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On-line Appendix for the paper: 'Sticky Wages. Evidence from Quarterly Microeconomic Data'

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Appendix A. Weights used to compute aggregate indicators

The raw observations are sequences of wages $w_{i,s,k,t}$, where:

i is an index for establishments, $i = 1, ..., I_s$

s is an index for sectors, $s = 1, ..., S$

k is an index for representative occupation, $k = 1, ..., 12$

t is a time index, $t = 1, ..., T$

Weights are derived from a stratified sampling scheme, following the approach used by the Ministère du Travail to produce an aggregate wage index. Within each sector, establishments are weighted according to the number of employees. The sectors are in turn weighted according to their respective weights in terms of employees in the economy. Weights are defined as follows:

$$\omega_{i,s,k} = \lambda_{i,s,k}\theta_{s,k}$$

with

$\lambda_{i,s,k} = \frac{n_{i,s,k}}{n_{s,k}}$, the share of employees of the category k in an establishment i, in the sector s. $n_{s,k}$ denotes the total number of employees of the category k in the sector s in the sample of the ACEMO survey (averaged over the sample period).

And:

$\theta_{s,k} = \frac{N_{s,k}}{N_k}$, the share of employees of the category k, in the sector s at the aggregate level. N_k denotes the total number of employees of the category k at the national level. This auxiliary information comes from the national register of establishments 'Sirene'.

These weights are then used to produce statistics for the frequency of wage changes. First we define a frequency of wage changes at the level of a representative occupation

$F_{i,s,k} = \frac{1}{T} \sum_{t=1}^{T} I_{i,s,k,t}$

where $I_{i,s,k,t}$ an indicator for a wage change of a job category k in a establishment i at date t.

We can compute the average unweighted frequency of wage changes

$\overline{F} = \frac{1}{I_s} \frac{1}{S} \frac{1}{12} \sum_{i=1}^{I_s} \sum_{s=1}^{S} \sum_{k=1}^{12} F_{i,s,k}$

Now, using weights we compute the weighted average frequency of wage changes

$\overline{F}^W = \sum_{i=1}^{I_s} \sum_{s=1}^{S} \sum_{k=1}^{12} \omega_{i,s,k} F_{i,s,k}$

Similar formulas were used to produce aggregate indicators on the size of wage changes

Appendix B. Alternative indicators of synchronization

This appendix complements section 5.3 of the paper. It investigates a less restrictive definition of wage change synchronization to compute an indicator of synchronization within establishments. Consider an establishment for which the number of representative occupations reported is N^{cat}. We consider as a benchmark the null hypothesis of wage changes being independent across representative occupations, and each occurring with a probability p. For a given quarter, the number of wage changes n in that establishment then follows a binomial distribution with parameters (p, N^{cat}). We then consider that the hypothesis of independence can be rejected, and thus that wage changes can be considered as synchronized within the firm, whenever the observed n is larger than the 95th percentile of the binomial distribution. The threshold n^* above which the wage changes are considered as synchronized depends on p and N^{cat}. For instance with p =35%, and a number of reported occupations $N^{cat} = 12$ we select $n^* = 7$. Thresholds are $n^* = 2$ for $N^{cat} = 2$ or 3, $n^* = 3$ for $N^{cat} = 4$ or $5, n^* = 4$ for $N^{cat} = 6$ or 7, $n^* = 5$ for $N^{cat} = 7, 8$, $n^* = 6$ for $N^{cat} = 9, 10$, $n^* = 7$ for $N^{cat} = 11, 12$. With this criteria, the share of synchronized wage changes within establishments is much larger than with the restrictive criteria used in section 5.3. (where we imposed $n^* = N^{cat}$ to define synchronization): it is as large as 73%

as compared to 44%. We have constructed yet another alternative indicator by considering that wage changes are synchronized if all employees within the same broad occupational category experience a change in wage. Recall that in each establishment 1 to 4 broad occupational category are considered, each of them including a number of 1, 2 or 3 representative occupations. Only occupational categories with at least two (and at most 3) occupations were considered. The share of synchronized wage changes we obtain is 74%, hence quite large as well. Note that when restricting the definition of synchronization to the case of observing exactly 3 wages change when 3 representative occupation are reported in a broad category, the indicator is equal to 65%. As a benchmark, under the null hypothesis, hence under a binomial distribution with parameter 38% (the average sample frequency), the share of synchronized wage change should be equal to only $38\%^3/(1-(68\%^3)) \approx 7\%$ (the probability of observing 3 simultaneous wage changes, conditional on observing one wage change).

Appendix C Estimation of the two-threshold sample selection model

This appendix derives our estimation method for system (2)-(3)-(4a)-(4b) of the paper. This system is replicated below for convenience:

$$y_{it}^* = z_{it}\mu + \xi_i + \varepsilon_{it} \quad (1)$$

$$\Delta w_{it}^* = x_{it}\beta + \eta_i + u_{it} \quad (2)$$

where $\Delta w_{it} = 0$ is observed if $v_{it}\gamma_1 < y_{it}^* < v_{it}\gamma_2$ and $\Delta w_{it} = \Delta w_{it}^*$ otherwise.

We use a two-step approach following Verbeek and Nijman (1992 a,b), who have extended the Heckman (1979) procedure to models of panel data with random effects. Given our sample size, the computational advantages implied by using a two step approach rather than a maximum likelihood strategy are substantial, while the loss of efficiency is presumably very limited. We first consider a model with 2 outcomes that matches Verbeek and Nijman's (1992 a,b) framework, by assuming that Δw_{it} is only observed in case of wage increases, that is when $y_{it}^* > v_{it}\gamma_2$.

The first step in the procedure consists in estimating the vector of parameters γ_2 and μ through maximum likelihood using a Probit model. Conditional on unobserved heterogeneity ξ_i, the probability that wage of individual i is increased at date t is:

$$\begin{aligned} P(\Delta w_{it} &> 0|\xi_i) = P(\Delta w_{it}^* > v_{it}\gamma_2|\xi_i) \\ &= P(\varepsilon_{it} > v_{it}\gamma_2 - z_{it}\mu - \xi_i|\xi_i) \\ &= P(\varepsilon_{it} < z_{it}\mu - v_{it}\gamma_2 + \xi_i|\xi_i) \\ &= \Phi((z_{it}\mu - v_{it}\gamma_2 + \xi_i)/\sigma_\varepsilon), \end{aligned}$$

where $\Phi(.)$ is the cdf of the gaussian distribution. The probability of not observing a wage increase is $P(\Delta w_{it} \leq 0|\xi_i) = 1 - \Phi((-v_{it}\gamma_2 + z_{it}\mu + \xi_i)/\sigma_\varepsilon)$.

Integrating over unobserved heterogeneity, the likelihood of a trajectory for individual i is:

$$L_i = \int_{-\infty}^{+\infty} \prod_{t=1}^{T} \left[[\Phi((-v_{it}\gamma_2 + z_{it}\mu + \xi_i)/\sigma_\varepsilon)]^{d_{it}} [1 - \Phi((-v_{it}\gamma_2 + z_{it}\mu + \xi_i)/\sigma_\varepsilon)]^{1-d_{it}} \right] \frac{1}{\sqrt{2\pi}\sigma_\xi} e^{\frac{-\xi^2}{2\sigma_\xi^2}} d\xi_i$$

where T is the number of periods in the sample, and the indicator variable d_{it} is defined as $d_{it} = 1$ if $\Delta w_{it} > 0$ and $d_{it} = 0$ if $\Delta w_{it} \leq 0$. We impose the identifying restriction $\sigma_\varepsilon = 1$. The above integral is computed by Gauss-Hermite quadrature.

Estimators of $\gamma_2, \mu, \sigma_\xi$ are then obtained by maximizing the likelihood of the whole sample:

$$\ln L = \sum_{i=1}^{N} \ln L_i.$$

The log-likelihood is maximized using a Newton-Raphson algorithm as implemented in the SAS-IML software. The vector of first derivatives of the likelihood function with respect to parameters and the Hessian matrix are computed numerically.

The second step of the procedure of Verbeek and Nijman (1992 a,b), consists in estimating equation (2) by least squares, with, in the spirit of Heckman (1979), added regressors that corrects for the sample selection bias. Unlike in the cross-sectional case, there are here two correction terms, which we will denote A_{1i} and A_{2it}, corresponding to the conditional expectations of η_i and u_{it} given selection. The coefficients on these correction terms reflect the covariances between η_i and ξ_i and between u_{it} and ε_{it}. For convenience, we note $y_{it} = 2d_{it} - 1$ so that $y_{it} = 1$ when $\Delta w_{it} > 0$ and $y_{it} = -1$ when $\Delta w_{it} < 0$.

$$A_{1i} = \frac{1}{\sigma_\varepsilon^2 + T_i\sigma_\xi^2} \sum_{s=1}^{T} E\left\{\xi_i + \varepsilon_{is} \ / \ y_{it}\right\} \tag{3}$$

$$A_{2it} = \left[E\left\{\xi_i + \varepsilon_{it} \ / \ y_{it}\right\} \frac{\sigma_\xi^2}{\sigma_\varepsilon^2 + T_i\sigma_\xi^2} \sum_{s=1}^{T} E\left\{\xi_i + \varepsilon_{is} \ / \ y_{it}\right\}\right] \tag{4}$$

The conditional expectation $E\left\{\xi_i + \varepsilon_{is} \ / \ y_{it}, \xi_i\right\}$ is given by:

$$E\left\{\xi_i + \varepsilon_{is} \ / \ y_{it}, \xi_i\right\} = \int_{-\infty}^{+\infty} \left[\xi_i + E\left\{\varepsilon_{it} \ / \ y_{it}, \xi_i\right\}\right] f(\xi_i/y_{it}) d\xi_i \tag{5}$$

$$\text{where } E\left\{\varepsilon_{it}/y_{it}, \xi_i\right\} = y_{it}\sigma_\varepsilon \frac{\phi(\frac{z_{it}\mu - v_{it}\gamma_2 + \xi_i}{\sigma_\xi})}{\Phi(y_{it}\frac{z_{it}\mu - v_{it}\gamma_2 + \xi_i}{\sigma_\xi})} \tag{6}$$

$$\text{and } f(\xi_i/y_{it}) = \frac{\Pi_{s=1}^{T}\Phi(y_{it}\frac{z_{it}\mu - v_{it}\gamma_2 + \xi_i}{\sigma_\xi})(\frac{1}{\sigma_\xi})\phi(\frac{\xi_i}{\sigma_\xi})}{\int_{-\infty}^{+\infty}\Pi_{s=1}^{T}\Phi(y_{it}\frac{z_{it}\mu - v_{it}\gamma_2 + \xi_i}{\sigma_\xi})(\frac{1}{\sigma_\xi})\phi(\frac{\xi_i}{\sigma_\xi})d\xi_i} \tag{7}$$

The vector of parameters β can then be consistently estimated by the following linear regression restricted to observations with only wage increases ($\Delta w_{it} > 0$):

$$\Delta w_{it} = x_{it}\beta + c_1\widehat{A}_{1i} + c_2\widehat{A}_{2it} + e_{it}$$

While the Verbeek and Nijman procedure assumes one threshold and two regimes, in our application, we have two thresholds and observations from three regimes: wage changes, stability, and decreases. Our strategy to use observations both from the wage decreases and wage increases regime is the following : we implement a random effect probit model to estimate parameter set γ_1 (as well as an alternative parameter estimate for μ) for wage decreases, similar to that above with wage increase. We recover estimates of counterparts of the above auxiliary variables, which we label A_{3i} and A_{4it} in the case $\Delta w_{it} < 0$.

Parameter vector β is finally consistently estimated using the least square estimator in the following extended model on all observations with wage changes ($\Delta w_{it} \neq 0$) :

$$\Delta w_{it} = x_{it}\beta + c_1 d_{it}^{+}\widehat{A}_{1i} + c_2 d_{it}^{+}\widehat{A}_{2it} + c_3 d_{it}^{-}\widehat{A}_{3i} + c_4 d_{it}^{-}\widehat{A}_{4it} + e_{it}$$

where the dummy variables d_{it}^{+} and d_{it}^{-} are defined as follow: $d_{it}^{+} = 1$ when $\Delta w_{it} > 0$, $d_{it}^{+} = 0$ otherwise; $d_{it}^{-} = 1$ when $\Delta w_{it} < 0$, $d_{it}^{-} = 0$ otherwise.

Appendix Tables (Tables A1 to A6)

Table A1: Frequency of Wage Change
Excluding observations at times of legal working time reduction

	Mean frequency	Number of observations
Total	0.37	3 664 664
Manufacturing	0.39	1 534 275
Construction	0.37	285 897
Services	0.35	1 844 492
Manual workers	0.39	899 787
Clerical workers	0.36	980 953
Intermediate occupations	0.38	877 463
Managers	0.32	906 461
0 to 19 employees	0.36	480 221
20 to 49 employees	0.34	570 777
50 to 149 employees	0.33	1 248 862
150 to 499 employees	0.36	1 045 386
more than 500 employees	0.40	319 418

Table A2: Frequency and size of hourly base wage changes
Restricting for trajectories of occupation that are observed for full sample period

		Number of observations	all	increase	decrease
Frequency	all	2 120 130	37%	31%	5%
	0 to 19 employees	283 012	35%	28%	7%
	20 to 49 employees	360 399	34%	28%	6%
	50 to 149 employees	792 503	34%	29%	5%
	150 to 499 employees	556 556	38%	33%	4%
	more than 500 employees	127 660	40%	37%	4%
Size	all	721 100	2.3%	3.2%	-3.7%
	0 to 19 employees	94 519	2.4%	4.3%	-4.5%
	20 to 49 employees	116 309	2.6%	4.1%	-4.4%
	50 to 149 employees	260 094	2.5%	3.6%	-3.8%
	150 to 499 employees	199 854	2.2%	3.0%	-3.3%
	more than 500 employees	50 324	1.8%	2.2%	-2.0%

Table A3: Frequency and size of monthly wage changes

		Number of observations	all	increase	decrease
Frequency	all	3 717 502	35%	30%	5%
	0 to 19 employees	482 823	34%	26%	8%
	20 to 49 employees	579 457	32%	26%	6%
	50 to 149 employees	1 268 455	32%	27%	5%
	150 to 499 employees	1 062 207	34%	30%	5%
	more than 500 employees	324 560	39%	34%	5%
Size	all	1 190 335	1.7%	2.5%	-3.0%
	0 to 19 employees	155 592	2.1%	3.9%	-4.1%
	20 to 49 employees	175 494	2.0%	3.6%	-4.1%
	50 to 149 employees	386 863	1.8%	2.8%	-3.5%
	150 to 499 employees	350 478	1.6%	2.3%	-3.0%
	more than 500 employees	121 908	1.3%	1.7%	-1.6%

Table A4: Conditional probability of wage decreases

		Panel A			Panel B		
		Parameter estimates	Standard errors	Impact on probability of wage decrease	Parameter estimates	Standard errors	Impact on probability of wage decrease
Variable category	**Variable**	γ_2	$se(\gamma 2)$		γ_2	$se(\gamma 2)$	
	Intercept	1.550 ***	*0.024*		-1.796 ***	*0.046*	
"Time dependent" variables	First quarter	-0.112	*0.012*	-0.012	-0.130 ***	*0.012*	-0.014
Seasonal dummies	Second quarter	-0.014	*0.012*	-0.001	0.040 ***	*0.012*	0.004
	Third quarter	-0.101	*0.012*	-0.011	-0.032 ***	*0.013*	-0.003
	1 quarter				-0.283 ***	*0.038*	-0.031
Duration	2 quarter				0.014 ***	*0.035*	0.002
	3 quarter				0.095 ***	*0.033*	0.010
	4 quarter				0.107 ***	*0.033*	0.012
		μ	$se(\mu)$		μ	$se(\mu)$	
"State dependent" variables	Cumulated inflation	0.264 ***	*0.006*	0.029	0.097 ***	*0.012*	0.011
	Cumulated unemployment variation	0.010 ***	*0.010*	0.001	0.057 ***	0.010	0.006
	Cumulated productivity	0.027 ***	*0.002*	0.003	0.024 ***	*0.002*	0.003
	Clerical workers	0.040 ***	*0.021*	0.004	0.039 ***	*0.013*	0.004
Socio-occupational group	Intermediate occupations	0.065 ***	*0.016*	0.007	0.061 ***	*0.014*	0.007
	Managers	0.058 ***	*0.019*	0.006	0.053 ***	*0.014*	0.006
Industry dummies (NES)	Manufacture of cars	0.004	*0.041*	0.000	0.011	*0.041*	0.001
	Manufacture of capital goods	-0.046 ***	*0.017*	-0.005	-0.044 ***	*0.020*	-0.005
	Manufacture of intermediate goods	-0.004 ***	*0.022*	0.000	-0.004 ***	*0.015*	0.000
	Construction	-0.036 ***	*0.021*	-0.004	-0.035 ***	*0.019*	-0.004
	Trade	-0.076 ***	*0.021*	-0.008	-0.078 ***	*0.015*	-0.008
	Transports	0.028 ***	*0.020*	0.003	0.028 ***	*0.022*	0.003
	Financial activities	-0.170 ***	*0.020*	-0.019	-0.166 ***	*0.026*	-0.018
	Real estate activities	0.097 ***	*0.038*	0.011	0.093 ***	*0.040*	0.010
	Services to businesses	-0.027 ***	*0.012*	-0.003	-0.031 ***	*0.017*	-0.003
	Personal and domestic services	-0.166	*0.012*	-0.018	-0.161	*0.021*	-0.017
Size of the firm dummies	10 to 19 employees	-0.290 ***	*0.012*	-0.032	-0.289 ***	*0.020*	-0.031
	20 to 49 employees	-0.144 ***	*0.000*	-0.016	-0.151 ***	*0.020*	-0.016
	50 to 149 employees	0.000 ***	*0.000*	0.000	-0.009 ***	*0.019*	-0.001
	150 to 499 employees	0.052 ***	*0.000*	0.006	0.045 ***	*0.020*	0.005
	Working Time Reduction	0.358 ***	*0.000*	0.039	0.334 ***	*0.037*	0.036
	Rho	0.210	0.000		0.178	*0.000*	
	Sigma²	0.264	0.000		0.210	*0.000*	
	Number of observations	262 771			262 771		
	Log Likelihood :	-59 145			-55 870		

Note: The model is estimated by maximum likelihood. The reference category is : Manual Worker, Manufacturing goods, Firm with more than 500 employees, Fourth quarter, Duration > 4 quarters. The impact on the probabilities of wage decrease are the impact of the change of one unit evaluated for the reference category, and for cumulated changes in inflation and unemployment equal to zero.

Table A5: Conditional probability of wage increases without random effect

		Panel A			Panel B		
		Parameter estimates	Standard errors	Impact on probability of wage increase	Parameter estimates	Standard errors	Impact on probability of wage increase
		γ_1	$se(\gamma_1)$		γ_1	$se(\gamma_1)$	
Variable category	**Variable**						
	Intercept	-0.580 ***	0.012		-0.469 ***	0.026	
"Time dependent" variables	First quarter	0.605 ***	0.008	0.211	0.517 ***	0.008	0.180
Seasonal dummies	Second quarter	0.225 ***	0.007	0.078	0.208 ***	0.008	0.072
	Third quarter	0.284 ***	0.007	0.099	0.295 ***	0.008	0.103
	1 quarter				-0.067 ***	0.021	-0.023
Duration	2 quarter				0.010	0.019	0.003
	3 quarter				-0.053 ***	0.017	-0.018
	4 quarter				0.714 ***	0.016	0.248
		μ	$se(\mu)$		μ	$se(\mu)$	
"State dependent" variables	Cumulated inflation	0.001 ***	0.003	0.018	-0.001 ***	0.000	0.000
	Cumulated unemployment variation	-0.003	0.005	-0.001	0.029 ***	0.006	0.010
	Cumulated productivity	-0.007 ***	0.001	-0.002	-0.009 ***	0.001	-0.003
Socio-occupational group	Clerical workers	-0.057 ***	0.007	-0.020	-0.058 ***	0.007	-0.020
	Intermediate occupations	-0.124 ***	0.007	-0.043	-0.125 ***	0.008	-0.043
	Managers	-0.243 ***	0.008	-0.085	-0.245 ***	0.008	-0.085
Industry dummies (NES)	Manufacture of cars	0.199 ***	0.020	0.069	0.203 ***	0.020	0.071
	Manufacture of capital goods	-0.001	0.011	0.000	0.000	0.011	0.000
	Manufacture of intermediate goods	0.014	0.008	0.005	0.014	0.008	0.005
	Construction	-0.082 ***	0.011	-0.029	-0.086 ***	0.011	-0.030
	Trade	-0.087 ***	0.009	-0.030	-0.093 ***	0.009	-0.032
	Transports	-0.040 ***	0.012	-0.014	-0.039 ***	0.012	-0.014
	Financial activities	0.030 *	0.015	0.010	0.035 *	0.015	0.012
	Real estate activities	0.001	0.020	0.000	0.001	0.020	0.000
	Services to businesses	-0.109 ***	0.010	-0.038	-0.112 ***	0.010	-0.039
	Personal and domestic services	0.043 ***	0.013	0.015	0.044 ***	0.013	0.015
Size of the firm dummies	10 to 19 employees	-0.188 ***	0.011	-0.065	-0.191 ***	0.011	-0.067
	20 to 49 employees	-0.227 ***	0.011	-0.079	-0.236 ***	0.011	-0.082
	50 to 149 employees	-0.201 ***	0.010	-0.070	-0.212 ***	0.010	-0.074
	150 to 499 employees	-0.124 ***	0.010	-0.043	-0.133 ***	0.010	-0.046
	Working Time Reduction	2.302	0.036	0.803	2.320	0.036	0.807
	Number of observations	276 771			276 771		
	Log Likelihood :	-151 318			-158 093		

Note: The model is estimated by maximum likelihood. The reference category is : Manual Worker, Manufacturing goods, Firm with more than 500 employees, Fourth quarter, Duration > 4 quarters. The impact on the probabilities of wage increase of one unit evaluated for the reference category, and for cumulated changes in inflation and unemployment equal to zero.

Table A6: Sample selection model estimates: size of wage changes

Variable category	Variable	Parameter estimates	se	Parameter estimates	se	Parameter estimates	se
	Intercept						
		Panel A Backward-looking				Panel B Backward and forward-looking	
	Estimation method	OLS (excluding zeros)		Two-step (sample selection)		Two-step (sample selection)	
	Intercept	0.410 ***	0.068	-0.064	0.103	1.353 ***	0.068
TV Covariates	Inflation (backward, elapsed spell)	0.544 ***	0.020	0.212 ***	0.019	0.141 ***	0.024
	Inflation (backward, elapsed 2 spells)						
	Inflation (backward, lagged, elapsed 2 spells)						
	Inflation (forward current spell)					0.312 ***	0.032
	Inflation (forward, 2 spell)						
	Inflation (forward, lagged forecast, 2 spell)						
	Unemployment (backward, elapsed spell)	-0.264 ***	0.030	-0.305 ***	0.024	-0.272 ***	0.039
	Unemployment (backward, elapsed 2 spells)						
	Unemployment (backward, lagged, elapsed spell)						
	Unemployment (current spell forward)					-0.330 ***	0.069
	Unemployment (forward, 2 spells)						
	Unemployment (forward, lagged forecast, 2 spell)						
	Productivity (backward, elapsed spell)	0.006	0.007	-0.011 **	0.005	-0.010	0.007
	Productivity (backward, elapsed 2 spells)						
	Productivity (backward, lagged, elapsed spell)						
	Productivity (current spell forward)					0.037 **	0.014
	Productivity (forward, 2 spells)						
	Productivity (forward, lagged forecast, 2 spell)						
Socio-occupational group	Clerical workers	0.217 ***	0.038	0.202 ***	0.046	0.239 ***	0.037
	Intermediate occupations	0.111 ***	0.041	0.095 ***	0.037	0.186 ***	0.039
	Managers	0.333 ***	0.042	0.352 ***	0.037	0.479 ***	0.042
Time dummies	First quarter	0.669 ***	0.042	0.998 ***	0.030	0.275 ***	0.044
	Second quarter	0.300 ***	0.044	0.385 ***	0.033	0.057	0.042
	Third quarter	0.156 ***	0.044	0.361 ***	0.036	0.015	0.043
Industry dummies (NES)	Manufacturing of cars (D)	0.205 *	0.101	0.315 ***	0.083	0.114	0.094
	Manufacturing of capital goods (E)	0.187	0.058	0.253 ***	0.046	0.092	0.059
	Manufacturing of intermediate goods (F)	0.032 ***	0.045	0.054 *	0.036	0.001	0.043
	Construction (H)	0.449 ***	0.062	0.508 ***	0.049	0.595 ***	0.064
	Trade (J)	0.180 ***	0.048	0.308 ***	0.038	0.269 ***	0.048
	Transports (K)	0.269 ***	0.066	0.254 ***	0.052	0.099 *	0.064
	Financial activities (L)	0.022	0.080	0.227 **	0.064	0.121 *	0.075
	Real estate activities (M)	-0.152	0.111	-0.276 ***	0.087	-0.276 **	0.103
	Services to businesses (N)	0.284 ***	0.054	0.362 ***	0.043	0.443 ***	0.054
	Personal and domestic services (P)	0.089	0.069	0.312 ***	0.054	0.194 **	0.070
Firm size dummies	10 to 19 employees	0.358 ***	0.060	0.717 ***	0.048	0.767 ***	0.058
	20 to 49 employees	0.391 ***	0.061	0.554 ***	0.049	0.668 ***	0.059
	50 to 149 employees	0.322 ***	0.054	0.331 ***	0.044	0.479 ***	0.051
	150 to 499 employees	0.144 ***	0.054	0.100 **	0.044	0.246 ***	0.050
	Working Time Reduction	8.432 ***	0.068	9.007 ***	0.083	7.949 ***	0.075
Corrections terms	A1			1.045 ***	0.053	-0.005	0.023
	A2			1.473 ***	0.051	0.146 ***	0.022
	A3			-1.980 ***	0.031	-2.433 ***	0.023
	A4			-2.461 ***	0.051	-2.411 ***	0.042
Number of wage observations		100 648		100 648		62 753	
RMSE		3.50		3.52		3.42	

Variable category	Variable	Parameter estimates	se	Parameter estimates	se
	Intercept				
		Panel C Backward-looking with predetermination		Panel D Forward-looking with predetermination	
	Estimation method	Two-step (sample selection)		Two-step (sample selection)	
	Intercept	0.579 ***	0.116	1.383 ***	0.082
TV Covariates	Inflation (backward, elapsed spell)	0.172 ***	0.042		
	Inflation (backward, elapsed 2 spells)	0.066 **	0.033		
	Inflation (backward, lagged, elapsed 2 spells)	-0.159 ***	0.027		
	Inflation (forward current spell)			0.278 ***	0.056
	Inflation (forward, 2 spell)			0.043	0.029
	Inflation (forward, lagged forecast, 2 spell)			0.072 **	0.031
	Unemployment (backward, elapsed spell)	-0.106	0.081		
	Unemployment (backward, elapsed 2 spells)	0.034	0.062		
	Unemployment (backward, lagged, elapsed spell)	-0.135 ***	0.035		
	Unemployment (current spell forward)			-0.236	0.165
	Unemployment (forward, 2 spells)			-0.055	0.108
	Unemployment (forward, lagged forecast, 2 spell)			-0.315 ***	0.046
	Productivity (backward, elapsed spell)	0.022	0.015		
	Productivity (backward, elapsed 2 spells)	-0.014	0.011		
	Productivity (backward, lagged, elapsed spell)	0.003	0.007		
	Productivity (current spell forward)			-0.006	0.031
	Productivity (forward, 2 spells)			0.007	0.019
	Productivity (forward, lagged forecast, 2 spell)			-0.005	0.013
Socio-occupational group	Clerical workers	0.185 ***	0.041	0.213 ***	0.042
	Intermediate occupations	0.046	0.043	0.130 **	0.045
	Managers	0.275 ***	0.048	0.406 ***	0.048
Time dummies	First quarter	0.926 ***	0.064	0.308 ***	0.047
	Second quarter	0.430 ***	0.050	0.121 **	0.049
	Third quarter	0.451 ***	0.051	0.141 ***	0.049
Industry dummies (NES)	Manufacturing of cars (D)	0.278 **	0.098	0.174 *	0.102
	Manufacturing of capital goods (E)	0.238 ***	0.060	0.185 **	0.070
	Manufacturing of intermediate goods (F)	0.019	0.046	0.042	0.050
	Construction (H)	0.514 ***	0.074	0.505 ***	0.077
	Trade (J)	0.213 ***	0.055	0.261 ***	0.056
	Transports (K)	0.178 **	0.071	0.033	0.073
	Financial activities (L)	0.287 ***	0.080	0.217 **	0.085
	Real estate activities (M)	-0.291 **	0.110	-0.337 **	0.116
	Services to businesses (N)	0.326 ***	0.062	0.350 ***	0.065
	Personal and domestic services (P)	0.312 ***	0.081	0.079	0.086
Firm size dummies	10 to 19 employees	0.655 ***	0.065	0.679 ***	0.068
	20 to 49 employees	0.435 ***	0.067	0.533 ***	0.069
	50 to 149 employees	0.322 ***	0.054	0.450 ***	0.056
	150 to 499 employees	0.154 **	0.052	0.255 ***	0.055
	Working Time Reduction	8.668 ***	0.119	7.925 ***	0.081
Corrections terms	A1	0.596 ***	0.065	-0.144 ***	0.024
	A2	0.967 ***	0.062	0.075 ***	0.019
	A3	-1.811 ***	0.037	-2.498 ***	0.025
	A4	-2.064 ***	0.067	-2.574 ***	0.047
Number of wage observations		41 028		44 977	
RMSE		3.05		3.34	

Note: The model is estimated using a two-step procedure adapted from Verbeek and Nijman (1996) and presented in the on-line appendix. The dependent variable is wage change computed as $100.\ln(w_t/w_{t-1})$. Control variables and terms correcting for sample selection are included but not reported. Paremeters values for control variables are reported in on-line Appendix Table A5.

Table A6 (continued): Sample selection model estimates: size of wage changes

Variable category	Variable	Parameter estimates	se	Parameter estimates	se
	Intercept				
		Panel C Backward-looking with predetermination		Panel D Forward-looking with predetermination	
	Estimation method	Two-step (sample selection)		Two-step (sample selection)	
	Intercept	0.579 ***	0.116	1.383 ***	0.082
TV Covariates	Inflation (backward, elapsed spell)	0.172 ***	0.042		
	Inflation (backward, elapsed 2 spells)	0.066 **	0.033		
	Inflation (backward, lagged, elapsed 2 spells)	-0.159 ***	0.027		
	Inflation (forward current spell)			0.278 ***	0.056
	Inflation (forward, 2 spell)			0.043	0.029
	Inflation (forward, lagged forecast, 2 spell)			0.072 **	0.031
	Unemployment (backward, elapsed spell)	-0.106	0.081		
	Unemployment (backward, elapsed 2 spells)	0.034	0.062		
	Unemployment (backward, lagged, elapsed spell)	-0.135 ***	0.035		
	Unemployment (current spell forward)			-0.236	0.165
	Unemployment (forward, 2 spells)			-0.055	0.108
	Unemployment (forward, lagged forecast, 2 spell)			-0.315 ***	0.046
	Productivity (backward, elapsed spell)	0.022	0.015		
	Productivity (backward, elapsed 2 spells)	-0.014	0.011		
	Productivity (backward, lagged, elapsed spell)	0.003	0.007		
	Productivity (current spell forward)			-0.006	0.031
	Productivity (forward, 2 spells)			0.007	0.019
	Productivity (forward, lagged forecast, 2 spell)			-0.005	0.013
Socio-occupational group	Clerical workers	0.185 ***	0.041	0.213 ***	0.042
	Intermediate occupations	0.046	0.043	0.130 **	0.045
	Managers	0.275 ***	0.048	0.406 ***	0.048
Time dummies	First quarter	0.926 ***	0.064	0.308 ***	0.047
	Second quarter	0.430 ***	0.050	0.121 **	0.049
	Third quarter	0.451 ***	0.051	0.141 ***	0.049
Industry dummies (NES)	Manufacturing of cars (D)	0.278 **	0.098	0.174 *	0.102
	Manufacturing of capital goods (E)	0.238 ***	0.060	0.185 **	0.070
	Manufacturing of intermediate goods (F)	0.019	0.046	0.042	0.050
	Construction (H)	0.514 ***	0.074	0.505 ***	0.077
	Trade (J)	0.213 ***	0.055	0.261 ***	0.056
	Transports (K)	0.178 **	0.071	0.033	0.073
	Financial activities (L)	0.287 ***	0.080	0.217 **	0.085
	Real estate activities (M)	-0.291 **	0.110	-0.337 **	0.116
	Services to businesses (N)	0.326 ***	0.062	0.350 ***	0.065
	Personal and domestic services (P)	0.312 ***	0.081	0.079	0.086
Firm size dummies	10 to 19 employees	0.655 ***	0.065	0.679 ***	0.068
	20 to 49 employees	0.435 ***	0.067	0.533 ***	0.069
	50 to 149 employees	0.322 ***	0.054	0.450 ***	0.056
	150 to 499 employees	0.154 **	0.052	0.255 ***	0.055
	Working Time Reduction	8.668 ***	0.119	7.925 ***	0.081
Corrections terms	A1	0.596 ***	0.065	-0.144 ***	0.024
	A2	0.967 ***	0.062	0.075 ***	0.019
	A3	-1.811 ***	0.037	-2.498 ***	0.025
	A4	-2.064 ***	0.067	-2.574 ***	0.047
Number of wage observations		41 028		44 977	
RMSE		3.05		3.34	

Note: The sample selection model is estimated using the two-step procedure suggested by Verbeek and Nijman (1996). Parameters for the selection equation are very close to those reported in table 5 and are not reported. The dependent variable is wage change computed as $100.\ln(w_t/w_{t-1})$. The reference category is : Manual Worker, Manufacturing goods, Firm with more than 500 employees, Fourth quarter, Duration > 4 quarters.

Figure A1. Distribution of (non zero) wage changes, with monthly wages