DISCUSSION PAPER SERIES

IZA DP No. 10290

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October 2016

Forschungsinstitut
zur Zukunft der Arbeit
Institute for the Study
of Labor

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Discussion Paper No. 10290
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IZA Discussion Paper No. 10290
October 2016

ABSTRACT

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

This paper examines empirically how industry-level wage floors are set in French industry-level wage agreements and how the national minimum wage (NMW) interacts with industry-level wage bargaining. For this, the authors use a unique dataset containing about 50,000 occupation-specific wage floors in 365 French industries over the period 2007-2015. They find that the NMW has a significant impact on the seasonality and on the timing of the wage bargaining process. Inflation, past sectoral wage increases and real NMW increases are the main drivers of wage floor adjustments; elasticities of wage floors with respect to these macro variables are 0.6, 0.4 and 0.2 respectively. Wage floor elasticities to inflation and to the NMW both decrease along the wage floor distribution but are still positive for all levels of wage floors.

JEL Classification: J31, J51, E24

Keywords: collective bargaining, wages, minimum wage

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* We thank Laurent Baudry for his valuable research assistance. We are also grateful to Christian Bredemeier, Eve Caroli, Gilbert Cette, Romain Espinoza, Alexander Hijzen, Etienne Lehmann, François Langot, Pedro Martins, Christian Schluter, Ernesto Villanueva, and participants in the 3rd AMSE-Banque de France Conference on Labor Market Issues (Aix-en-Provence, 2014), JMA conference (Montpellier, 2015), AFSE Congress (Rennes, 2015), TEPP Conference (Paris, 2015), EEA Congress (Mannheim, 2015), IAB Conference on the Minimum Wage (Nuremberg, 2015), CEPREMAP Workshop on "What place for unions today?" (Paris, 2015), Royal Economic Society Conference (Brighton, 2016), 15th Journées Louis-André Gérard-Varet (Aix-en- Provence, 2016) and in seminars at Université Paris-Dauphine (Paris, 2015), at Banque de France (Paris, 2016), TEPP Winter School (Aussois, 2016) for helpful comments and suggestions. This paper previously circulated under the title "The Impact of the National Minimum Wage on Industry-level Wage Bargaining in France". The views expressed in this paper do not necessarily reflect those of the Banque de France. Denis Fougère acknowledges support from the French National Research Agency's (ANR) "Investissements d'Avenir" grants ANR-11-LABX-0091 (LIEPP).

1. Introduction

Wage setting institutions are often considered as one of the key differences between US and European labor markets. Contrary to the United States, a vast majority of workers in European countries are covered by collective wage bargaining which shapes wage setting within firms. In France, as in many other European countries, unions and employers' associations bargain at the industry level on wage floors for a set of representative job occupations which are specific to the industry. Those wage floors should be higher than the national minimum wage (NMW) which is a legal national wage floor, binding for all workers. To keep wage floors above the NMW, industries may have to update thousands of industry-level wage floors after an increase in the NMW. Since industry-level agreements are quasi automatically extended to all employees in an industry (see Villanueva, 2015, for a survey on extension procedures in Europe), those wage floors are then binding for all firms and are used as references for firms' wage policies. Thus, the NMW is not only a floor for all wages but it is also embedded into a complex system of institutions of wage bargaining. Similar patterns are observed in other European countries and a recent but growing literature focuses on how industry-level wage agreements affect labor market outcomes (see Díez-Catalán and Villanueva, 2014, for Spain, Martins, 2014, and Guimaraes *et al*., 2015, for Portugal).[1] However, little is known about the determinants of wage floor adjustments and how they interact with NMW increases. In this paper, we investigate how wage floors adjust to shocks in French industry-level agreements by using a large and unique dataset consisting of about 50,000 job-specific wage floors over the period 2007-2015.

Our first contribution is to open the black box of industry-level bargaining in France and deepen our knowledge of the functioning of wage bargaining institutions that are widespread in Europe (Visser, 2016). For this purpose, we collect a large and unique new dataset containing the whole industry-specific scales of wage floors for 365 French industries (covering about 75% of workers of the private sector) over the period 2007-2015. In each industry, wage floors are defined for a specific classification of representative occupations. Those wage floors are then used by firms as a reference to set their wages. 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) obtain a significantly positive short-term elasticity of actual wages to wage floors (see Lopez-Novella and Sissoko (2013) for similar

[1] Magruder (2012) reports similar institutional features of wage bargaining in South Africa and finds that centralised bargaining has a negative effect on employment.

evidence on Belgian data). In our dataset, we are able to observe for several years a wage floor associated with a given occupation within the industry-level job classification, which allows us to compute the size of occupation-specific wage floor adjustments between two wage agreements. Overall, our dataset contains about 50,000 wage floors for around 6,500 different occupations defined in industry agreements. Our paper provides new stylised facts on how industry wage floors are adjusted in France. We contribute to the empirical literature looking at how the level of wage bargaining shapes firms' wage adjustment in different European countries (see, e.g., Card and de la Rica, 2006, for Spain, Cardoso and Portugal, 2005, for Portugal, Gürtzgen, 2009, for Germany, Hartog *et al.*, 2002, for the Netherlands). Another strand of the literature looks at the determinants of firm-level agreements in Canada and in the United States, emphasizing the role played by inflation or indexation clauses on bargained wage adjustments (see, for instance, Christofides and Wilton, 1983, Christofides and Stengos, 2003, Rich and Tracy, 2004 and Christofides and Nearchou, 2007). To our knowledge, little evidence is available on the determinants of wage floor adjustments contained in industry-level agreements in a European country. Avouyi-Dovi et al. (2013) provide some empirical evidence on wage bargaining in France combining data on firm- and industry-level agreements. However, they focus mainly on the timing at which firms are affected by firm- and industry-level wage agreements. Besides, one limitation of their data is that information on job-specific wage floors is not available. Thus, they are not able to examine the economic determinants of wage floor adjustments. Our contribution is here to collect an original data set consisting of the whole wage floor scales for 365 French industries and to provide new results on economic determinants of wage floor adjustments.

Our second contribution is to investigate the interactions between the NMW and industry-level wage floors adjustments. A large strand of literature examines the effects of the NMW either on other wages or on employment (see, e.g., Card and Krueger, 1995 and Neumark and Wascher, 2008). In most European countries, the NMW is not only a minimum wage threshold binding for all workers, it also affects wage bargaining at different levels and, in particular, industry-specific wage floors which then shape individual wage adjustments within firms. Here, our contribution is to investigate the spillover effects of the NMW on bargained wage floors which are industry and occupation specific. France is an interesting case study since a large share of the labor force is directly affected by NMW increases (between 10 and 15% versus less than 5% in most European countries; see, e.g. Du Caju *et al.*, 2009). Besides this direct effect of the NMW on wages close to the NMW, several empirical studies find that

minimum wages have spillover effects on higher wages (see, e.g. Grossman, 1983, Card and Krueger 1995, Machin *et al.,* 2003, Dickens and Manning, 2004, Neumark and Wascher, 2004, Gregory, 2015, and Autor *et al.,* 2016). In France, one important channel of transmission of NMW increases to other wages may come from industry-level wage agreements.[2] By law, wage floors cannot be set below the NMW. After a NMW increase, industries have to bargain over new values of wage floors to keep the lowest wage floors above the NMW. For higher wage floors, unions and employers may want to maintain some wage differentials between workers because of fairness or efficiency wage arguments. To assess the impact of the NMW on wage floors variations, we use a Tobit model to disentangle the effect of the NMW increase on the frequency of wage agreements and on the size of wage floor adjustments. We also investigate whether the effect of the NMW is heterogeneous along the wage floor distribution.

Our results are also useful to understand why aggregate real wages have been downward rigid in France, in particular during the recent crisis (see, for recent evidence on other European countries, Gartner *et al.*, 2013, and Addison *et al.,* 2015). In France, since 2008, real wages have been increasing at a rate close to 1% per year whereas the unemployment rate has also been rising steadily. An explanation of the small cyclical variations of wages relies on the existence of strong nominal and real wage rigidities which prevent wages from adjusting to shocks in the short run (see Le Bihan *et al.*, 2012 for evidence using French firm-level wage data). Here, we investigate the relevance of wage bargaining as one source of potential wage rigidity. Wage bargaining institutions play a role in shaping nominal and real wage rigidity since wage agreements allow firms and workers to incorporate (or not) specific and common shocks into updated wages. Using firm-level data and combining information on the timing of both firm- and industry-level agreements, Avouyi-Dovi et al. (2013) assess to which extent predictions of wage rigidity models used in macro models are empirically relevant. Using our detailed information on individual wage floors, we here investigate the degree of wage rigidity of wage floors and how these wage floors react to usual determinants of wages and business cycle conditions.

[2] Using experimental data, Dittrich *et al.* (2014) show that wage bargaining is a possible channel through which NMW spillover effects might arise.

2. Institutional features of the industry-level wage bargaining in France

Institutions of collective wage bargaining in France are quite similar to those observed in other European countries. In particular, wages are bargained at different levels. At the national level, a binding national minimum wage (NMW) is set by the government. At the industry level, employers' organisations and unions bargain on occupation-specific wage floors and firms cannot opt out of an industry-level agreement. At the firm level, 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).[3] 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) depending mainly on their activity (possibly combined with a geographical criterion).[4] The definition of a *"contractual industry"* is determined by employers and unions' requests and its existence may depend on historical or geographical reasons. The French Ministry of Labor is in charge of enforcing this system, in particular of ensuring that firms are correctly classified in their actual contractual industry. There are more than 700 different "*contractual industries*" in France. However, just over 300 industries cover more than 5,000 workers and small industries rarely bargain on wages.

For each contractual industry, a general collective agreement ("*convention collective*" in French) defines general 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. It defines in particular an industry-specific classification of representative occupations; this classification is generally based on many criteria such as worker skills, job requirements, experience, age or qualifications required for the job. All workers in the industry are assigned to one position in this job classification. A wage floor is set for every position and workers assigned to a given position

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

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

cannot be paid below the corresponding industry-specific wage floor. The set of all wage floors is denoted as the industry-level scale of wage floors. We provide two examples of job classification and corresponding wage floors in 2014 for “Hairdressing” and for “Manufacture of paper and paperboard”, in Table 1.

[Insert Table 1]

By law, contractual industries must open a bargaining process on wage floors at least once every year but there is no legal obligation to reach an agreement at the end of the bargaining process. When parties fail to reach an agreement, it delays the agreement signing and the duration between two successive agreements can be larger than one year. Obviously, industries are also free to bargain on wages several times during a year, which can induce smaller durations between two successive agreements. One important outcome of wage bargaining is the definition of new values for wage floors. In the absence of any new agreement, wage floors remain unchanged until the next agreement and an agreement does not define any explicit contract duration (as it may be the case in Spain for instance). Once an agreement is signed by unions and employers’ associations, industry-level wage agreements are automatically extended by decision of the Ministry of Labor to all firms belonging to the corresponding contractual industry. Those extensions are generally quickly implemented. 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 in the 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 Timing and magnitude of wage floor adjustments

Two margins of wage floor adjustments can be considered: their timing (i.e. the extensive margin) and their magnitude (i.e., the intensive margin). The timing of wage floor adjustments is directly related to the frequency of wage agreements. Industry-level wage bargaining is not a continuous process since it involves the costs of gathering and sharing information and coordination of unions and employers. The size of wage adjustments may reflect macroeconomic or sector-specific shocks on different wage floor levels within the same industry. This section presents the main mechanisms linking macro variables and the margins of wage floor adjustments. We focus first on the specific role of the NMW, and then we discuss the potential effects of other determinants.

a) The role of the NMW

The binding national minimum wage (in French, *SMIC* for *Salaire Minimum Interprofessionnel de Croissance*) is expected to shape the wage floor adjustment process since it defines a legal wage floor for all French workers. NMW increases directly affect wages of about 10 to 15% of workers. The NMW is automatically adjusted every year, on July 1st until 2009 and on January 1st since 2010. This annual frequency of NMW adjustments is expected to induce some synchronisation of industry-level wage agreements around the month of the NMW increase (in particular in low-wage industries) and should affect the extensive margin of wage floor adjustment. NMW increases are decided by the Ministry of Labor 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 blue-collar hourly base wage and ε_t is a possible discretionary governmental additional increase.[5] Over the period 2007-2015, only one discretionary increase (+0.6%) was implemented in July 2012 (just after François Hollande was elected as Président de la République).

The NMW can affect wage floor adjustments through different channels. First, the NMW can be set above the lowest wage floors previously defined in industry-level agreements. There is no strict obligation for industries to update immediately wage floors that are below the NMW.[6] However, in that case, they have strong incentives to bargain on wage floors and adjust them accordingly since wage floors below the NMW become irrelevant for actual wage setting. Moreover, unions and firms' representatives receive strong recommendations from the Ministry of Labor to open new industry-level wage negotiations and update their lowest wage floors. When industries have all their wage floors above the NMW, they are said to comply with the NMW.

Second, wage floors above the NMW might also be affected through spillover effects. Different theoretical explanations rationalise these spillover effects at the firm level and may be extended to the case of industries. Using an efficiency wage model, Grossman (1983)

[5] 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 happened in May 2008 and in December 2011).

[6] 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.

shows that after a NMW increase, the wage differential between skilled and unskilled workers becomes smaller and firms have to increase wages of skilled (high-wage) workers in order to avoid a reduction in the effort of skilled workers. Another potential explanation is that a NMW increase may shift the labor demand of relative skilled workers, which results in higher wages for skilled workers. Manning (2003) also shows that if firms used to pay high wages to attract better workers from the low-wage firms, these firms have to increase their wages after a NMW increase if they want to keep on hiring better workers.[7] These spillover effects may be heterogeneous because industries cannot uniformly increase all wages after a NMW increase. In this case, NMW increases should result in a lower dispersion of wage floors. These spillover effects will mainly affect the intensive margin of wage floor adjustments.

b) Other determinants

Wage floors are set for every occupation in the industry-specific job classification and are constrained by the NMW. These wage floors can be seen as wages that would be set by a representative firm for some representative occupations. So, wage floor adjustments might depend on the usual determinants of wage inflation that are considered in most macro empirical analyses (see Blanchard and Katz, 1999, and Gali, 2011, for theoretical foundations), i.e. the inflation rate, the unemployment rate and/or a measure of productivity. However, besides the role played by NMW adjustments, the standard wage inflation equation should be adapted to examine the adjustment of industry-level wage floors for at least two reasons, namely infrequent wage bargaining and possible interactions between wage floors and actual wages.

First, the wage floor adjustment is not a continuous process over time since it depends on the infrequent signing of an agreement at the industry level. Hence wage floor changes should be considered with respect to the last date they were changed. Usual determinants of wage adjustments, like inflation or variations in productivity, should also be introduced with respect to the date of the last wage floor adjustment, and not at a fixed quarterly or annual frequency (see Figure A in the Appendix).[8] Moreover, the usual determinants of wage floor adjustments may also affect the timing of wage agreements. For instance, unions are more likely to ask for opening wage negotiations in periods of high productivity gains.

[7] Predictions of this model can be transposed to industries competing with each other.

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

Second, in standard wage inflation equations, actual aggregate or individual wages are generally considered whereas here we examine industry-level wage floors that could interact with actual wages. In particular, past changes in actual industry-specific wages may affect wage floor updates when they are renegotiated. 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 rationalised by fairness issues (Falk *et al*., 2006). This increase in industry-level wages may be due to productivity gains in the industry but also 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' associations might agree with a wage floor adjustment, in particular if they want to prevent potential competitors from maintaining low wages and obtaining a substantial competitive advantage (Haucap et al. 2001).

3. Data on industry-level wage floors

Our data set contains a little more than 50,000 individual bargained different wage floors (defined at the occupational level) in the 365 biggest "contractual" industries (among a little more than 700 industries in France). For those 365 industries, we have collected all wage agreements over the period 2007-2015 available on a government website (*Legifrance*).[9] This data set is to our knowledge the first one containing such detailed information on wage floors negotiated within industries. Table 2 provides some simple statistics on 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 in 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 (207 industries). In the metalworking sector, wage floors of non-managerial employees are bargained at the local level: about 76 local different wage scales coexist at the *département*[10] 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

[9] http://www.legifrance.gouv.fr/initRechConvColl.do

[10] 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.

several *départements*): about 81 regional different wage scales coexist and for each of those 3 sectors job classifications are similar.

[Insert Table 2]

The typical wage agreement contains the date (day/month/year) when the agreement was signed, the date at which it is enforced,[11] the name of unions that have signed the agreement, and the scale of wage floors (corresponding to wage floors for all 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.

Each scale of wage floors is specific to a job classification defined at the industry level. Thus the number of wage floors contained in wage agreements can vary across industries. On average, industry-level scales of wage floors contain 21 different wage floors corresponding to different job occupations (Table 2).[12] The average wage gap between two wage floors in a given scale of wage floors is about 5.7%. This average wage differential is much smaller in the first half of the wage floor scale (close to 2%) whereas the average differential is 9.5% at the top of the distribution.[13] Finally, the average wage floor over the sample period is about 2,000 euros. When we compare average actual wages and average wage floors by industry, the average wage differential is about 40% and wage floors and actual average wages are highly correlated across industries.[14]

Using our data set, we are able to compute the aggregate annual growth rate of wage floors stipulated by industry-level wage agreements. For that purpose, we calculate the year-on-year wage change for each wage floor over the sample period. Figure 1 plots the average annual growth of wage floors. First, the aggregate wage floor increase is close to but below the aggregate base wage published by the Ministry of Labor since actual wage changes may also

[11] 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.

[12] All statistics are weighted using the number of workers by industry or the number of workers by position in the industry job classification. See the data appendix for details on calculations of the number of workers and employment weights.

[13] The top of the wage floor scale consists of wage floors above the median of wage floors in a given job classification.

[14] See Figure B in Appendix for further details on the sectoral correlation between wage floors and actual wages.

include firm-level and individual wage increases. Second, aggregate variations of wage floors are also highly correlated to the actual aggregate wage increase. Third, in real terms, the aggregate wage floor increase is +0.4% on average while the output gap has been negative since 2008; this positive real growth of wage floors is mainly driven by low inflation periods. Lastly, there is a correlation between the annual growth of wage floors and NMW variations. In particular, 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]

Figure 2 reports the distribution of the year-on-year wage floor changes (calculated in Q4). First, there is no nominal wage decrease in industry wage agreements. Second, there is a peak at zero corresponding to industries where there is either no agreement or where wage floors do not change: over the sample period, between 15 and 35% of wage floors are not modified in a given year. This peak is much higher in periods of low inflation (in particular during the recent period). Third, these distributions exhibit some peaks exactly equal or close to the NMW increase or to past inflation, revealing some real rigidity of wage floors. For instance, in 2011, we observe two peaks in the distribution, at 1.5 and 2%, while the NMW increase was about 1.5% and inflation was 2%. During the recent low inflation period, the distribution of changes is much less dispersed. In 2015, there is a peak in the distribution around 0.75% which corresponds to the NMW increase (while the inflation rate was about 0%).

[Insert Figure 2]

4. An empirical model for wage floor adjustment

Our aim is to investigate empirically the main determinants of industry-level wage agreements and wage floor adjustments. These determinants include inflation, NMW increases, overall sectoral wage increases and variables capturing productivity shocks or business cycle position (as mentioned in Section 2).

4.1 The empirical model

The estimated model is a Tobit-II type model which takes into account the discretionary process of wage bargaining. The first equation corresponds to a Probit model where the dependent variable is a dummy variable equal to one if there is a wage agreement in industry *j* at date *t*, 0 otherwise. Our baseline Probit model can be 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 $Y_{jt} = 1$, 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 in industry *j*) and date *t*. For instance, $\Delta_{t-\tau_j,t}CPI = CPI_t - CPI_{t-\tau_j}$. This operator allows us to compute cumulated variations of macro-variables between the last wage agreement observed at date $t - \tau_j$ and date *t*, CPI is the overall French consumer price index (CPI), NMW is the NMW in real terms (i.e. divided by the consumer price index), and W_j is an average wage index in industry *j*. The cumulated variation of this variable is taken in real terms and net of NMW effects. [15] This variation is then decomposed into an aggregate wage increase common to all industries $\Delta_{t-\tau_j,t-1}\overline{W}$ (which should be close to the aggregate base wage increase in France) and an industry-specific wage increase (which is calculated as $\Delta_{t-\tau_j,t-1}\widetilde{W}_j = \Delta_{t-\tau_j,t-1}W_j - \Delta_{t-\tau_j,t-1}\overline{W}$). The log-difference is in this case 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 output gap and x_{jt} a dummy variable capturing the 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). Besides τ_j, we include three dummy variables corresponding to durations between two successive wage agreements[16] (equal to 6 months, one year and two years), and λ_t are time fixed effects.[17] To our best knowledge, average wage indices, output gap or unemployment

[15] To obtain a broad estimation of the effects of the NMW on industry actual 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.

[16] In France, wage agreements do not contain any explicit definition of the contract duration. The wage floor classification is not changed until the next agreement. Here, instead of the contract duration, we consider the durations between two successive dates of wage agreement enforcements.

[17] 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).

measures are not available at the "contractual" industry level. We here compute these variables using NACE industry available variables (see data appendix).

The second equation of the Tobit model relates 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. This second equation is as follows:

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

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 at dates when a new wage agreement is signed, it is missing otherwise. Most of the independent variables are the same as in the first equation but, using estimates obtained in the first equation, we also calculate a Mills ratio which is specific to each industry and which is denoted MR_j, based on exclusion restrictions detailed in the subsection below. Finally, v_j is an industry fixed effect and L_t are date controls.

In our dataset, wage floor scales are specific to each industry and the number of bargained wage floors can be very different across industries. This might raise a technical issue since an industry with a very precise job classification will be oversampled (because of its many job categories). To control for this issue, we define ten wage categories defined by the ratio of each wage floor to the NMW (wage floors less than $1.01 \times NMW$, wage floors between $1.01 \times NMW$ and $1.03 \times NMW$, wage floors between $1.03 \times NMW$ and $1.07 \times NMW$, wage floors between $1.07 \times NMW$ and $1.13 \times NMW$, wage floors between $1.13 \times NMW$ and $1.21 \times NMW$, wage floors between $1.21 \times NMW$ and $1.32 \times NMW$, wage floors between $1.32 \times NMW$ and $1.48 \times NMW$, wage floors between $1.48 \times NMW$ and $1.70 \times NMW$, wage floors between $1.70 \times NMW$ and $2.09 \times NMW$, wage floors above $2.09 \times NMW$). These thresholds are chosen so that the resulting wage categories contain approximately the same number of wage floors. In each category, we select randomly only

one wage floor for each industry.[18] The sample then consists of a little less than 20,000 observations (industry × wage category × date) among about 50,000 wage floors.[19] Moreover, we consider specifications where the NMW effect can vary with the wage floor level. For this purpose, we interact the cumulated NMW variable with dummy variables corresponding to each wage category.

The Tobit model is estimated using a two-step estimation procedure and standard deviations of estimators are obtained using block bootstrap simulations by industry. This method allows us to obtain consistent estimates of the standard errors (i.e., they account for the potential correlation between wage floors within the same industry). This method was preferred to direct clustering to deal with the Tobit model structure.

4.2 Identification and endogeneity issues

We address now 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 (NMW or inflation variations) that are by definition not industry-specific but macro. Thus, the identification of the impact of such variables relies only on their temporal variability. In our model, industries bargain on wages infrequently. Consequently, we can expect 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. 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 but also for the CPI and sectoral actual wages for which we also consider log-variations between two successive wage agreements.

Another identification issue stems 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 stem from

[18] We choose this procedure instead of weighted regressions because weighted regressions would strongly reduce the data variability needed for the identification. Weighting would generate a large discrepancy between large industries/worker categories and small ones.

[19] Robustness checks have been run using the whole dataset. Results remain quite similar.

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 a given 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 it 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*.

The identification of the Tobit model comes from the following assumptions. 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 introduced in the model. Second, we argue that durations equal to one or two years correspond to calendar or seasonal effects (related to negotiation costs or legal constraints), independent of the decision about the size of wage adjustments. Third, the compliance to the NMW is supposed not to affect directly the size of wage floor adjustments since the cumulated increase in the NMW already captures the adjustment of previous wage floors to the new ones. Compliance has no direct effect on the size of wage floor increases besides the direct effect of the cumulated NMW variable. It only affects incentives to reach a new wage agreement. These arguments yield the exclusion restrictions that insure identification of the Tobit model. Dummy variables for durations exactly equal to six months, one year and two years, and the dummy variable indicating that “all wage floors in an industry comply with the NMW” (i.e. the compliance with the NMW) are included in equation (2) and excluded from equation (3) since they only

affect the timing of the industry-level wage bargaining process, but not the size of wage floor adjustments.

5. Results

This section reports the results of our estimations.

5.1 Frequency of industry-level agreements

Table 3 reports marginal effects of Probit models in which the dependent variable is a dummy variable for the enforcement of a wage agreement.[20] We run two different specifications where we include or not the dummy "non-compliance with the NMW" in order to assess the overall effect of the NMW on the frequency of wage agreements. We also report results concerning different groups of industries, namely national industries with a high proportion of minimum-wage workers, national industries with a low proportion of minimum-wage workers, local metalworking industries (where the proportion of minimum-wage workers is very low) and regional construction and public works industries (where the proportion of NMW workers is slightly lower than the average).

[Insert Table 3]

First, duration effects are quite substantial and statistically significant: the probability of a wage agreement after exactly one year is higher by 33 percentage points (pp) (by comparison, the average quarterly frequency of agreement is about 20%). A similar but smaller effect (17 pp) is obtained for wage agreements signed after exactly two years.[21] This reflects the strong time dependence of wage agreements, which might 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.

Seasonal effects are other important factors contributing to the variations in the probability of a wage agreement. We plot parameter estimates associated with date dummies on Figure 3 (2015Q4 is the reference). 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. After 2010, the probability of observing a wage agreement during the first quarter is higher (about +10 pp) whereas it is much smaller during the last quarter of the

[20] See Table A in Appendix for results of a Probit model in which the dependent variable is a dummy variable indicating the date of the wage agreement signing. Results are broadly similar.

[21] See Figure C in Appendix for the distribution of durations between two wage agreements.

year.[22] This result is related to the 2010 reform relative to the timing of NMW increases which moved the month of the usual NMW adjustment from July to January. Before 2010, 26% of wage agreements were implemented during the third quarter whereas, after 2010, most enforcement dates of wage agreements occurred in the first quarter (about 60%) (see Figure E in Appendix). Duration and seasonal effects are consistent with predictions of bounded rationality models:[23] employers and unions may react to salient and large observable shocks (such as NMW increases which are publicly announced by the government).

[Insert Figure 3]

In some industries, an increase in the NMW may make it higher than some wage floors, which might exert some specific pressures on these industries to update their wage scales.[24] The dummy variable capturing the compliance of wage floors with the NMW indeed has a positive effect on the probability that an agreement will come into force. This effect is greater after 2010 than before 2010. If we exclude this dummy variable, the marginal effect of the cumulated NMW increases by 0.5 pp (Table 3), suggesting that we capture here a specific channel for the transmission of the NMW increase to the frequency of wage agreements. When considering different types of industries, we find higher effects of the compliance indicator in industries with a large proportion of low-paid workers and in metalworking industries.

The NMW may affect directly the probability of a wage agreement since it is an important reference for low-paid workers. Thus, increases in the NMW might have a positive impact on the probability of revising the wage scale. However, the empirical effect of the cumulated real NMW increase on the probability of a wage agreement is rather limited (about 2 pp). This effect is heterogeneous across industries: the impact of a real NMW increase is much higher for industries with a high share of minimum-wage workers (3.5 pp) than for industries with a low share of minimum-wage workers (about 1 pp).

Cumulated increases in the inflation rate and in the aggregate base wage have both a greater effect than the real NMW increase on the probability of an industry-level wage agreement. Marginal effects associated with inflation or aggregate base real wages are similar, between 6

[22] Similar results are obtained using the date of the wage agreement signing (see Figure D in Appendix).

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

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

and 7 pp (Table 3). This result is consistent with the fact that workers are more likely to claim for opening a new negotiation if they observe 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).

An industry-specific real wage increase seems to have only a small and barely significant effect on the dates of agreements. This result suggests that industry-specific productivity developments (that would have been 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 effect on the occurrence of a wage agreement (one exception is the group of industries with a low share of NMW workers).

5.2 Size of wage floor changes

Table 4 reports parameter estimates of the second equation of our Tobit model which focuses on the determinants of the size of wage floor adjustments. Separate regressions have been run for different groups of industries, i.e., all industries, 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 4]

First, the Mills ratio has a small but 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 contained in the agreement will be larger, all other observable things being equal.

The most important determinant of the size of wage floor adjustments is the cumulated inflation. The elasticity of wage floor adjustments with respect to cumulated inflation is close to 0.6 (Table 4). This result suggests that wage floors are partly indexed to past inflation. Here, part of this indexation might stem from either a "direct" inflation effect, or from more "indirect" effects resulting either from the NMW indexation to past inflation or from 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. Moreover, we find that this degree of indexation to inflation is much larger in industries with a high proportion of minimum-wage workers (elasticity of 0.59) than in industries with a low proportion of minimum-wage

workers (0.44). In local metalworking and construction industries, the elasticities of wage floor adjustments to inflation are even higher (0.74 and 0.63).

Second, the cumulated real NMW variation has a positive and significant effect on the size of wage floor adjustments; on average, in a given industry, an increase of 1% in the NMW (in real terms) will increase wage floors by 0.24 pp. When we consider 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 0.3) than in industries with a low proportion of minimum-wage workers (elasticity of 0.26), and in metalworking industries where the proportion of minimum-wage workers is close to 0 (elasticity of 0.14). However, in all groups of industries, the effect of the NMW is significant even when the proportion of minimum-wage workers is very low, which suggests the existence of NMW spillover effects.

Contrary to what we observe for the occurrence of wage agreements, the cumulative aggregate real wage variation plays a limited role on the size of wage floor adjustments. Its effect is significant but small (elasticity of 0.18). Industry-specific real wage variations have a similar impact on the size of wage floor changes (elasticity of 0.22) and play a role in determining a new scale of wage floors. Considering the heterogeneity of these effects across industries (Table 4), we observe that the effect of industry-specific wage changes is larger in industries with a low proportion of minimum-wage workers. The elasticity of wage floor changes with respect to sectoral wage changes is 0.32 in industries with a low proportion of minimum-wage workers and 0.58 in metalworking industries, whereas it is small and not significant in industries with a high proportion of minimum-wage workers.[25] In the same way, aggregate cumulated wage change plays a larger role in industries with a high proportion of minimum-wage workers than in other industries. This result might suggest that industries where the NMW is less binding have much more leeway to take into account the industry-specific wage or productivity developments. Lastly, the sectoral output gap measure and the local unemployment rate have no significant or very small effect on the size of wage floor changes. This finding suggests that business cycle conditions play only a limited role on industry-level wage adjustment. However, this result might also come at least partly, from measurement errors in our proxy for business cycle conditions of "*contractual*" industries.

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

[Insert Figure 4]

Finally, we test whether the impact of NMW increases varies along the wage floor distribution and examine the NMW spillover effects along this distribution.[26] Figure 4 reports estimated parameters associated with the variables representing interactions between cumulated real NMW variations and dummy variables capturing the different effects along the wage floor distribution. As expected, these parameter estimates decrease along the wage floor distribution, from 0.46 for wage floors close to the NMW to 0.16 for wage floors above twice the NMW. One interesting result is that the NMW effect is significant all along the wage floor distribution. It decreases quickly from the lowest wage floor to wage floors equal to $1.1 \times NMW$. However, we find that NMW real variations have a positive effect on wage floor adjustments for all levels of wage floors.

We then test whether other macro variables have such 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 with respect to both real NMW variations and inflation along the wage floor distribution. In particular, 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 0.5 for wages above $2 \times NMW$). This elasticity is positive and significant for all levels of wage floors. This decreasing slope is very similar to the one obtained for the NMW.

[Insert Figure 5]

Some separate regressions run on different groups of industries show some heterogeneity across industries (Figure G in the Appendix). All along the wage distribution, the NMW effect is a little larger in industries with a high share of minimum-wage workers than in industries with a low proportion of minimum-wage workers and in metalworking industries. Moreover, the NMW effect is positive and significant all along the wage floor distribution, not only in industries with a high proportion of minimum-wage workers but also in industries with a low proportion of minimum-wage workers. Regarding the elasticity of wage floor changes with respect to inflation, differences are much larger. This elasticity is close to 1 for low wages in industries with a high proportion of minimum-wage workers and the slope is slightly decreasing towards 0.7 for higher wage floors. A similar pattern appears for

[26] Wage growth is substantially different across wage floors: 30% of the total variance is explained by differences across occupations within the same industry (see Table C in the Appendix).

metalworking industries with still a high elasticity (close to 0.7) for wage floors above $1.1 \times NMW$. In industries with a lower proportion of minimum-wage workers, the elasticity of wage floors with respect to inflation is close to 0.7 for wage floors close to the NMW and decreases towards 0.3 for the highest wage floors.

We run two other regressions as robustness checks. First, we test whether our results are driven by heterogeneity across industries according to the composition of their wage floor categories (as defined in section 4). For this purpose, we run a regression restricting our sample to industries whose wage classification contains at least 8 of the 10 wage categories (more than 60% of industries in our sample). Results are quite similar to those obtained using all industries, which suggests that heterogeneity is not due to the wage category composition (see Figure H in the Appendix).

Second, we test whether determinants of wage floor variations differ before and after 2010. For this purpose, we introduce interaction terms between macro variables of our Tobit model and dummy variables "before 2010" and "after 2010" (see Table D in the Appendix). Elasticities with respect to inflation, average aggregate wage and NMW increases are slightly changed whereas the effect of sectoral wage variations is more significantly changed. Before 2010, the industry-specific wage effect is statistically significant and close to 0.5 whereas after 2010, the impact of sectoral wage variations becomes non-significant for all specifications and for all industries (except construction). The aggregate wage effect remains significant but small, especially for industries with a high share of minimum-wage workers. This result might suggest that after 2010 (which also corresponds to a recession and a low inflation period), industry-level wage agreements might be more constrained by indexation and by NMW real increases. In other words, they might be less likely to adjust industry-specific wage floors to industry-specific conditions.

6. Conclusion

Using a detailed data set of thousands of industry-level wage agreements in France over the period 2007-2015, our study provides new evidence on the determinants of industry-level wage floor adjustments.

We find that the time schedule of wage agreements is highly seasonal and depends strongly on the duration since the last wage agreement. Inflation and sectoral wage increases have also a significant impact on the probability of a wage agreement: a reduction of workers'

purchasing power or a drop in industry wages relative to aggregate wages leads to more frequent wage agreements. Inflation and past sectoral real wage increases have a larger impact on the size of wage floor increases: elasticities of wage floors to these macro variables are 0.6 and 0.4, respectively. We also find that the effect of inflation is heterogeneous along the wage floor distribution: the elasticity of wage floors with respect to inflation is close to 0.8 for the lowest wage floors and then decreases steadily to reach 0.4 for the highest wage floors.

The NMW is another important factor shaping wage-floor setting in industry-level agreements. It affects the timing of wage agreements through different channels. First, the seasonal timing of wage agreement can be partly linked to the seasonal adjustment of the NMW. Second, the signing of a wage agreement is more likely when the scale of wage floors does not comply with the NMW in a given industry. Finally, minimum wage increases have a small but positive impact on the probability of signing a wage agreement. Moreover, the NMW also affects the size of wage floor adjustments: when the real NMW increases by 1%, wage floors increase on average by 0.25%. The elasticity of wage floors with respect to real NMW variations also decreases along the wage floor distribution but only slowly, from 0.45 for the lowest wage floors to 0.15 for the highest wage floors.

Finally, we provide evidence that wage floors present strong downward nominal wage rigidity since there are no nominal decreases of wage floors. Besides, we also find a large correlation between wage floor adjustments and past inflation or past NMW increases, whereas business cycle conditions and local unemployment rates have no impact on wage floor adjustments. These results suggest that bargaining institutions can explain - at least partly - the small response of aggregate real wages to the rise of unemployment in France during the Great Recession. Further research linking dynamics of wage floors and firm-level wages should help to understand to which extent wage bargaining institutions (including their interactions with the NMW) might have shaped wage dynamics during the recent crisis.

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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	32,810	5,343	11,712	27,239
Number of wage levels	20.8	11	18	28
Average wage floor (in euro)	2,009	1,496	1,632	2,202
Average wage differential (%)	5.66	3.35	5.40	7.36
Average wage differential (%) (at the bottom of the wage scale)	2.08	0.35	0.95	2.90
Average wage differential (%) (at the top of the wage scale)	9.46	5.48	8.58	11.33
Maximum/minimum wage ratio within an industry	2.55	1.89	2.34	3.16
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 the Probit model for wage agreement (date of enforcement)

Dependent variable - *Dummy variable for wage agreement enforcement*	All industries		National coverage		Metal working	Construction and public works
	(1)	(2)	High prop. of min. wage workers	Low prop. of min. wage workers		
Cum. inflation	6.386*** (0.618)	7.534*** (0.608)	6.299*** (1.194)	4.996*** (0.899)	6.525*** (1.245)	8.122*** (1.178)
Cum. real NMW change	2.247*** (0.528)	2.718*** (0.551)	3.525** (1.502)	1.180 (0.740)	2.756*** (0.977)	2.546*** (0.849)
Cum. real aggregate wage change	7.152*** (1.078)	8.404*** (1.057)	5.295** (2.056)	7.236*** (1.481)	6.678*** (2.249)	7.678*** (1.938)
Cum. real wage change in the industry	3.218* (1.730)	3.406* (1.743)	-1.291 (2.536)	1.675 (2.660)	4.549 (6.009)	-1.522 (5.935)
Unemployment rate	0.006 (0.017)	0.010 (0.017)	0.014 (0.121)	-0.062* (0.033)	0.033 (0.26)	-0.008 (0.025)
Output gap	0.187 (0.262)	0.252 (0.272)	-0.323 (0.707)	1.111*** (0.331)	-1.128 (1.152)	1.105** (0.549)
Duration						
6 months	0.047*** (0.016)	0.044*** (0.016)	0.047* (0.025)	0.049* (0.027)	-0.043** (0.021)	0.148** (0.057)
1 year	0.329*** (0.016)	0.339*** (0.013)	0.257*** (0.025)	0.341*** (0.023)	0.314*** (0.022)	0.320*** (0.046)
2 years	0.171*** (0.024)	0.183*** (0.024)	0.165*** (0.046)	0.173*** (0.038)	0.132** (0.060)	0.150*** (0.043)
Before 2010						
Non-compliance with the NMW	0.013* (0.007)		0.023 (0.018)	0.016 (0.015)	0.074 (0.047)	0.016 (0.016)
After 2010						
Non-compliance with the NMW	0.058*** (0.007)		0.060*** (0.012)	0.027** (0.011)	0.111*** (0.016)	0.032** (0.017)
N	12,142	12,142	3,737	4,076	2,733	2,655

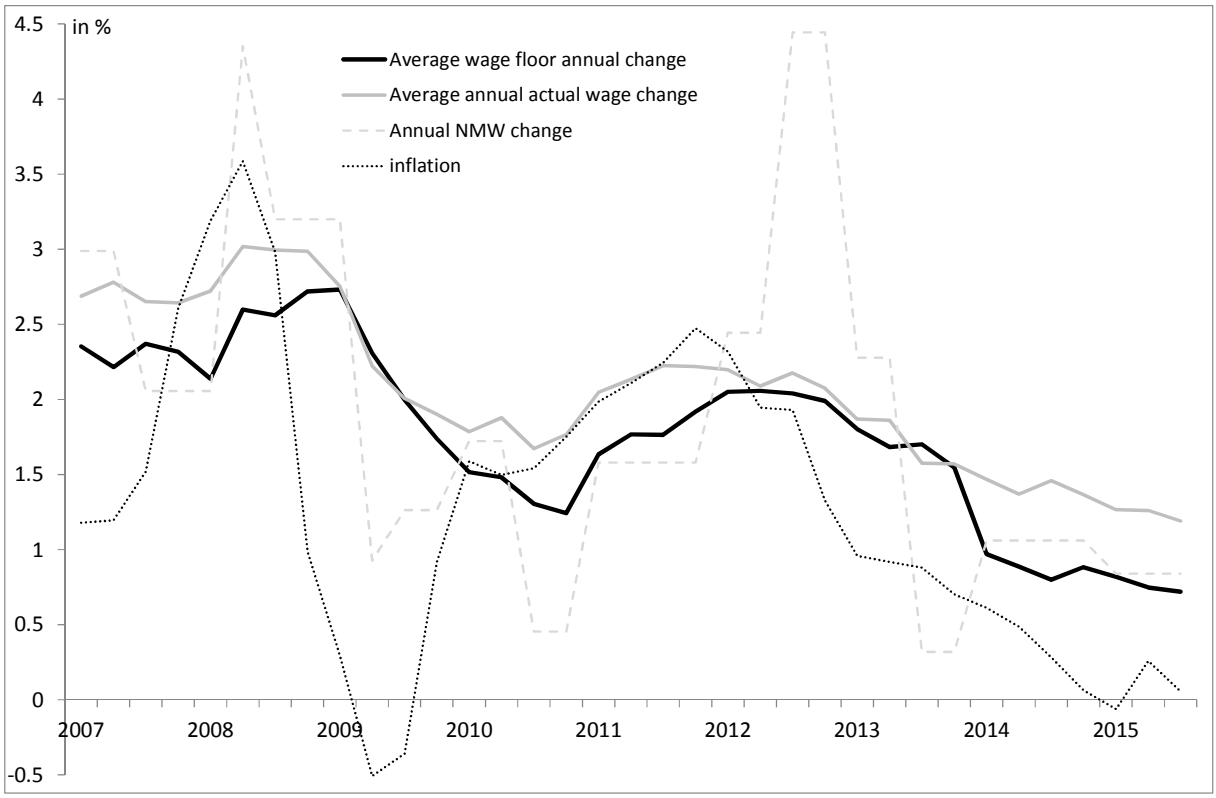
Note: This table reports marginal effects estimated with Probit models. Date and industry dummies are included (estimates corresponding to date dummies of specification (1) are presented in Figure 3). Standard errors are obtained using bootstrap methods and are reported in brackets. The dependent variable 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 4: Parameter estimates of the Tobit model – Wage floor changes

	All industries	National coverage		Metal working	Construction and public works
Dependent variable : Nominal wage floor changes		High prop. of min. wage workers	Low prop. of min. wage workers		
Cumulated inflation	0.590*** (0.029)	0.588*** (0.049)	0.443*** (0.061)	0.742*** (0.056)	0.635*** (0.073)
Cumulated real NMW change	0.241*** (0.023)	0.310*** (0.053)	0.262*** (0.053)	0.139*** (0.039)	0.295*** (0.053)
Cumulated real aggregate wage change	0.179*** (0.043)	0.213*** (0.065)	0.161 (0.109)	0.120 (0.093)	0.192** (0.078)
Cumulated real wage change in the industry	0.222*** (0.084)	-0.098 (0.120)	0.315** (0.142)	0.576** (0.233)	1.208*** (0.377)
Unemployment rate	0.000 (0.001)	0.006** (0.003)	0.004 (0.004)	0.001 (0.001)	-0.001 (0.001)
Output gap	0.026** (0.011)	-0.004 (0.022)	0.004 (0.031)	-0.014 (0.052)	-0.023 (0.024)
Mills Ratio	-0.001*** (0.000)	-0.002*** (0.001)	-0.003*** (0.001)	0.000 (0.001)	-0.002** (0.001)
R^2	0.578	0.538	0.525	0.675	0.818
N	19,711	6,516	5,009	5,262	2,924
Time dummies	Date	Date	Date	Date	Date
Industry dummies	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. 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: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

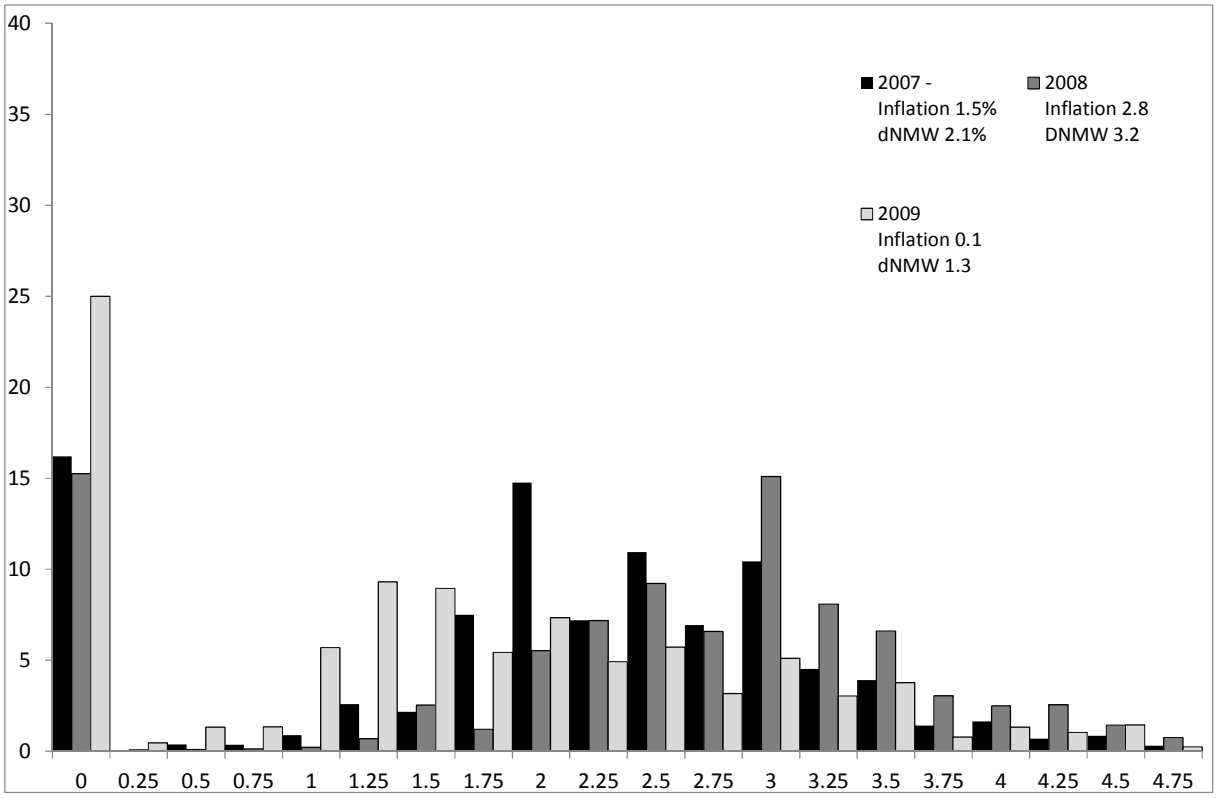
Figure 1: Average size of wage changes in industry-level wage agreements (2007-2015)



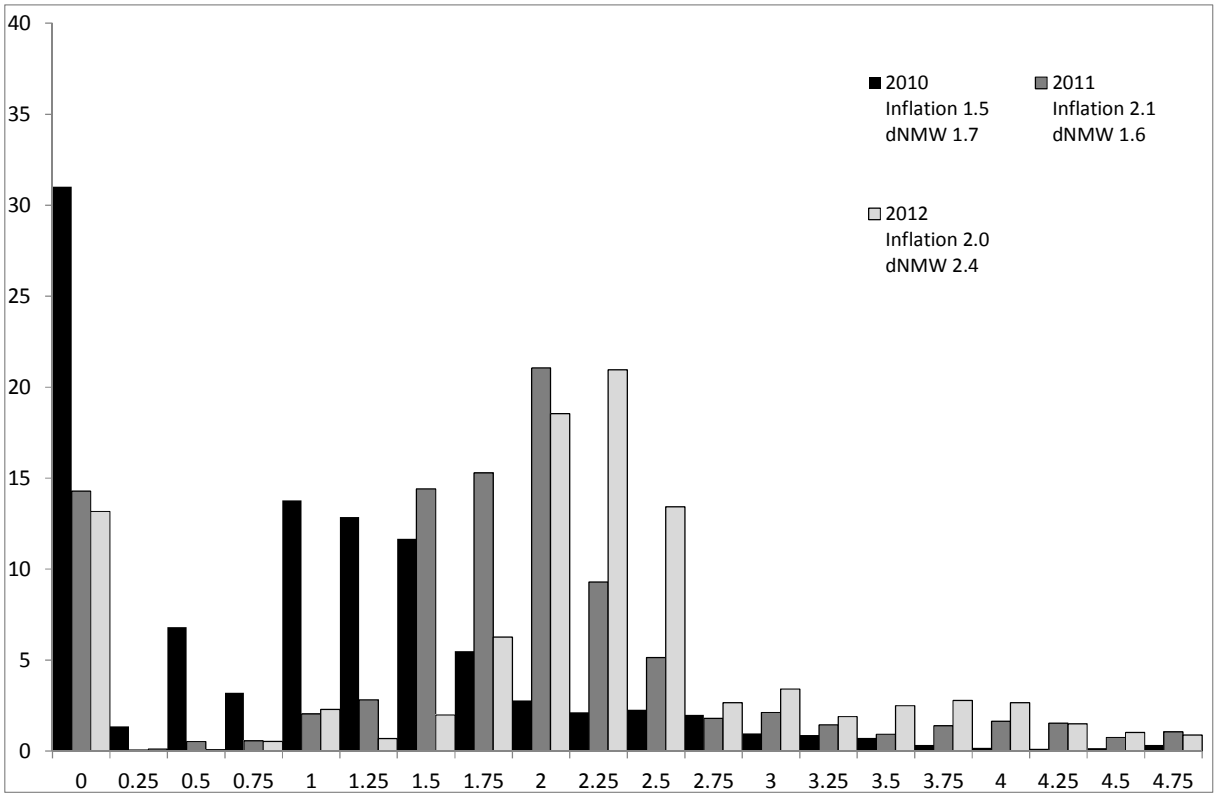
Notes: The average wage increase in industry agreement is computed as a weighted (using the number of employees by job category in each industry) average of all wage increases stipulated in industry agreement at a given date (year/quarter). The overall wage increase is the annual increase in the aggregate 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: Distribution of wage floors variations between two wage agreement enforcements

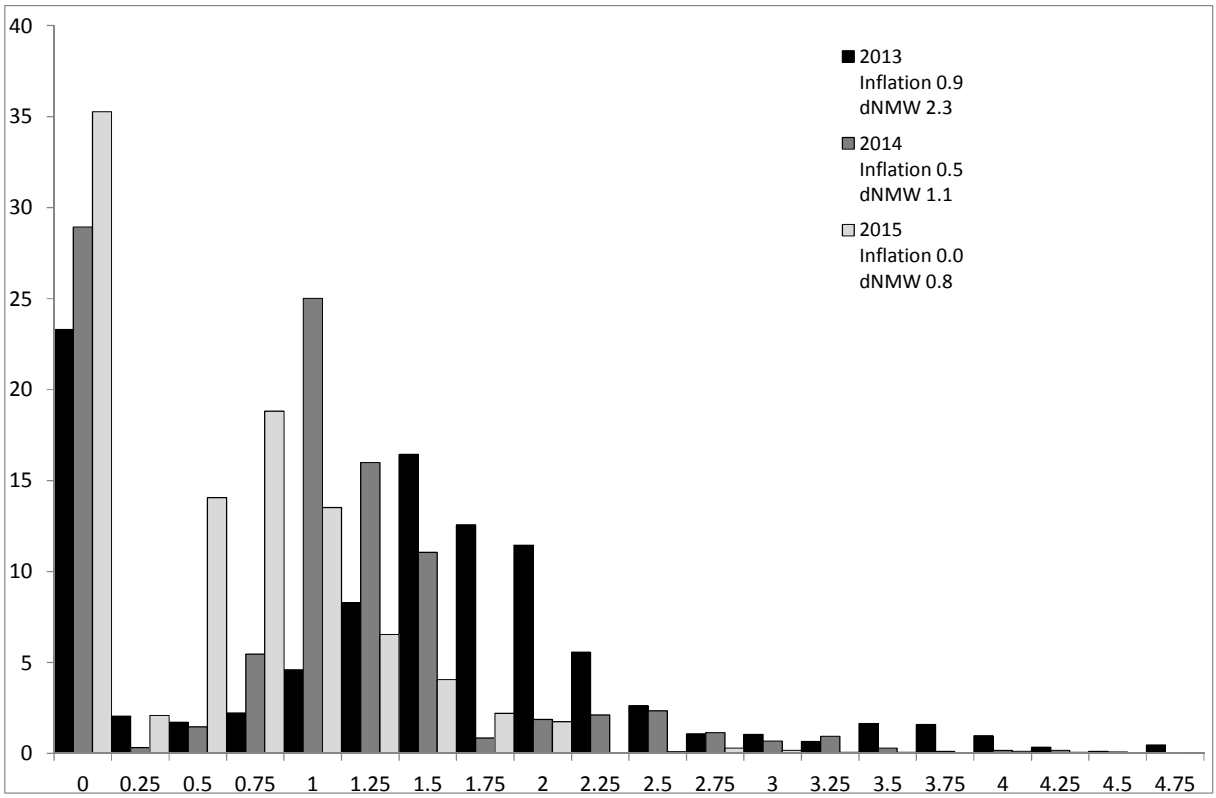
2007-2009



2010-2012

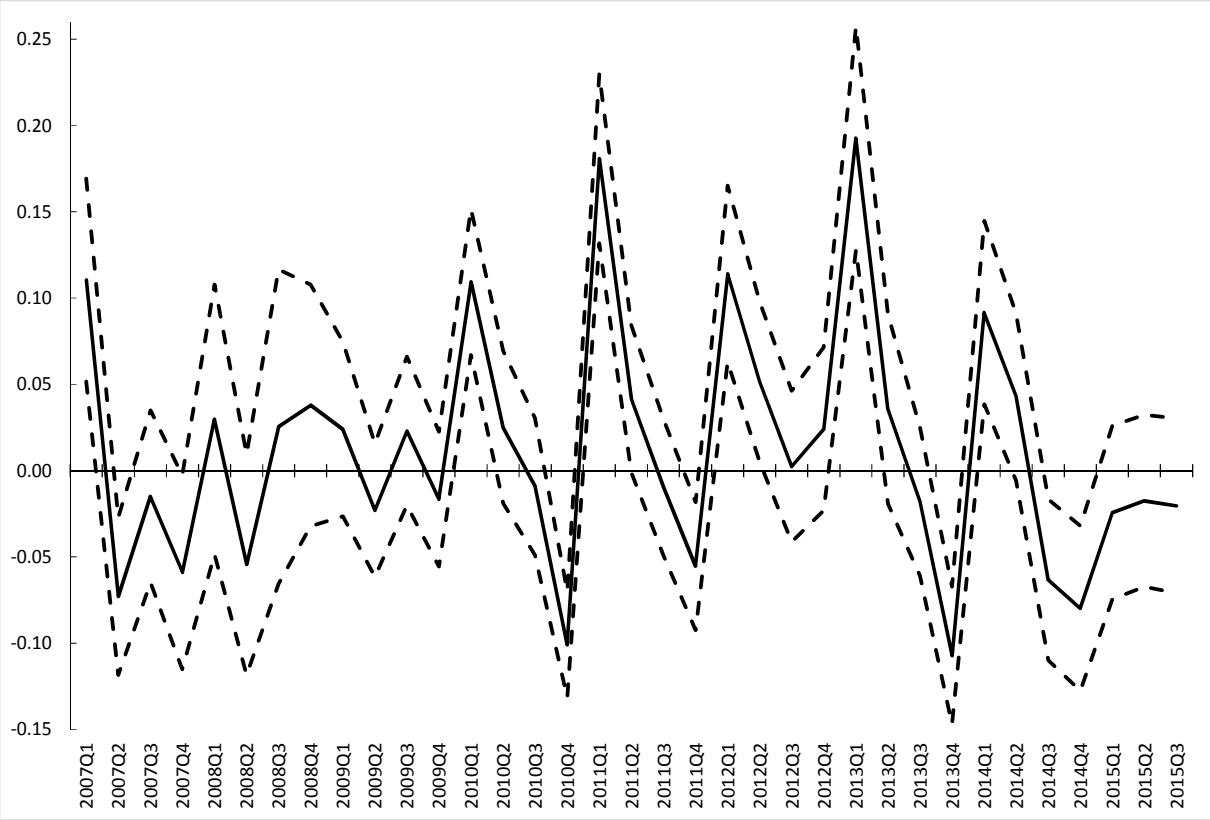


2013-2015



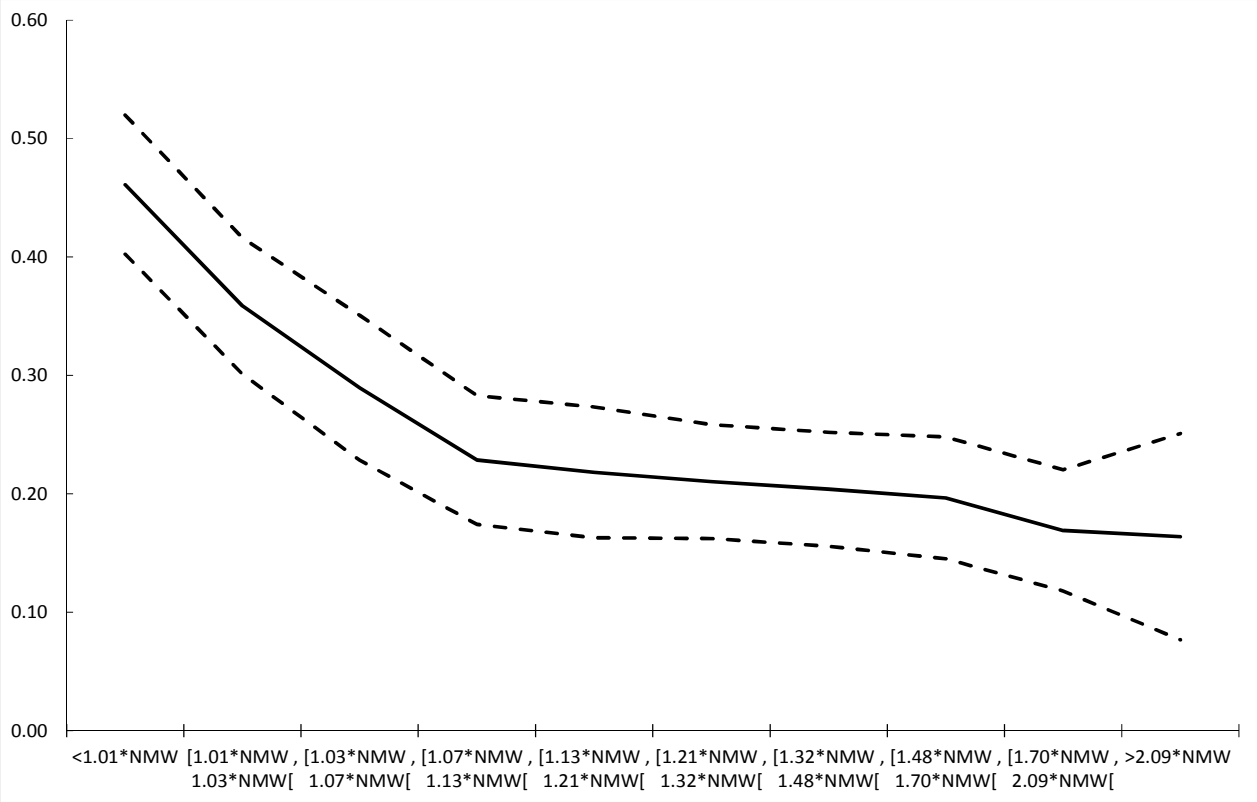
Notes: this figure plots the distribution of wage changes between two dates of industry-level agreement enforcements for all industries in our sample. Annual wage variations are calculated during the last quarter of a given year. Distributions are weighted by the number of employees by job category by industry.

Figure 3: Estimates of time effects in Probit regression



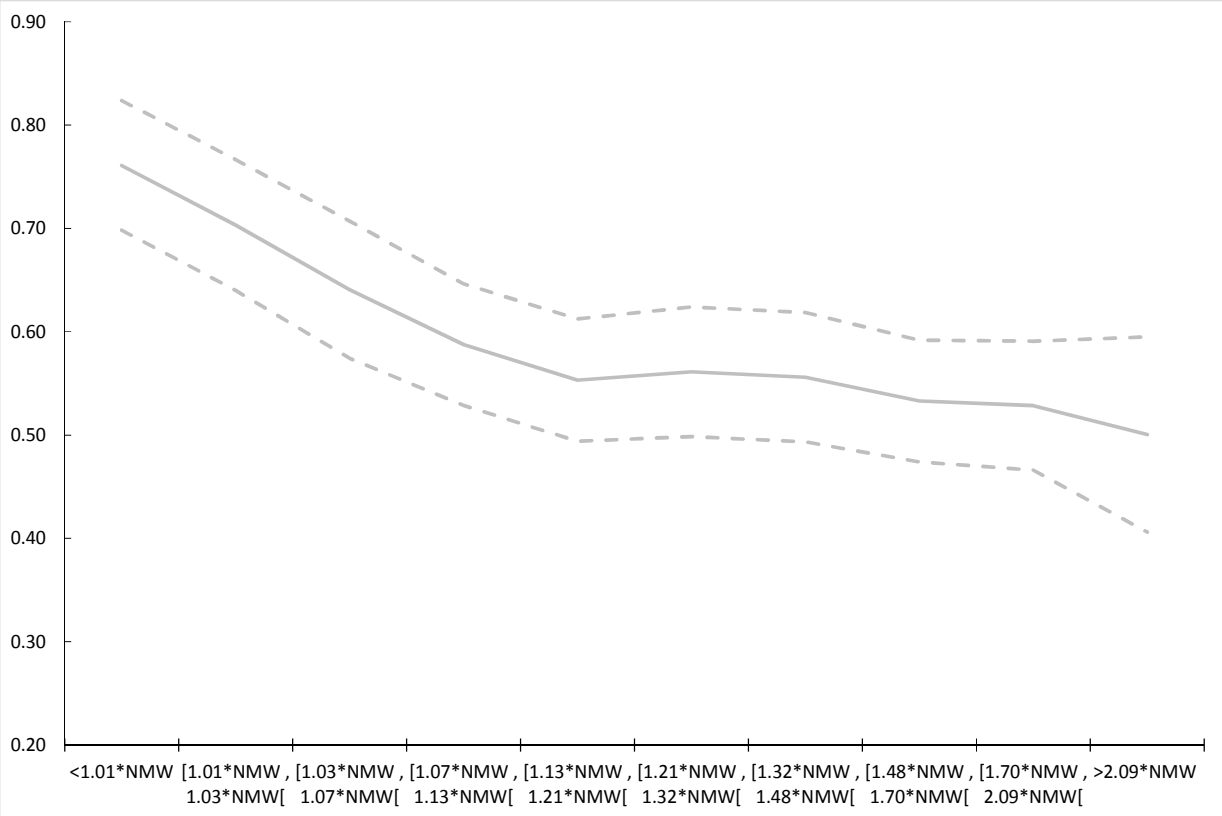
Notes: These figures report parameter estimates (black solid line) and 95%-confidence interval (black dashed lines) associated with date dummies used as time controls in the Probit regressions (equation 2) (results are presented in Table 3 (specification (1)). Q42015 is chosen as the reference quarter.

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 Tobit 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 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 Tobit 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 (not intended to be published)

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 every 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 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 category of the job classification, 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 every "contractual" industry. The Ministry of Labor publishes some summary statistics for each of the biggest 250 industries,[27] 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 are able to 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 our wage floor data set, we calculate the average ratio of wage floors on NMW within each job category. We multiply this ratio by 1.4 to take into account for 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 category of the job classification so that the sum of employees over 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, distribution of wage floor changes, …

[27] 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 NMW 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 (resp. 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 industry level series of actual wages for each contractual industry W_{jt},, 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.

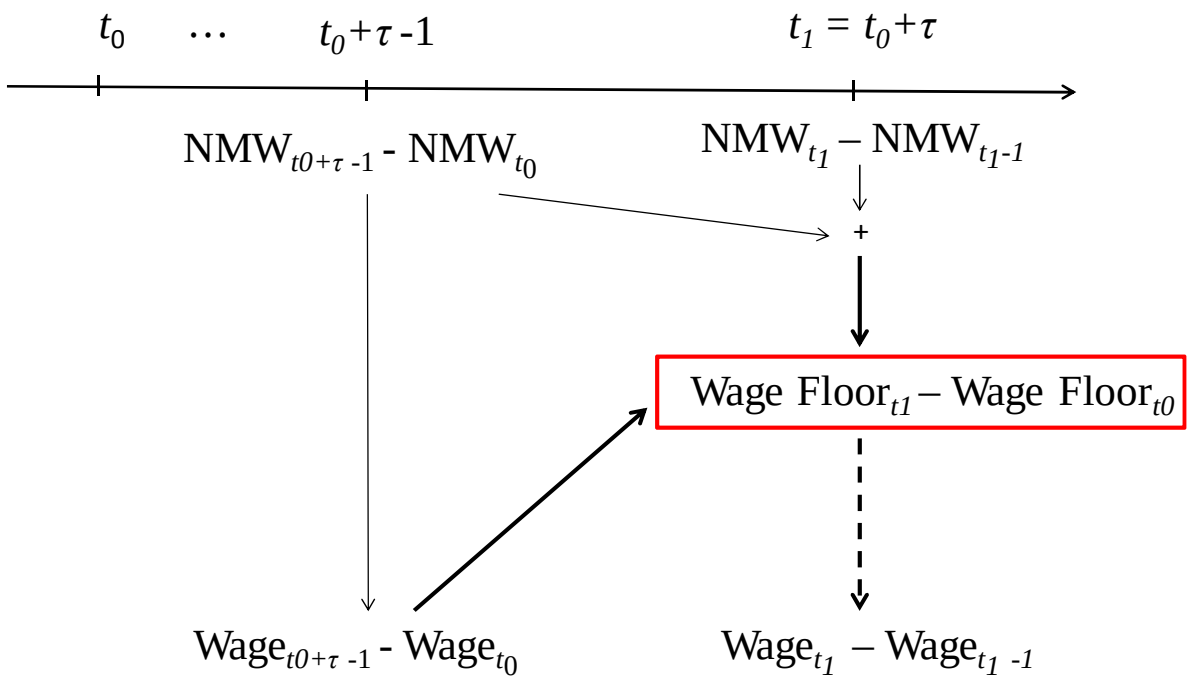
- Industry-level unemployment

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 are able to 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 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.

Figure A: Timing of wage floor adjustments



2

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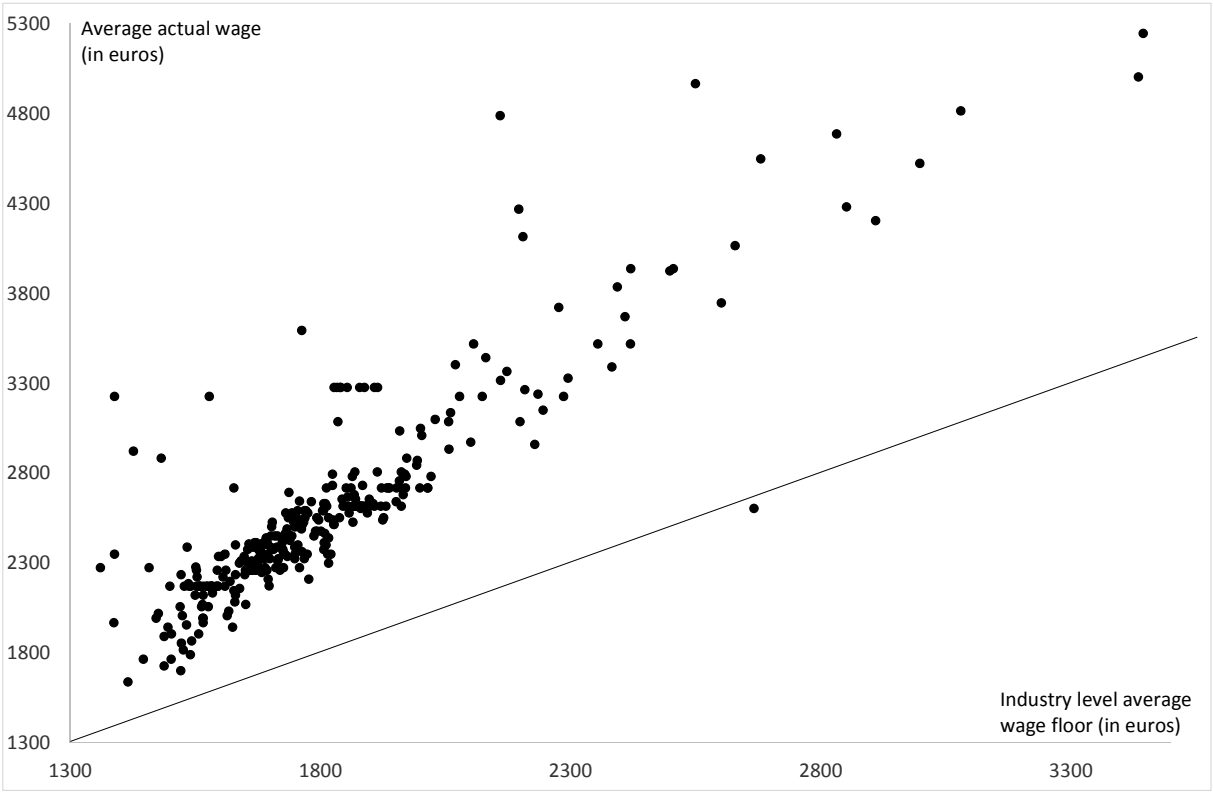
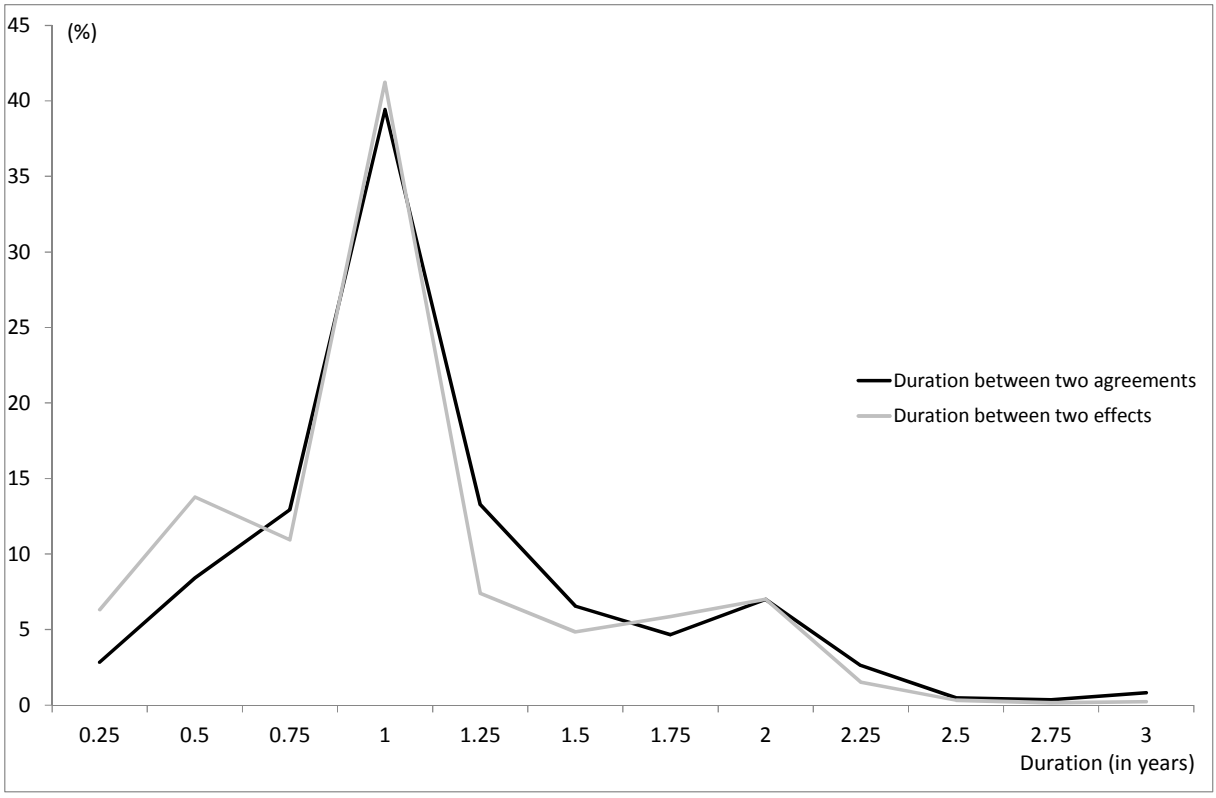
Figure B: Average wage floors versus average actual wages (2011)



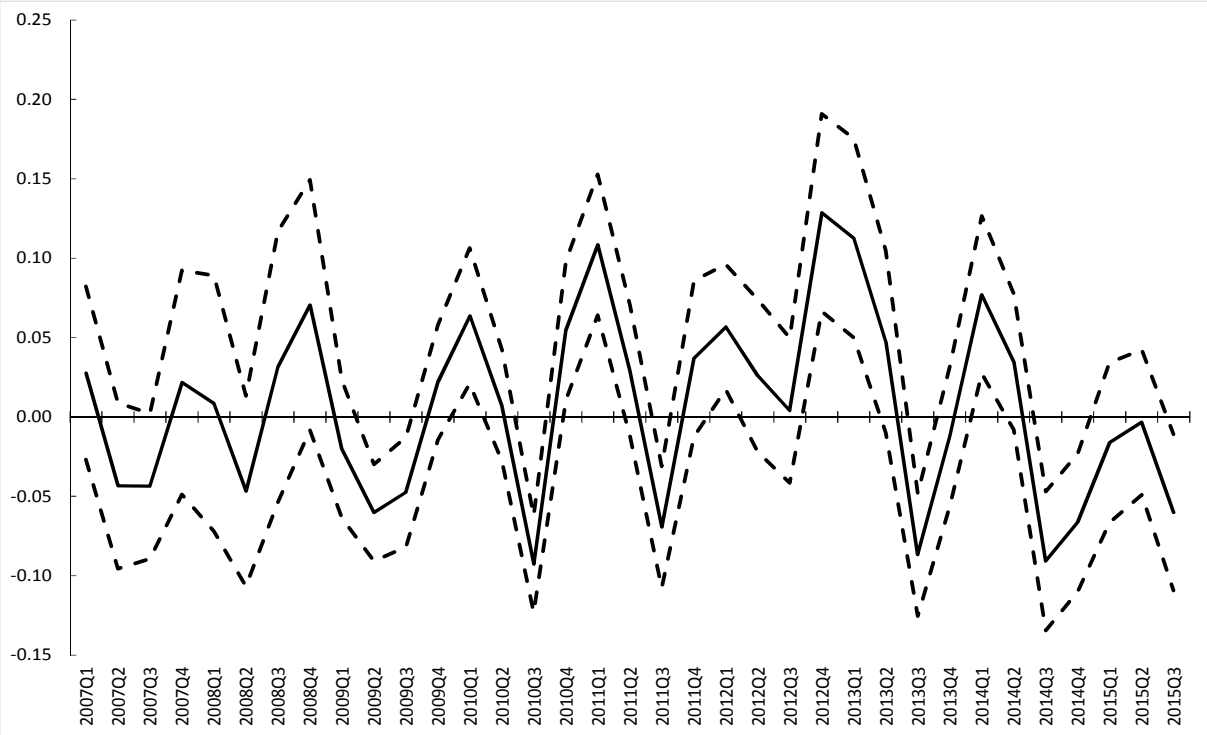
Notes: Actual average gross wages are collected and published by the Ministry of Labor for the year 2011 (in euro). Using our data, we calculate the weighted average wage floor for each industry in year 2011. Each point represents a given industry whereas the dark line is the line $y = x$.

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



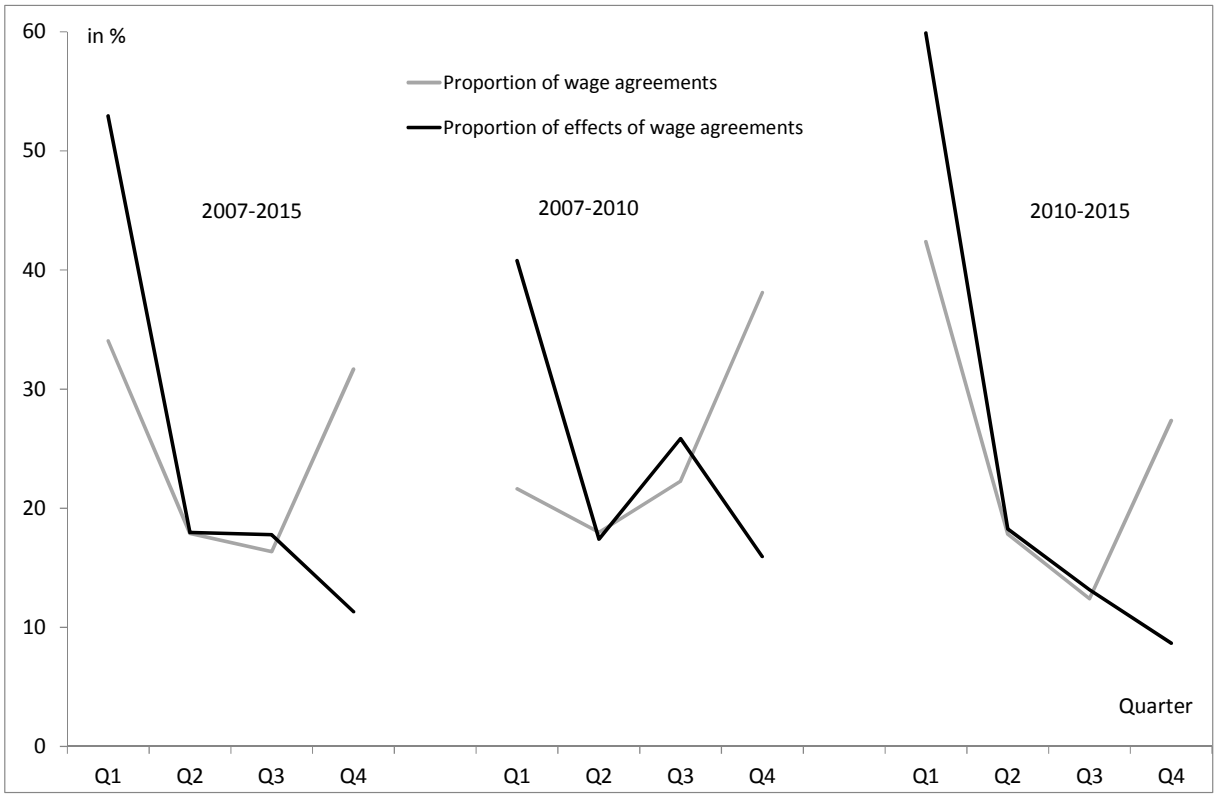
Notes: durations are computed as the difference between two successive signing dates of wage agreements (or two dates of agreement enforcement). All industries are considered over the period 2007-2015.

Figure D: Estimates of time effects in Probit regression using date controls: dates of wage agreement signing



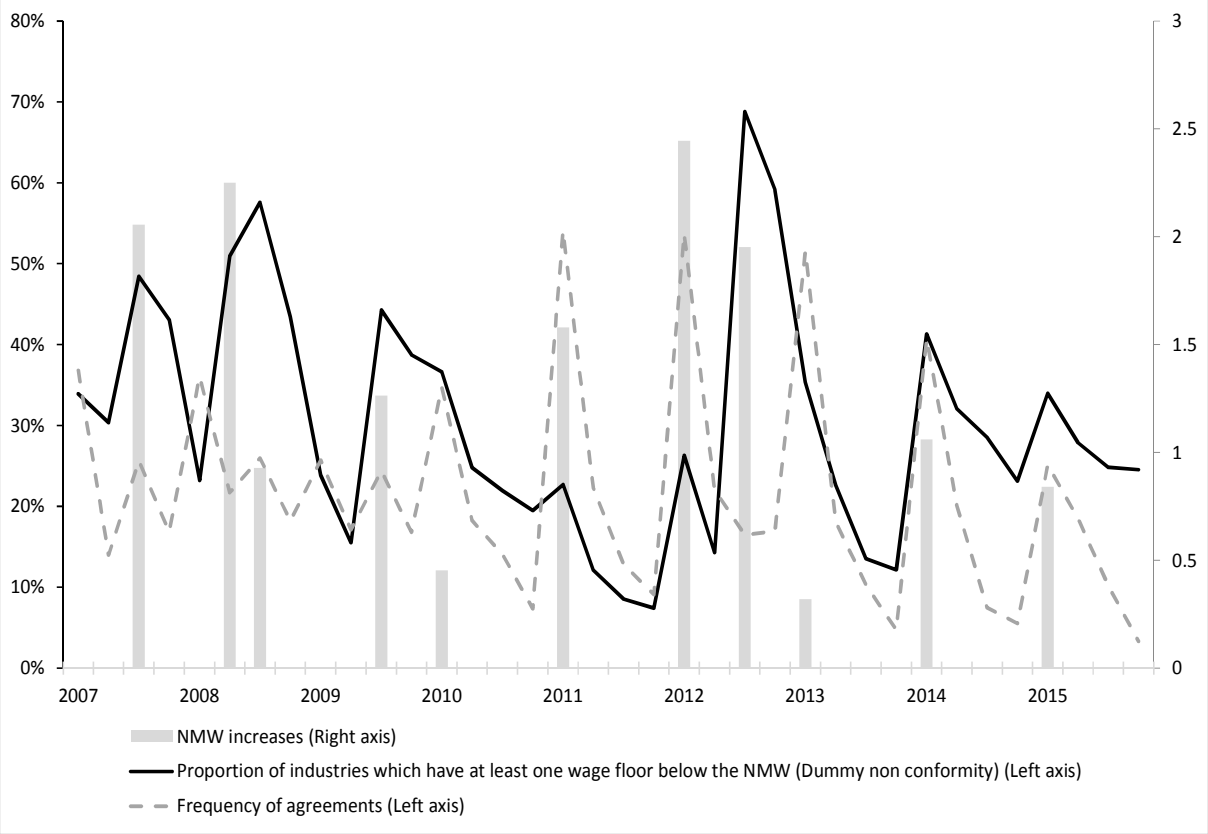
Notes: These figures report parameter estimates (black solid line) and 95%-confidence interval (black dashed lines) associated with date dummies used as time controls in the Probit regressions (equation 2). Q42015 is chosen as the reference quarter.

Figure E: Proportion of industry-level wage agreements (in percent) by quarter



Notes: The light grey line is the weighted proportion of agreements that are signed in a given quarter and the black line is the same proportion but for agreement enforcement. We compute those statistics for three periods: 2007-2015, 2007-2010 where the NMW was usually adjusted in Q3 and 2010-2015 where the NMW was usually adjusted in Q1.

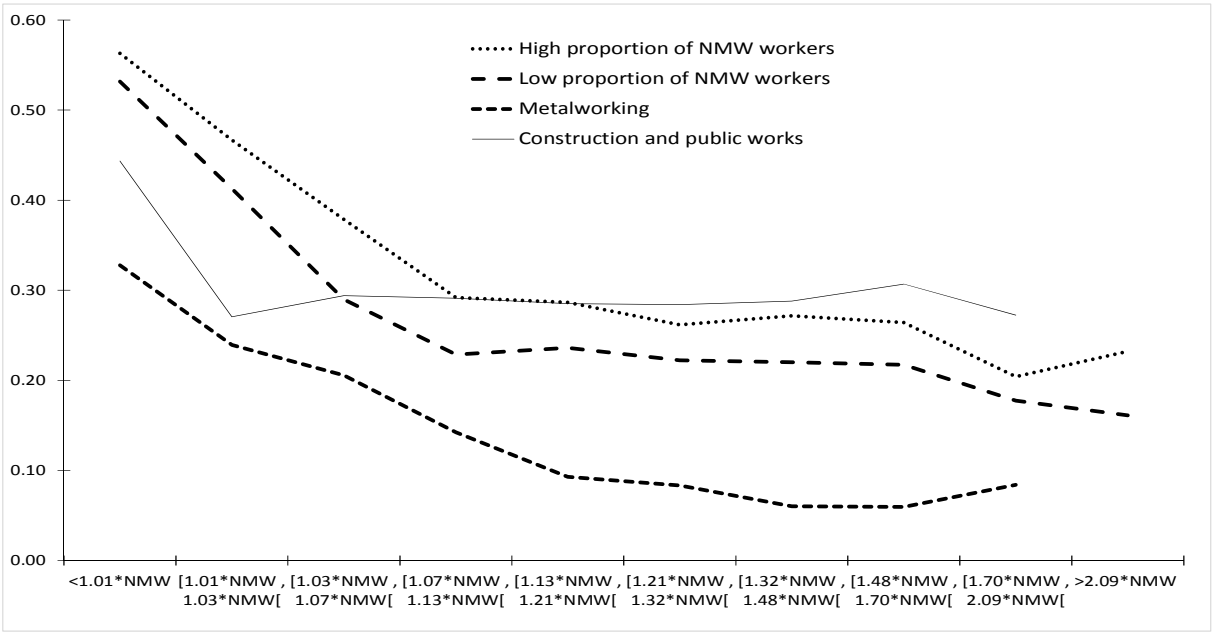
Figure F: Proportion of industries with at least a wage floor below the NMW over time



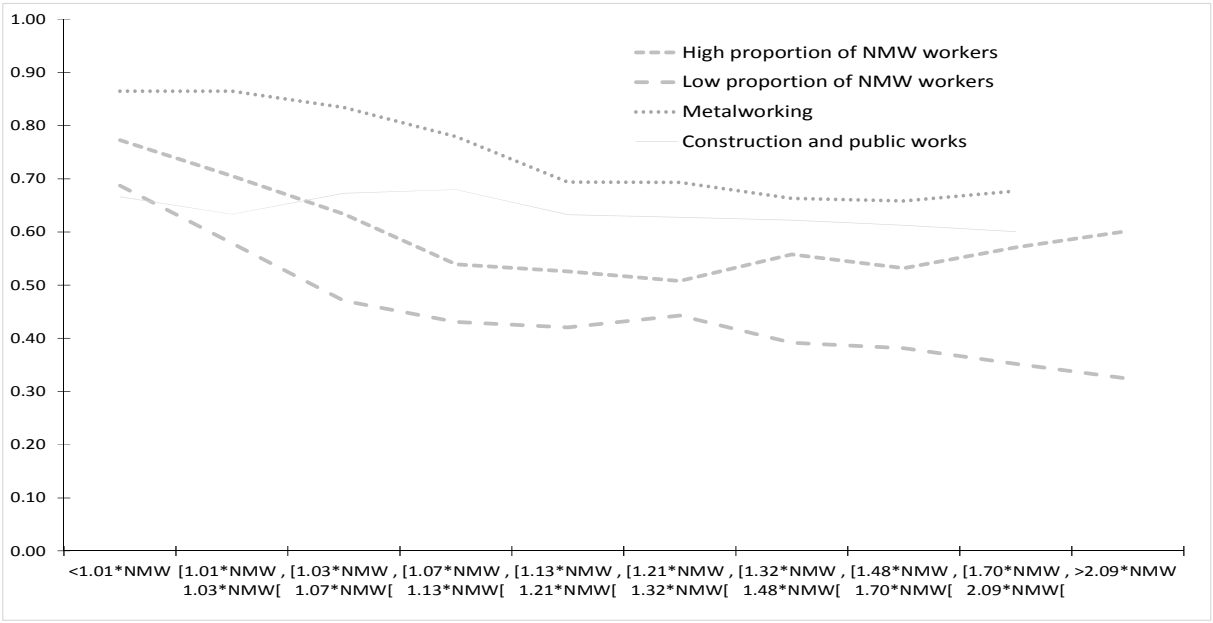
Notes: the grey histogram (right axis) corresponds to NMW increases (in percentage). The dark solid line is the proportion of industries with at least one wage floor below the NMW (in percentage) calculated as the ratio of the total number of employees in non-conform industries over the total number 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 G: 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



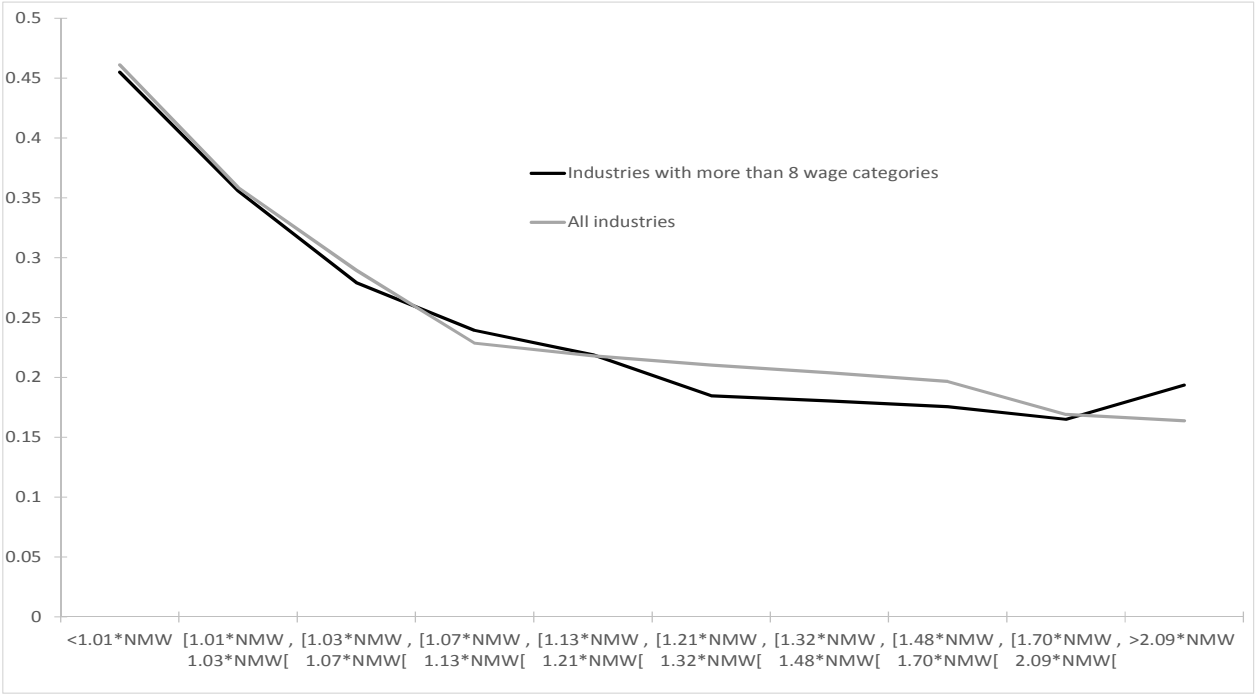
b) Inflation



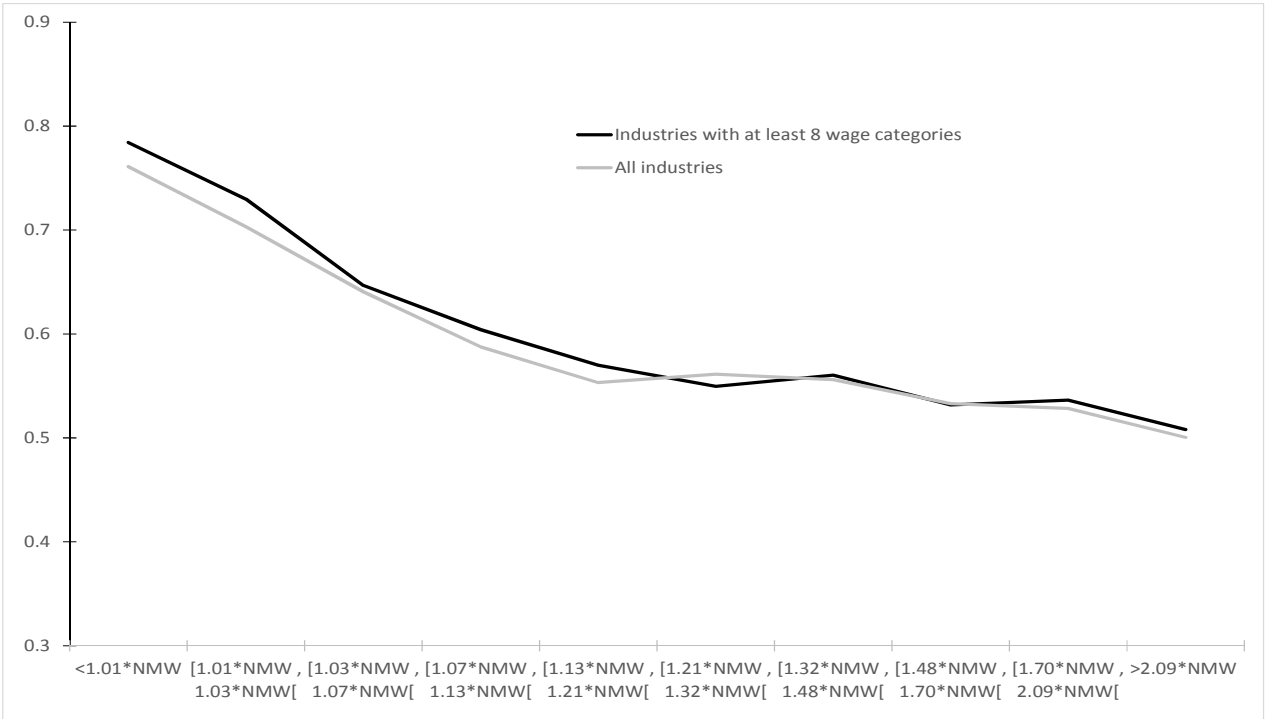
Notes: This figure reports parameter estimates obtained by adding to our baseline Tobit model interaction terms capturing the relative position of a wage floor along the wage distribution (with respect to the NMW level). The black lines report elasticities of the nominal wage floors with respect to NMW 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.

Figure H: Elasticity of wage floor variations with respect to the real NMW increases and to inflation along the wage floor distribution (industries with at least 8 wage categories versus all industries)

a) Real NMW



b) Inflation



Notes: This figure reports parameter estimates obtained by adding to our baseline Tobit 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 black line reports 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.

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

Dependent variable - *Dummy variable for a wage agreement signing*	(1)	(2)
Cumulated inflation	7.020***	7.653***
	(0.536)	(0.517)
Cumulated real NMW	2.755***	2.950***
	(0.573)	(0.568)
Cumulated real aggregate wage change	7.687***	8.416***
	(0.949)	(0.920)
Cumulated real wage change in the industry	1.992	2.226*
	(1.362)	(1.326)
Local unemployment rate	-0.002	0.002
	(0.017)	(0.019)
Output gap	-0.547**	-0.484*
	(0.245)	(0.245)
Duration		
6 months	-0.019*	-0.026**
	(0.011)	(0.011)
1 year	0.312***	0.313***
	(0.012)	(0.012)
2 years	0.168***	0.175***
	(0.022)	(0.022)
Before 2010		
Non-compliance with the NMW	0.003	
	(0.006)	
After 2010		
Non-compliance with the NMW	0.045***	
	(0.006)	
N	12,136	12,136
Dates dummies	Yes	Yes
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: Parameter estimates of the Tobit model – Wage floor changes – 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	0.618*** (0.040)	0.570*** (0.043)	0.527*** (0.039)	0.653*** (0.051)
Cumulated real NMW change	0.261*** (0.035)	0.237*** (0.031)	0.227*** (0.039)	0.247*** (0.030)
Cumulated real aggregate wage change	0.161** (0.072)	0.167*** (0.057)	0.242*** (0.060)	0.099* (0.058)
Cumulated real wage change in the industry	0.059 (0.148)	0.295*** (0.089)	0.243* (0.127)	0.171 (0.138)
Local unemployment rate	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)
Output gap	0.028 (0.021)	0.017 (0.016)	0.030* (0.017)	0.017 (0.017)
Mills Ratio	-0.001** (0.000)	-0.002*** (0.000)	-0.002*** (0.001)	-0.001** (0.000)
R^2	0.653	0.533	0.533	0.642
N	7,959	11,752	9,608	10,103
Time dummies	Date	Date	Date	Date
Industry dummies	Yes	Yes	Yes	Yes

Note: The dependent variable is the nominal (or real) wage floor change between two effects of wage agreements in a given industry. 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 C: 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	0.70
2008	0.70
2009	0.69
2010	0.72
2011	0.84
2012	0.70
2013	0.76
2014	0.74
2015	0.72

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.

Table D: Parameter estimates of the Tobit model – Wage floor changes – Before / after 2010

Dependent variable: Nominal wage floor changes					
	All	High prop. of min. wage workers	Low prop. of min. wage workers	Metalworking	Construction and public works
Before 2010					
Cumulated inflation	0.600*** (0.056)	0.601*** (0.068)	0.405*** (0.091)	0.725*** (0.082)	0.570*** (0.153)
Cumulated real NMW change	0.235*** (0.048)	0.359*** (0.076)	0.244*** (0.060)	0.160*** (0.062)	0.272*** (0.071)
Cum. real aggregate wage change	0.187** (0.087)	0.157* (0.091)	0.279* (0.164)	0.274 (0.186)	0.132 (0.107)
Cum. real wage change in the industry	0.462*** (0.145)	-0.115 (0.177)	0.640*** (0.191)	1.692*** (0.607)	1.454*** (0.496)
After 2010					
Cumulated inflation	0.575*** (0.053)	0.556*** (0.062)	0.514*** (0.089)	0.728*** (0.083)	0.631*** (0.069)
Cumulated real NMW change	0.258*** (0.044)	0.232*** (0.060)	0.294*** (0.077)	0.219*** (0.062)	0.361*** (0.065)
Cum. real aggregate wage change	0.182** (0.081)	0.249*** (0.090)	0.040 (0.154)	0.090 (0.115)	0.174* (0.105)
Cum. real wage change in the industry	0.034 (0.105)	-0.081 (0.151)	-0.004 (0.158)	0.100 (0.315)	1.120** (0.460)
Unemployment rate	0.000 (0.002)	0.006** (0.003)	0.005 (0.004)	0.001 (0.001)	-0.001 (0.001)
Output gap	0.021 (0.016)	-0.008 (0.022)	-0.001 (0.032)	-0.013 (0.048)	-0.027 (0.025)
Mills Ratio	-0.001*** (0.001)	-0.002*** (0.001)	-0.003*** (0.001)	0.000 (0.001)	-0.002*** (0.001)
R^2	0.580	0.540	0.536	0.681	0.820
N	19,711	6,516	5,009	5,262	2,924
Time dummies	Date	Date	Date	Date	Date
Industry dummies	Y	Yes	Yes	Yes	Yes

Note: The dependent variable is the nominal (or real) wage floor change between two effects of wage agreements in a given industry. 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: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.