma_j$, and that $cov\left(\varepsilon_{jt}, \nu_{ijt}\right) = \rho\sigma$. We set $\Sigma_j[i,i] = \sigma^2$, the other elements of Σ_j being left unspecified. This covariance structure ensures that $E\left(\nu_{ijt} | \varepsilon_{jt} > -X_{jt}^{*}\theta\right) = \rho\sigma\lambda\left(X_{jt}^{*}\theta\right)$ (where X_{jt}^{*} is the vector of covariates affecting the propensity to sign an agreement at time t in industry j). The dynamic nature of the model requires a specification for the covariance structure over time. To ensure exogeneity of the explanatory variables in the selection equation, we assume that shocks in this the agreement equation (at date *t*) are uncorrelated with shocks affecting agreement and outcome equations in other periods, namely:

$$cov(\varepsilon_{jt}, \varepsilon_{js}) = 0, \text{ and } cov(\varepsilon_{jt}, \nu_{ijs}) = 0, s \neq t.$$

Nonetheless, we can allow for an unrestricted covariance structure across outcome shocks in different periods since this does not affect the exogeneity assumption in these equations. Such a covariance structure is consistent with our estimation strategy that consists in a two-step procedure used to provide consistent estimates of our model in the spirit of type II Tobit models.

Estimating our model by maximizing directly its likelihood function is less simple. To write this function, we first need to consider shocks of the outcome equations conditional on ε_{jt}. They are equal to $\nu_{ijt} = \rho\sigma\varepsilon_{jt} + \mu_{ijt}$ where μ_{ijt} is a Gaussian variable independent from ε_{jt} and whose covariance matrix (for all occupations in industry *j*) is equal to $var\left(\nu_{1jt}, \cdots, \nu_{I_j jt}\right)' = \Sigma_j - \rho^2\sigma^2 J_{I_j} = \tilde{\Sigma}_j$ where J_{I_j} is a $\left(I_j \times I_j\right)$ square matrix in which each element is equal to 1. Hence, the contribution to the likelihood function of an uncensored observation is:

$$P\left(Y_{jt} = 1, \Delta_{t-\tau_j,t}WF_{1j}, \dots, \Delta_{t-\tau_j,t}WF_{I_j j}\right) =$$

$$P\left(\varepsilon_{jt} > -X_{jt}^*\theta, \mu_{1jt} = \Delta_{t-\tau_j,t}WF_{1j} - X_{1jt}f - \rho\sigma\varepsilon_{jt}, \dots, \mu_{I_j jt} = \Delta_{t-\tau_j,t}WF_{I_j j} - X_{I_j jt}f - \rho\sigma\varepsilon_{jt}\right)$$

$$= \int_{\varepsilon > -X_{jt}^*\theta} \frac{1}{(2\pi)^{(I_j+1)/2}\left|\tilde{\Sigma}_j\right|^{1/2}} e^{-\frac{1}{2}\left(\Delta_{t-\tau_j,t}\overrightarrow{WF_j} - \overrightarrow{X_{jt}}f - \rho\sigma\varepsilon\right)'\tilde{\Sigma}_j^{-1}\left(\Delta_{t-\tau_j,t}\overrightarrow{WF_j} - \overrightarrow{X_{jt}}f - \rho\sigma\varepsilon\right) - \frac{1}{2}(\varepsilon)^2} d\varepsilon$$

$$= \frac{1}{(2\pi)^{(I_j+1)/2}\left|\tilde{\Sigma}_j\right|^{1/2}} \int_{\varepsilon > -X_{jt}^*\theta} e^{-\frac{1}{2}\left[\begin{array}{c}\left(\Delta_{t-\tau_j,t}\overrightarrow{WF_j} - \overrightarrow{X_{jt}}f\right)'\tilde{\Sigma}_j^{-1}\left(\Delta_{t-\tau_j,t}\overrightarrow{WF_j} - \overrightarrow{X_{jt}}f\right) - (\rho\sigma\varepsilon)'\tilde{\Sigma}_j^{-1}\left(\Delta_{t-\tau_j,t}\overrightarrow{WF_j} - \overrightarrow{X_{jt}}f\right) \\ -\left(\Delta_{t-\tau_j,t}\overrightarrow{WF_j} - \overrightarrow{X_{jt}}f\right)'\tilde{\Sigma}_j^{-1}\rho\sigma\varepsilon + (\rho\sigma\varepsilon)'\tilde{\Sigma}_j^{-1}\rho\sigma\varepsilon\end{array}\right] - \frac{1}{2}(\varepsilon)^2} d\varepsilon$$

$$= \frac{e^{-\frac{1}{2}\left[\left(\Delta_{t-\tau_j,t}\overrightarrow{WF_j} - \overrightarrow{X_{jt}}f\right)'\tilde{\Sigma}_j^{-1}\left(\Delta_{t-\tau_j,t}\overrightarrow{WF_j} - \overrightarrow{X_{jt}}f\right) - \frac{\left(\rho\sigma(1\dots1)\tilde{\Sigma}_j^{-1}\left(\Delta_{t-\tau_j,t}\overrightarrow{WF_j} - \overrightarrow{X_{jt}}f\right)\right)^2}{\left[1 + (1\dots1)\tilde{\Sigma}_j^{-1}(1\dots1)'(\rho\sigma)^2\right]}\right]}}{(2\pi)^{I_j/2}\left|\tilde{\Sigma}_j\right|^{1/2}\left[1 + (1\dots1)\tilde{\Sigma}_j^{-1}(1\dots1)'(\rho\sigma)^2\right]^{\frac{1}{2}}}$$

$$\times \Phi\left(X_{jt}^*\theta\left[1 + (1\dots1)\tilde{\Sigma}_j^{-1}(1\dots1)'(\rho\sigma)^2\right]^{\frac{1}{2}} + \frac{2\rho\sigma(1\dots1)\tilde{\Sigma}_j^{-1}\left(\Delta_{t-\tau_j,t}\overrightarrow{WF_j} - \overrightarrow{X_{jt}}f\right)}{\left[1 + (1\dots1)\tilde{\Sigma}_j^{-1}(1\dots1)'(\rho\sigma)^2\right]^{\frac{1}{2}}}\right)$$

In this setting, the notation $\vec{x}$ corresponds to the column vector $(x_1, \dots x_1)$. Then the expression of the full likelihood function is:

$$L = \prod_{j=1}^{J} \prod_{t=1}^{T} \left[P\left(Y_{jt} = 1, \Delta_{t-\tau_j,t} WF_{1j}, \dots, \Delta_{t-\tau_j,t} WF_{I_j j} \right) \right]^{Y_{jt}} \left[1 - \Phi\left(X_{jt}^{*} \theta \right) \right]^{1-Y_{jt}}$$

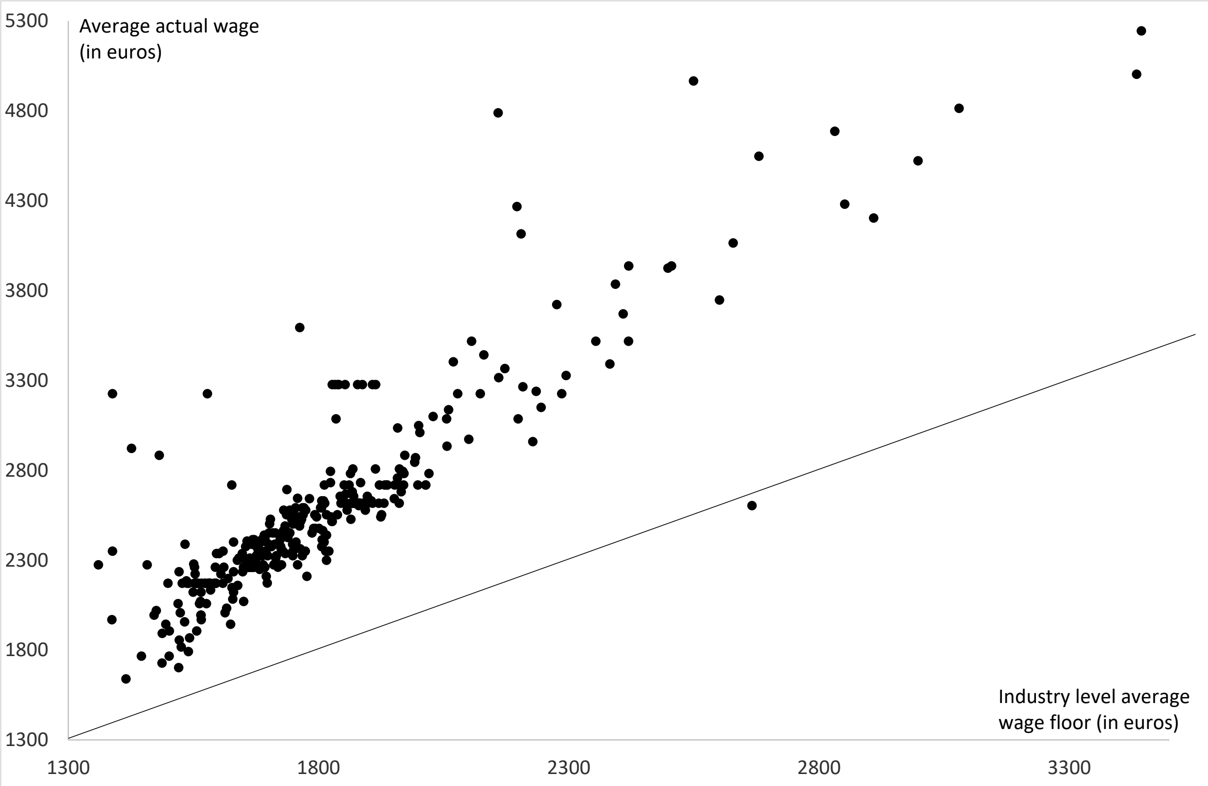
Note that this likelihood function is a conditional likelihood function in the sense that the probability of Y_{jt} in each period is conditional on past values of Y_{jt} (which are included in the vector of explanatory variables affecting selection and outcome equations).

Overall, we prefer to resort to a two-step procedure rather than a full-maximum likelihood estimation for the following reasons:

- The two-step method does not require to precisely parametrize the covariance matrix of the residuals Σ_j while a ML procedure does. Evidence suggests that wage floor re-evaluations are highly correlated across occupations and assuming that Σ_j is a diagonal matrix might be a strong assumption. Moreover, the two-step method provides consistent estimates of the coefficients of interest even in the case where residuals of the outcome equations are correlated over time (this case is not treated in the derivation of the likelihood function above).
- The two-step method is much easier to implement than the ML method. First, the expression of the likelihood of the type II Tobit model with multiple outcomes is not coded in standard software packages. Second, the number of outcome equations (one for each occupation) may vary a lot across industries. The expression above shows that maximization of this function is possible in theory but it also clearly shows that in practice it would be rather complex and may involve rather strong technical difficulties like convergence time. This econometric question is beyond the scope of our paper.
- In the two-step method, the only restrictions on the covariance structure of residuals concern residuals of the agreement equation whereas the covariance structure of residuals in the wage floor change equations is left unrestricted. Hence, we rely on Cameron *et al.* (2008) who propose to use pair-cluster bootstrap to account for heteroscedasticity within industries (corresponding to clusters here). Since our two-step estimation method provides consistent estimates in the presence of heteroscedasticity (i.e., by allowing for correlated errors within each industry across different occupations or over time), we can rely on their bootstrap method to compute the variance of the

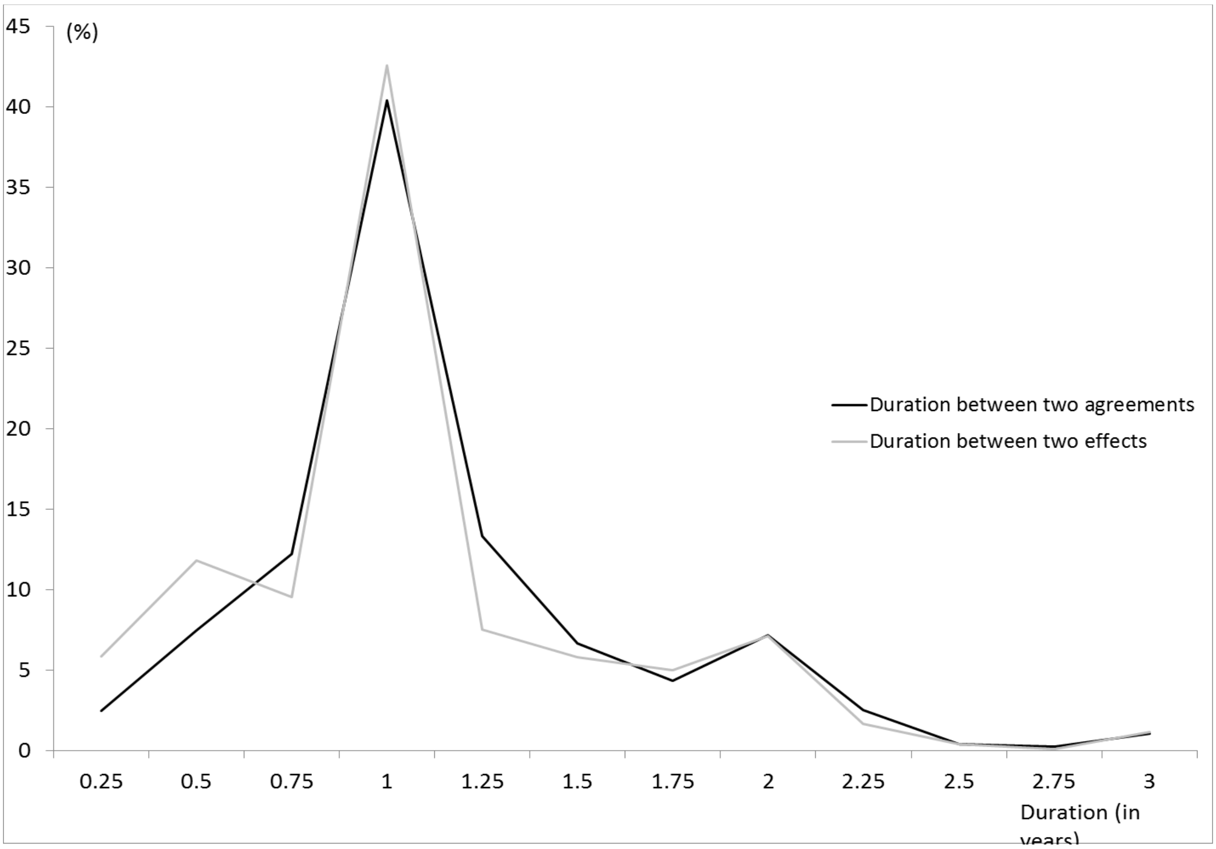
parameter estimates. The number of industries is large enough (more than 300) for the bootstrap methods to be implemented.

Figure A: Average wage floors versus average actual wages (2011)



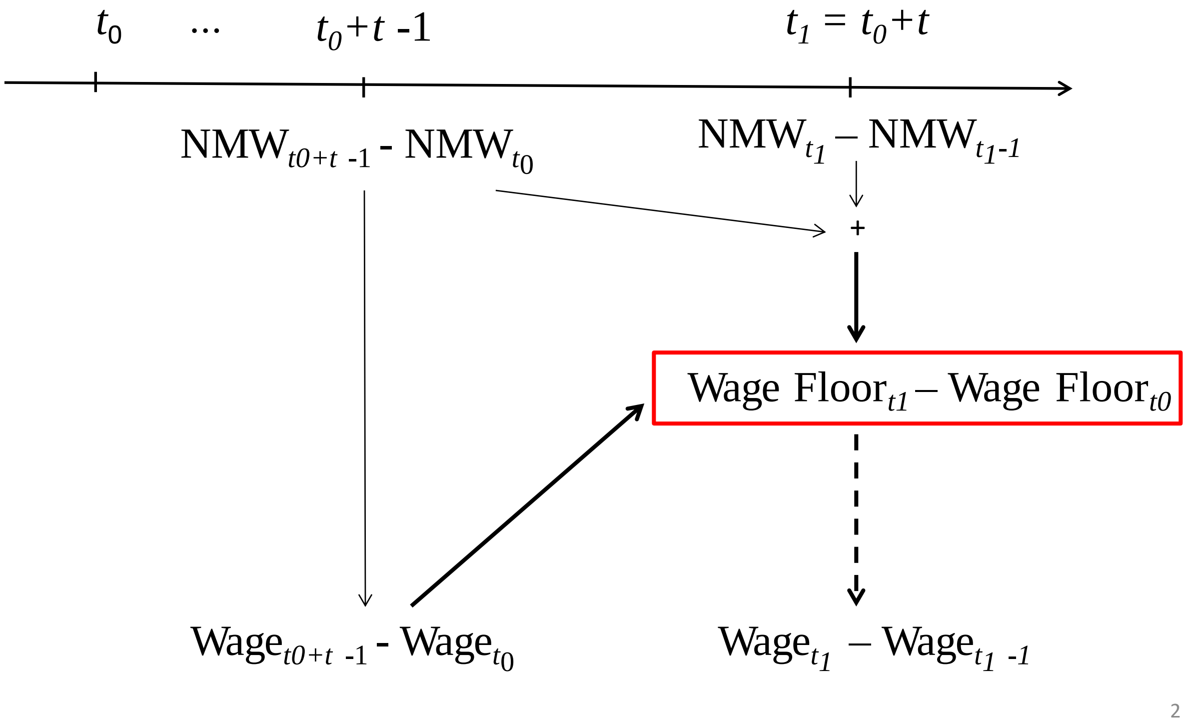
Notes: Actual average gross wages are collected and published by the Ministry of Labor for the year 2011 (in euro). Using our data, we calculate the weighted average wage floor for each industry in year 2011. Each point represents a given industry whereas the dark line is the line $y = x$.

Figure B: Distribution of durations (in years) between two successive signing dates of wage agreements (or two dates of wage agreement enforcement)



Notes: durations are computed as the difference between two successive signing dates of wage agreements (or two dates of agreement enforcement). All industries are considered over the period 2007-2015.

Figure C: Timing of wage floor adjustments



Notes: t0 and t1 correspond to dates of wage agreements. “NMW” is the national minimum wage that can be changed at all dates. “Wage” corresponds to actual individual wages that can be adjusted by different factors, including NMW and wage floors. “Wage Floor” corresponds to wage floors that are adjusted at each wage agreement. They can impact actual wages and are impacted by past changes in actual wages in a given industry, but also by changes in the NMW level.

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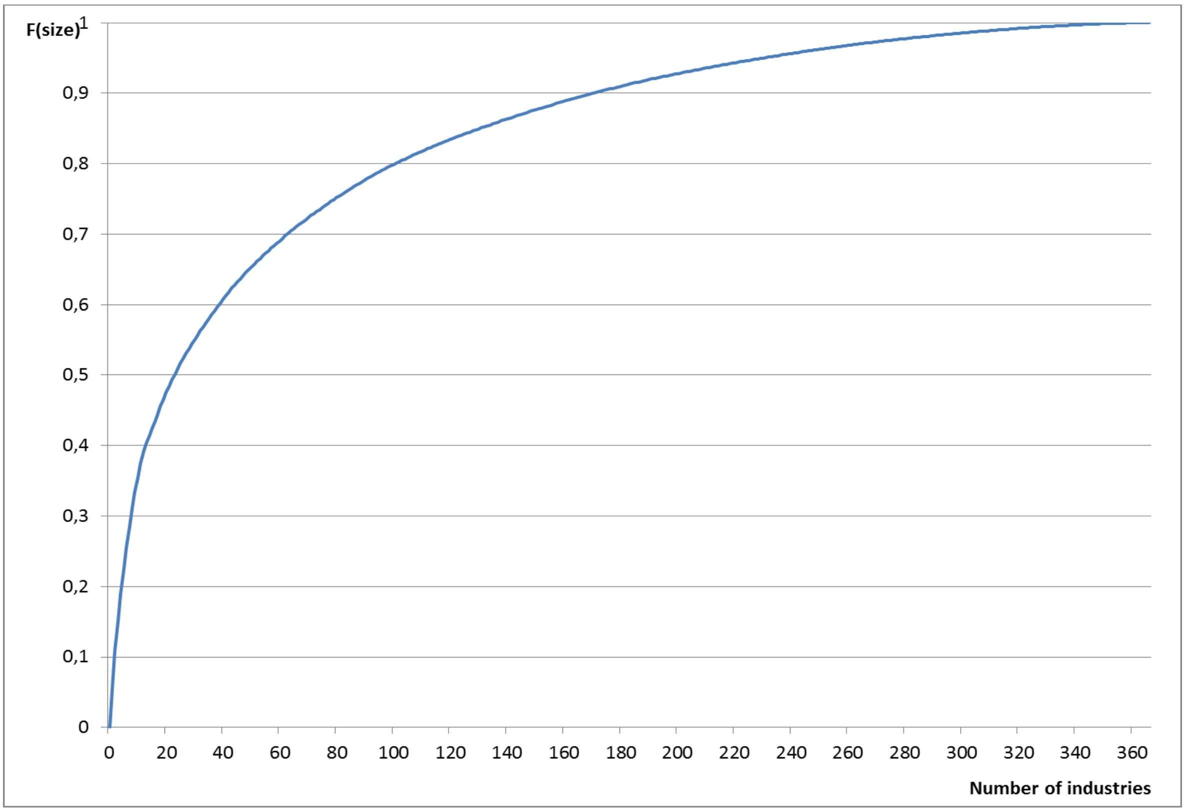
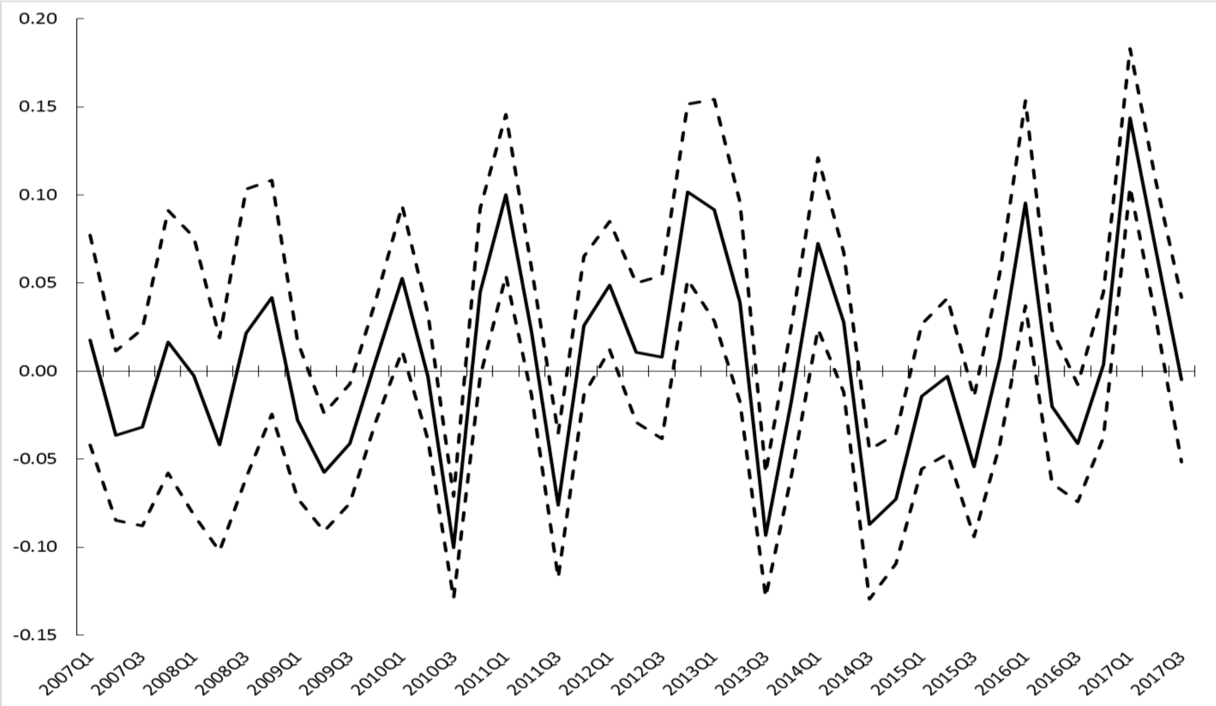
Figure D: Proportion of workers covered by the largest industries (in terms of number of workers)



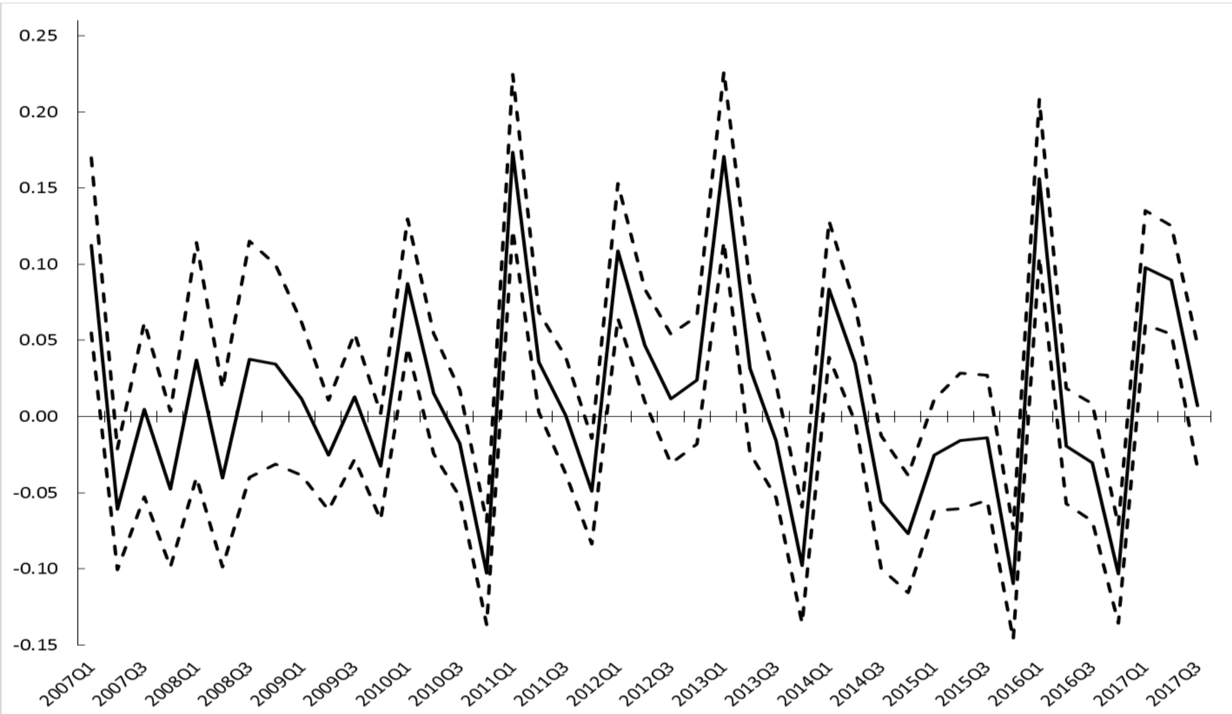
Note: This graph plots the cumulative density function of the number of employees in industries. Industries are ranked from the largest to the smallest size in terms of workers covered by agreements; all industries taken together cover 12 million of workers. We then compute the percentage of the overall population covered by the first largest industries. For instance, the 20 largest industries cover about 48% of the overall population of workers covered by industry-wage agreements.

Figure E: Estimates of time effects in the wage agreement regression

1) dates of wage agreement signing

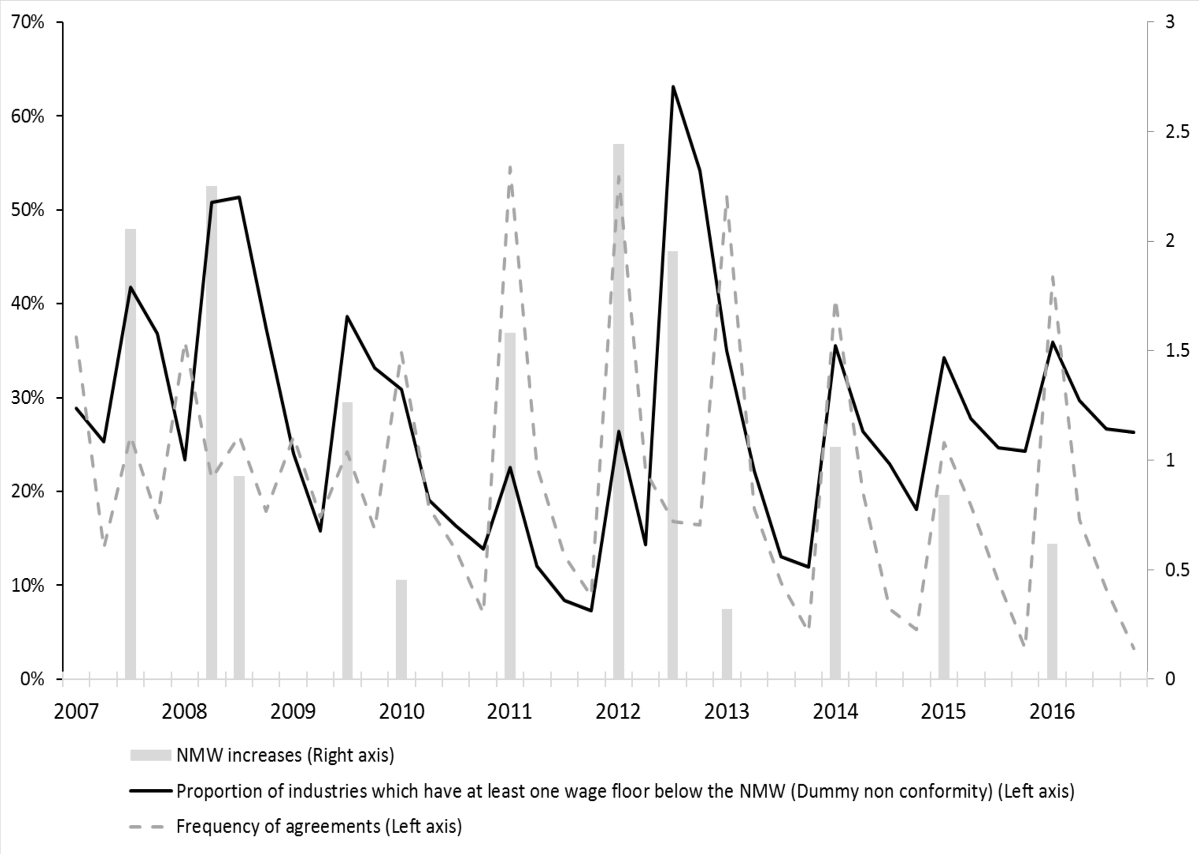


2) dates of wage agreement enforcement



Notes: These figures report parameter estimates (black solid line) and 95%-confidence interval (black dashed lines) associated with date dummies used as time controls in the Probit regressions (equation 2) (results are presented in Table 3 (specification (1)). Q42017 is chosen as the reference quarter.

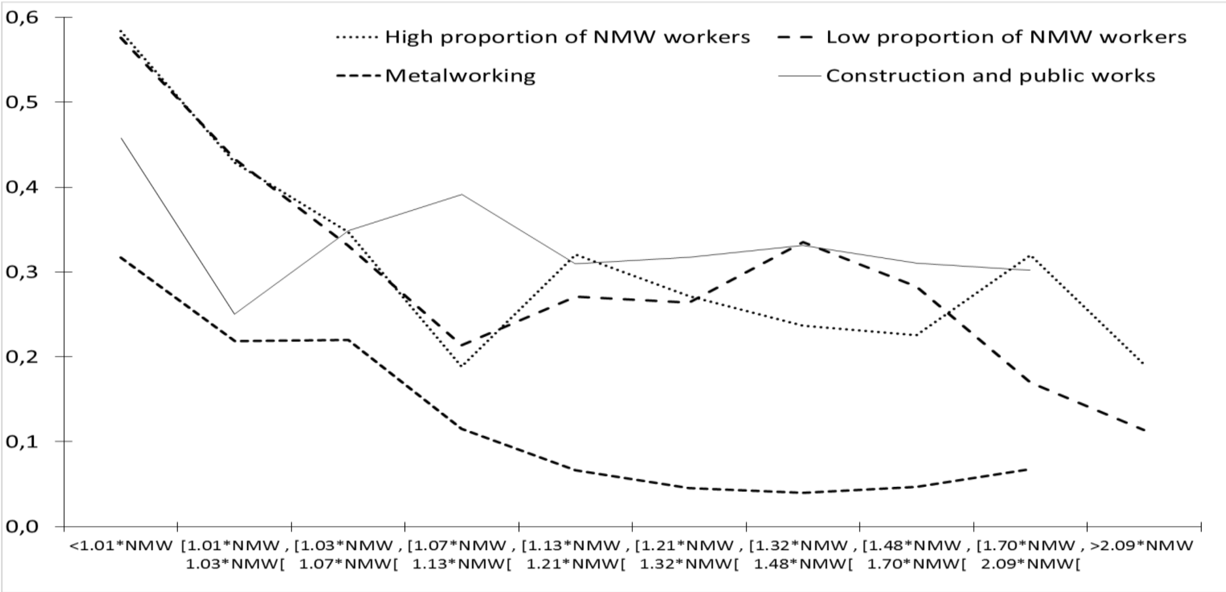
Figure F: Proportion of industries with at least a wage floor below the NMW over time



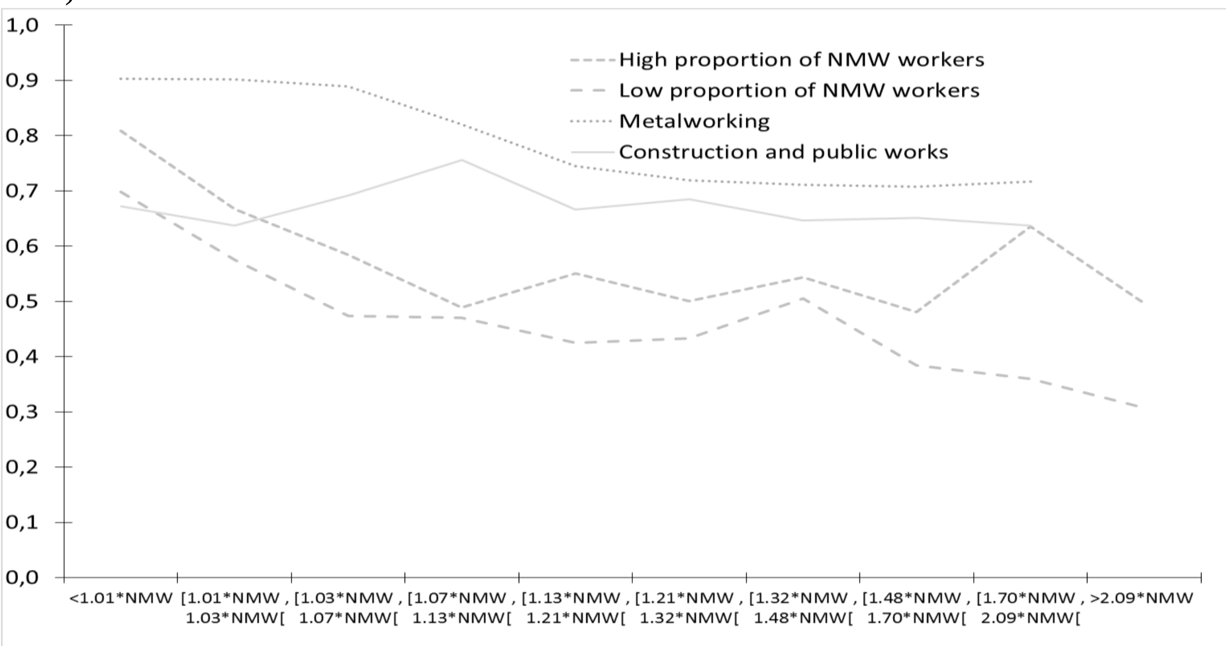
Notes: the grey histogram (right axis) corresponds to NMW increases (in percentage). The dark solid line is the proportion of industries with at least one wage floor below the NMW (in percentage) calculated as the ratio of the total number of employees in non-conform industries over the total number of employees. The grey dashed line represents the proportion of industries (weighted by the number of employees) in which wage agreements come into effect at a given date (quarter-year).

Figure H: Elasticity of wage floor variations with respect to the real NMW increases and to inflation along the wage floor distribution (industry heterogeneity)

a) Real NMW



b) Inflation



Notes: This figure reports parameter estimates obtained by adding to our baseline Tobit model interaction terms capturing the relative position of a wage floor along the wage distribution (with respect to the NMW level). The black lines report elasticities of the nominal wage floors with respect to NMW increases (in real terms). The grey lines report elasticities of nominal wage floors with respect to inflation. Estimates associated with the curve "High prop. of NMW workers" are based on the subsample of industries with a national coverage and with a proportion of minimum-wage workers higher than the median among all industries. Estimates associated with the curve "Low prop. of NMW workers" are based on the subsample of industries with a national coverage and with a proportion of minimum-wage workers smaller than the median among all industries. Estimates associated with the curve "Metalworking" are based on the subsample containing local metalworking industries "Construction and public works" are based on the subsample containing regional construction industries. For those two last groups, managers are not included since they are covered by a national industry, thus there is no wage floors above 2.09 NMW.

Table A: Marginal effects of covariates in the wage agreement equation for wage agreement signing

Dependent variable - *Dummy variable for a wage agreement signing*	(1)	(2)
Cumulated inflation	6.975***	6.420***
	(0.433)	(0.509)
Cumulated real NMW	2.729***	2.374***
	(0.357)	(0.503)
Cumulated real aggregate wage change	3.802***	5.683***
	(0.625)	(0.859)
Cumulated real wage change in the industry	2.146*	2.180*
	(1.201)	(1.297)
Local unemployment rate	0.716	-0.576
	(0.520)	(1.573)
Output gap	-0.358***	-0.657***
	(0.132)	(0.242)
Duration		
6 months	-0.029***	-0.030***
	(0.010)	(0.010)
1 year	0.326***	0.329***
	(0.008)	(0.013)
2 years	0.222***	0.225***
	(0.008)	(0.020)
Before 2010		
Non-compliance with the NMW	0.009	0.006
	(0.008)	(0.006)
After 2010		
Non-compliance with the NMW	0.048***	0.044***
	(0.006)	(0.005)
N	14,903	14,903
Time dummies	Quarter	Date
Industry dummies	Yes	Yes

Note: This table reports marginal effects estimated with Probit models. Standard errors are obtained using bootstrap methods and are reported in brackets. The dependent variable is the dummy variable equal to 1 if there is a wage agreement in industry *j* at date *t* (quarter-year). Significance levels: *** p < 0.01, ** p < 0.05, * p < 0.1.

Table B: Marginal effects of covariates in the wage agreement equation (date of enforcement) – Sectoral heterogeneity - without time dummies

Dependent variable - *Dummy variable for wage agreement enforcement*	National coverage		Local coverage	
	High prop. of min. wage workers	Low prop. of min. wage workers	Metal working	Construction and public works
Cum. inflation	6.566***	5.151***	5.852***	8.222***
	(0.917)	(0.825)	(0.960)	(0.827)
Cum. real NMW change	3.649***	2.191***	3.022***	1.559**
	(0.890)	(0.729)	(0.723)	(0.671)
Cum. real aggregate wage change	1.316	3.235**	4.532***	7.560***
	(1.350)	(1.638)	(1.495)	(1.196)
Cum. real wage change in the industry	-0.190	2.517	6.111	-4.472
	(1.818)	(1.595)	(4.199)	(4.654)
Unemployment rate	-1.396	0.302	3.910***	-0.383
	(1.028)	(1.142)	(0.890)	(0.834)
Output gap	-0.585*	0.309	0.212	0.054
	(0.300)	(0.307)	(0.253)	(0.209)
Duration				
6 months	0.022	0.052*	-0.051***	0.120**
	(0.022)	(0.030)	(0.016)	(0.051)
1 year	0.269***	0.334***	0.319***	0.275***
	(0.022)	(0.028)	(0.020)	(0.036)
2 years	0.167***	0.167***	0.189***	0.131***
	(0.039)	(0.040)	(0.046)	(0.031)
Before 2010				
Non-compliance with the NMW	0.020	0.026	0.042**	0.034**
	(0.017)	(0.016)	(0.017)	(0.015)
After 2010				
Non-compliance with the NMW	0.054***	0.041***	0.108***	0.057***
	(0.012)	(0.013)	(0.011)	(0.015)
Date dummies	No	No	No	No
N	4,350	4,003	3,341	3,259

Note: This table reports marginal effects estimated with Probit models. Only industry dummies are included. Standard errors are obtained using bootstrap methods and are reported in brackets. The dependent variable is the dummy variable equal to 1 if there is a wage agreement in industry *j* at date *t* (quarter-year). Estimates in the column "High prop. of min. wage workers" are obtained for the subsample of industries with a national coverage and with a proportion of minimum-wage workers higher than the median among all industries. Estimates in the column "Low prop. of min. wage workers" are obtained for the subsample of industries with a national coverage and with a proportion of minimum-wage workers smaller than the median among all industries. Estimates in the column "Metalworking" are obtained for the subsample containing local metalworking industries. Estimates in the column "Construction and public works" are obtained for the subsample containing regional construction and public works industries. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table C: Marginal effects of covariates in the wage agreement equation (by size of industries)

Dependent variable - *Dummy variable for wage agreement enforcement*	30 largest industries (6.5 million workers)	54 largest industries (8 million workers)	80 largest industries (9 million workers)	Remaining industries (3 million workers
Cum. inflation	8.691*** (2.243)	6.920*** (1.731)	5.999*** (1.409)	6.008*** (0.573)
Cum. real NMW change	-1.373 (2.141)	0.701 (1.167)	1.106 (0.982)	2.256*** (0.726)
Cum. real aggregate wage change	12.424*** (2.746)	10.311*** (1.614)	7.125*** (2.052)	5.606*** (1.100)
Cum. real wage change in the industry	1.598 (4.772)	3.982 (3.185)	3.652 (2.495)	1.691 (1.624)
Unemployment rate	-14.733 (17.541)	-10.381 (11.942)	-5.852 (8.974)	0.494 (1.487)
Output gap	-0.937 (1.427)	-2.450** (1.157)	-1.625** (0.823)	0.083 (0.253)
Duration				
6 months	0.077 (0.052)	0.019 (0.013)	-0.007 (0.021)	0.042*** (0.016)
1 year	0.241*** (0.044)	0.262*** (0.033)	0.274*** (0.027)	0.345*** (0.014)
2 years	0.129* (0.075)	0.132** (0.061)	0.174*** (0.051)	0.197*** (0.023)
Before 2010				
Non-compliance with the NMW	0.019 (0.026)	0.039* (0.020)	0.041* (0.021)	0.009 (0.009)
After 2010				
Non-compliance with the NMW	0.049* (0.029)	0.034* (0.018)	0.042*** (0.012)	0.058*** (0.009)
Date dummies	Yes	Yes	Yes	Yes
N	1,276	2,206	3,277	11,676

Note: This table reports marginal effects estimated with Probit models. Date dummies are included. Standard errors are obtained using pair-cluster bootstrap methods and are reported in brackets. The dependent variable is the dummy variable equal to 1 if there is a wage agreement in industry j at date t (quarter-year). Estimates in the column "30 largest industries (6.5 million workers)" are obtained for the subsample of the 30 largest industries (in terms of number of workers covered), they cover all together about 6.5 million of workers. Estimates in the column "54 largest industries (8 million workers)" are obtained for the subsample of the 54 largest industries (in terms of number of workers covered), covering all together about 8 million workers. Estimates in the column "80 largest industries (9 million workers)" are obtained for the subsample of the 80 largest industries (in terms of number of workers covered), covering all together about 9 million workers. Estimates in the column "remaining industries" are obtained for the subsample of all other industries which do not belong to the 80 largest industry group and they cover altogether about 3 million workers. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table D: Parameter estimates of the wage floor change equation – Sectoral heterogeneity - without time dummies

Dependent variable : Nominal wage floor changes	National coverage		Local coverage	
	High prop. of min. wage workers	Low prop. of min. wage workers	Metal working	Construction and public works
Cumulated inflation	0.627*** (0.038)	0.451*** (0.038)	0.712*** (0.053)	0.650*** (0.068)
Cumulated real NMW change	0.445*** (0.035)	0.346*** (0.035)	0.268*** (0.030)	0.296*** (0.056)
Cumulated real aggregate wage change	0.301*** (0.056)	0.152*** (0.056)	0.225*** (0.057)	0.167*** (0.064)
Cumulated real wage change in the industry	-0.127 (0.090)	0.063 (0.090)	-0.030 (0.144)	1.030*** (0.333)
Unemployment rate	-0.176*** (0.033)	-0.268*** (0.033)	-0.124*** (0.036)	-0.001 (0.001)
Output gap	-0.004 (0.010)	-0.025** (0.010)	-0.014 (0.014)	-0.035* (0.018)
Inverse Mills Ratio	0.000 (0.000)	-0.001*** (0.000)	0.000 (0.001)	-0.002** (0.001)
R^2	0.528	0.478	0.601	0.828
N	18,734	14,024	15,605	5,163
Time dummies	No	No	No	No
Industry dummies	Yes	Yes	Yes	Yes

Note: The dependent variable is the nominal wage floor change between two successive effects of wage agreements in a given industry. Estimates in the column "All" concern all industries in our sample (national coverage industries, metalworking industries (with a local level coverage) and construction and public work industries (regional coverage). Estimates in the column "High prop. of min. wage workers" are based on the subsample of industries with a national coverage and with a proportion of minimum-wage workers higher than the median among all industries. Estimates in the column "Low prop. of min. wage workers" are based on the subsample of industries with a national coverage and with a proportion of minimum-wage workers smaller than the median among all industries. Estimates in the column "Metalworking" are based on the subsample containing local metalworking industries. Estimates in the column "Construction and public works" are based on the subsample containing regional construction and public works industries. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table E: Parameter estimates of the wage floor change equation – Large vs small firms

Dependent variable : Nominal wage floor changes	High share of large firms	Low share of large firms	High share of small firms	Low share of small firms
Cumulated inflation	0.647*** (0.036)	0.557*** (0.039)	0.557*** (0.039)	0.646*** (0.038)
Cumulated real NMW change	0.288*** (0.030)	0.245*** (0.028)	0.268*** (0.035)	0.253*** (0.031)
Cumulated real aggregate wage change	0.354*** (0.068)	0.367*** (0.057)	0.355*** (0.057)	0.382*** (0.070)
Cumulated real wage change in the industry	0.015 (0.097)	0.114** (0.057)	0.072 (0.091)	0.078 (0.086)
Local unemployment rate	-0.182 (0.040)	0.087 (0.080)	0.078 (0.100)	0.042 (0.068)
Output gap	0.024* (0.013)	0.031** (0.012)	0.045*** (0.010)	0.019 (0.012)
Inverse Mills Ratio	0.000 (0.000)	-0.001** (0.000)	-0.001*** (0.000)	0.000 (0.000)
R^2	0.672	0.574	0.583	0.667
N	23,814	29,712	24,287	23,239

Note: The dependent variable is the nominal (or real) wage floor change between two effects of wage agreements in a given industry. All specifications include time and industry dummies. Estimates in the column "High share of large firms" (resp., low share) are for industries in which the share of firms with more than 500 employees is above (resp. below) the median (0.25%). Estimates in the column "High share of small firms" (resp., low share) are for industries in which the share of firms with less than 10 employees is above (resp., below) the median (69%). Significance levels: *** p < 0.01, ** p < 0.05, * p < 0.1

Table F: Parameter estimates of the wage floor change equation (By size of industries)

Dependent variable - *Dummy variable for wage agreement enforcement*	30 largest industries (6.5 million workers)	54 largest industries (8 million workers)	80 largest industries (9 million workers)	All remaining industries
Cumulated inflation	0.371*** (0.103)	0.433*** (0.078)	0.464*** (0.060)	0.630*** (0.032)
Cumulated real NMW change	0.218** (0.100)	0.262*** (0.068)	0.170*** (0.051)	0.285*** (0.024)
Cumulated real aggregate wage change	0.619*** (0.168)	0.690*** (0.125)	0.518*** (0.102)	0.326*** (0.042)
Cumulated real wage change in the industry	0.272* (0.149)	0.254** (0.120)	0.018 (0.106)	0.100 (0.072)
Unemployment rate	0.453 (1.017)	0.681 (0.638)	0.569 (0.379)	0.052 (0.060)
Output gap	0.026 (0.081)	-0.041 (0.052)	0.008 (0.028)	0.032*** (0.009)
Inverse Mills Ratio	-0.003 (0.003)	-0.001 (0.001)	-0.003*** (0.001)	-0.001* (0.000)
R^2	0.513	0.534	0.560	0.643
N	5,750	9,024	15,154	38,381
Time dummies	Yes	Yes	Yes	Yes

Note: The dependent variable is the nominal wage floor change between two successive effects of wage agreements in a given industry. All specifications include industry and date fixed effects. Estimates in the column "30 largest industries (6.5 million workers)" are obtained for the subsample of the 30 largest industries (in terms of number of workers covered), they cover all together about 6.5 million of workers. Estimates in the column "54 largest industries (8 million workers)" are obtained for the subsample of the 54 largest industries (in terms of number of workers covered), covering all together about 8 million workers. Estimates in the column "80 largest industries (9 million workers)" are obtained for the subsample of the 80 largest industries (in terms of number of workers covered), covering all together about 9 million workers. Estimates in the column "remaining industries" are obtained for the subsample of all other industries which do not belong to the 80 largest industry group and they cover altogether about 3 million workers. Significance levels: *** p < 0.01, ** p < 0.05, * p < 0.1

Table G: Parameter estimates of the wage floor change equation - Before / after 2010

Dependent variable: Nominal wage floor changes	All	National coverage		Local coverage	
		High prop. of min. wage workers	Low prop. of min. wage workers	Metalworking	Construction and public works
Before 2010					
Cumulated inflation	0.633*** (0.042)	0.662*** (0.079)	0.424*** (0.084)	0.748*** (0.076)	0.565*** (0.069)
Cumulated real NMW change	0.240*** (0.026)	0.373*** (0.078)	0.254*** (0.072)	0.144*** (0.053)	0.272*** (0.078)
Cum. real aggregate wage change	0.173*** (0.066)	0.182** (0.078)	0.149 (0.164)	0.242 (0.207)	0.218* (0.128)
Cum. real wage change in the industry	0.421*** (0.102)	-0.178 (0.198)	0.587*** (0.183)	1.488** (0.597)	1.471*** (0.505)
After 2010					
Cumulated inflation	0.604*** (0.036)	0.594*** (0.059)	0.514*** (0.067)	0.770*** (0.076)	0.665*** (0.053)
Cumulated real NMW change	0.337*** (0.033)	0.364*** (0.063)	0.372*** (0.067)	0.228*** (0.061)	0.477*** (0.068)
Cum. real aggregate wage change	0.179*** (0.044)	0.320*** (0.107)	0.112 (0.097)	0.023 (0.089)	0.082 (0.072)
Cum. real wage change in the industry	-0.019 (0.052)	-0.149 (0.093)	0.011 (0.072)	-0.161 (0.262)	0.726** (0.308)
Unemployment rate	0.073 (0.060)	0.695*** (0.265)	0.665 (0.424)	0.084 (0.063)	-0.041 (0.108)
Output gap	0.025*** (0.008)	0.018 (0.018)	0.015 (0.030)	-0.008 (0.035)	-0.004 (0.014)
Inverse Mills Ratio	-0.001*** (0.000)	-0.001* (0.001)	-0.002** (0.001)	0.000 (0.000)	-0.002** (0.001)
R^2	0.610	0.564	0.558	0.694	0.817
N	53,526	17,591	15,430	15,451	5,054

Note: The dependent variable is the nominal (or real) wage floor change between two effects of wage agreements in a given industry. Date and industry dummies are included in all specifications. Estimates in the column "High prop. of min. wage workers" are based on the subsample of industries with a national coverage and with a proportion of minimum-wage workers higher than the median among all industries. Estimates in the column "Low prop of min. wage workers" are based on the subsample of industries with a national coverage and with a proportion of minimum-wage workers smaller than the median among all industries. Estimates in the column "Metalworking" are based on the subsample containing local metalworking industries. Estimates in the column "Construction and Public works" are based on the subsample containing regional construction and public works industries. Significance levels: *** p < 0.01, ** p < 0.05, * p < 0.1.

Table H: Variance decomposition of annual wage floor growth within industries and across industries

	R^2 of cross sectional regressions of year-on-year wage floor growth on industry fixed effects
2007	0.74
2008	0.70
2009	0.72
2010	0.78
2011	0.86
2012	0.71
2013	0.75
2014	0.80
2015	0.74
2016	0.77
2017	0.57

Note: Reported R-squared are obtained by regressing, for each year of our sample, year-on-year wage floor growth on industry fixed effects. It measures variance of annual wage growth explained by industry-specific difference. The remaining variance is explained by differences in annual wage growth across occupations within the same industry.