BARGAINING ABOUT WAGES:
EVIDENCE FROM SPAIN

DEPARTAMENT D'ECONOMIA

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threshold moves towards 0 (or towards a minimum relevant price level). Consequently, the lower the PU the higher is γ^i and so, workers are, in the absence of high PU cost, better off choosing a lower PU*, i.e. inflation target.

Finally, the findings about the effect of the proxy for PU* and the price catch-up variable are quite satisfactory. The proxy for PU* has a strong effect, around 0.28 in all the cases. Note this variable, which we were not able to identify in the non-COLA equation (because the time dummies) could be considered as a part of the wage-price elasticity. Adding the effect of the proxy for PU* to the estimated range for the ex-ante wage-price elasticity (γ^i) we obtain a range of 0.63 to 0.90 using θ_A (0.37-0.87 using θ_B), comparable to the Prescott and Wilton previous estimated range. On the other hand, the PCU variable has a small but significant effect on ex-ante wage increase. The estimate ranges from a low 0.06 in column (1) of Table 4.7.a to a high of 0.12 in column (4) of the same table. In contrast with Prescott and Wilton (1992) we did not found any significant interaction effect between the PCU variable and the proxies for the wage-price elasticity.

d. Ex-ante wage increase differentials.

The set of results we have obtained on ex-ante wage increase setting for indexed and non-indexed contracts will permit us to draw some conclusions about the implicit ex-ante wage increase differentials among both indexation regimes for twenty-two industries. To compute these differentials we apply the methodology that can be found in Stengos and

Swidinsky (1990). As they did, we report both differentials, corrected (considering the selection term) and uncorrected[113] (not considering the selection term) for 22 industries[114]. For comparison purposes, we also report the sample means ex-ante wage differentials. The results of our experiment are reported in Table 4.9.

The first point to note is that, though there are sensibly differences in the uncorrected case, corrected differentials are estimated rather similar under θ_A and θ_B. Our estimated sample means wage differential is 0.295 wage increase points (3.5% in relative terms) when using θ_A and 0.27 points when using θ_B (2.6% in relative terms). Note the estimated differentials increase with the wage-price elasticity (θ) and are larger in the latest years (1988-1991) of our sample period. The findings are robust to several wage increase equation specifications[115]. To our knowledge there is no previous work estimating ex-ante wage increase differentials for indexed and non-indexed contracts with which to contrast our results.

By big sectors (1-digit SIC classification), our findings also suggest

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[113] The corrected differential (CD_l, where l=A,B index the prediction for θ) could be expressed as:

$$CD_l = (1/M).\Sigma_{i=1}^{N}\Sigma_{t=1}^{T} \left\{(\Delta\hat{w}_{it}^{\bar{c}l}/I_{it}=0)-(\Delta\hat{w}_{it}^{cl}/I_{it}=1)\right\};\ l=A,B$$

where M is the number of observations, $\Delta\hat{w}_{it}^{cl}$ is the prediction of the COLA model and $\Delta\hat{w}_{it}^{\bar{c}l}$ is the prediction of the non-COLA model, both considering the selection induced by the observed indexation variable (I_{it}). On the other hand, the uncorrected differential is defined as:

$$UD_l = (1/M).\Sigma_{i=1}^{N}\Sigma_{t=1}^{T} \left\{\Delta\hat{w}_{it}^{\bar{c}l}-\Delta\hat{w}_{it}^{cl}\right\};\ l=A,B$$

where both predictions do not consider the selection terms. Consequently, the difference between CD and UD could be expressed as:

$$CD_l - UD_l = \sigma_{CI}\ \hat{\lambda}_{wc} - \sigma_{NCI}\ \hat{\lambda}_{w\bar{c}}$$

[114] Two digits Standard Industrial Code (SIC) classification.

[115] We have make several exercises which confirm our result. For instance, constraining the COLA wage equation to the same specification of the non-COLA wage equation implies a wage differential of 4.2 per cent.

workers pay a positive premium to obtain an indexation clause. However, there are some important differences. Whereas in the Energy sector the implicit wage differentials are practically negligible (0.06 wage increase points when using θ_A and 0.01 when using θ_B), in the Minerals and Chemical they are much bigger (0.43 and 0.41 basis points, respectively).

The most surprising findings are found when looking at industry level (2-digit SIC classification). As it is shown in Table 4.9, there are several industries for which the premium is negative and, in some cases, extremely large. This is the case of the Mineral Oil Refining (between -12 and -16 percentage points), the Electronic Engineering and the Leather industries. On the contrary, the biggest premia are given in the Non-metallic minerals and the Paper, Printing and Publishing industries.

According with the theory, risk averse workers ought to be willing to accept a lower expected real wage for getting a COLA clause from the firm. It is far beyond the scope of the chapter to analyze in deep ex-post wage increase differentials but adding the estimated wage differential with the sample mean of the realization of the contingent compensation for COLA contract we are able to obtain an approximate measure of ex-post wage differentials. As it can be seen in Table 4.9 there are very few industries (2 out of 22) for which the wage increase premium fully compensates the realized contingent compensation (column (6) of Table 4.9). On the contrary, for most of the industries the premium is much lower than the realized contingent compensation. Our finding for Spain is in contrast with a previous work estimating ex-post wage level differentials by Hendricks and Kahn (1985). They set such the ex-post cost or premium in a range of 1.5 to

2 per cent[116].

Consequently, our empirical evidence (though it has the inconvenience of a very short time series sample period) rejects the standard theory (Shavell (1976)) that COLA contracts imply lower expected ex-post wages. Unfortunately, we are not able to offer strong support for any alternative theory. As we have commented in the COLA decision section there is some evidence supporting our theoretical guess that non-nationwide unions have trouble getting the clause. However, there are other possibilities. The most evident one is that unions worry not only about wages but also about employment level. In such circumstance, the workers could renounce the COLA clause in order to preserve the employment level.

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[116] Their estimated range was 1.5 to 22 per cent. However, they consider the larger figure as unlikely.

VI. Concluding remarks.

This chapter develops and estimates a joint model of wage and revision clause setting in a uncertainty context. Assuming that unions are more risk averse than firms, the non-optimality of the escalator contract may be explained by the presence of weak union in negotiation and also by the existence of an alternative mechanism (ex-post catch-up) to link wages to prices. The set of specific assumptions taken leads to a very simple framework, which leads to a switching model of wage increases under COLA and without it, which was estimated using the well-known Heckman's method for selectivity models. Our estimates suggest that non-random sampling is a salient feature of our model but only for COLA contracts. However, we use a very restrictive set of assumptions about the error structure. As a previous step to the estimation of such a model, we deal with the observability problem of the wage-price elasticity variable by means of using an unconditional forecast for it to avoid simultaneity problems. The empirical part of the chapter was carried out using Spanish collective bargaining data for the manufacturing sector in the 1984-1991 period.

The estimated probability of observing an escalator contract is found to be higher (5 to 10 %) for nationwide unions than for others unions. Additionally, there is some evidence supporting the fact that non-nationwide unions get worse conditions (lower probability that the clause will be triggered and lower wage-price elasticity) when bargaining the escalator contract. On the other hand, there are no relevant differences in wage setting behaviour (in either COLA or non-COLA equations) between nationwide and other unions. Thus, there is no significant evidence against our initial assessment that regional unions or independent workers' representatives may have distinct bargaining power in wage setting with COLA and without it. Heterogeneity in bargaining power could also be supported by the asymmetry found between the wage premium workers must pay for getting a new COLA and what they receive if they renounce to it. Whilst the first is negligible, the second was found to be significantly positive. However, we shall note that we face some identification problems for this variable.

Both wage increase equations suggest that wage settlements are poorly related to industry performance and market variables (basically unemployment). In practice, much of the predictive power of our model comes from the variables trying to proxy the available information, at the time of signing the agreement, the BU variables and the set of time and industry dummies. Both alternatives to proxy the wage-price elasticity and the price variable performed quite well. However, in our opinion, the most adequate for representing the Spanish case is θ_A.

Ex-ante inflation coverage is estimated in a range of 0.04 to 0.08, depending on the proxy for the wage-price elasticity. However, note that an important share of the ex-ante inflation coverage is captured by the set of time dummies. Our estimate (only identifiable in the COLA equation) suggests this share could be in a range of 0.26-0.28. Hence, a reasonable ex-ante expected inflation coverage for indexed contracts should be in a range of 0.56-0.99. Consequently, inflation coverage in Spain is mostly given on ex-post basis. The catch-up variable has been found non-relevant for non-indexed contracts and having a small but significant coefficient in the complementary subsample. However, this could be explained by the low time series variation this variable has in sample. In this sense, not considering time dummies raises significantly the coefficient (up to 0.30) of the catch-up variable in both subsamples.

Using the set of estimates for the indexed and non-indexed ex-ante wage increase equations we have estimated the implicit wage premium workers must pay for obtaining a COLA clause. Such a premium has been set in a range of 2.6 to 3.5 per cent. By sectors, we found the premium is negligible for the Energy sector and very high for the Minerals and Chemical sector (around 5 per cent). However, we observe that the premium that workers pay to get the indexation clause does not compensate in our sample period (1984-1991) the mean contingent compensation, in contrast with a previous estimate for the US by Hendricks and Kahn (1985).

This observation has several consequences. Firstly, it maybe the case that ex-post wage increases for COLA contracts are greater than for non-COLA contracts. In such a context the employment level should be negatively related to the degree of indexation and, in general, to the COLA clause (see chapter 3). Consequently, we cannot offer support to the assumption that workers ought to be able to accept a lower expected wage to obtain the COLA clause. Naturally, we think such a situation is not sustainable for the Spanish economy in the long run. Note that the eighties were transition years for the Spanish economy and, consequently, this apparent contradiction of the theory may be transitory. Our impression is that in the forthcoming years the apparent contradiction may disappear because of the better adjustment of inflation to its expected target. This impression gains some support from our finding that the premium has been increased in the 1988-1991 period.

Table 4.1. Manufacturing firm level agreements (sample).1983-1991.

year	COLA clause present	#	% COLA	ex ante wage	ex post wage	% triggered COLA	mean hold -out	mean emp
1984	No COLA	352	--	7.5	--	--	0.93	366
	COLA	162	31.5	7.7	7.9	0.22	0.96	748
1985	No COLA	331	--	7.4	--	--	0.90	291
	COLA	294	47.0	7.2	8.0	0.77	0.94	660
1986	No COLA	363	--	8.2	--	--	0.77	340
	COLA	374	50.7	8.1	8.4	0.65	0.70	605
1987	No COLA	489	--	6.9	--	--	0.90	304
	COLA	380	43.7	6.4	6.4	0.01	0.87	654
1988	No COLA	570	--	5.7	--	--	0.75	321
	COLA	368	39.2	5.0	6.5	0.80	0.61	651
1989	No COLA	423	--	6.7	--	--	0.74	315
	COLA	463	52.2	6.3	8.0	0.84	0.75	572
1990	No COLA	330	--	8.3	--	--	0.78	249
	COLA	444	57.1	7.5	8.1	0.50	0.60	580
1991	No COLA	284	--	7.8	--	--	0.77	213
	COLA	371	56.6	7.3	7.5	0.31	0.69	572

SOURCE: "Estadística de Convenios Colectivos". 1984-1991.

Table 4.2. Mean and variance of ex-ante and ex-post agreements. 1984-1991.

	without COLA ex-ante			non-triggered COLA ex-ante			triggered COLA ex-ante			ex-post			
YEAR	#	Δw	$\sigma_{\Delta w}$	#	Δw	$\sigma_{\Delta w}$	#	Δw	$\sigma_{\Delta w}$	Δw	θ_A	θ_B	PU=T
1984	352	7.53	2.48	126	7.73	1.51	36	7.65	0.61	8.44	0.58	0.09	0.75
1985	331	7.42	2.21	67	7.51	0.99	227	7.15	0.42	8.20	0.96	0.13	0.71
1986	363	8.23	2.48	132	8.48	0.85	242	7.93	0.64	8.40	0.90	0.06	0.49
1987	489	6.90	3.38	376	6.45	1.02	4	5.12	1.06	5.26	0.22	0.03	--
1988	570	5.70	2.86	73	5.98	1.16	295	4.71	1.33	6.66	0.85	0.33	0.65
1989	423	6.73	3.56	73	7.22	2.22	390	6.09	2.72	8.16	0.74	0.33	0.58
1990	330	8.30	2.72	221	8.00	0.88	223	7.01	2.22	8.17	0.83	0.18	0.52
1991	284	7.83	1.81	256	7.65	1.17	115	6.58	1.16	7.12	0.84	0.10	0.79

Keys:

θ_A= (ex_post wage - ex_ante wage)/(inflation -inflation threshold)

θ_B= (ex_post wage - ex_ante wage)/(inflation) -i.e., marganal elasticity-

PU=T ⇒ Inflation threshold equals government's inflation target.

SOURCE: See below Table 4.1.

Table 4.3. Agreements by duration, COLA and delay in sample (6884 obs).

Agreement observed in its..	Number	COLA	% delay>0	delay
1 year	3895	0.41	0.96	101
2 years	2364	0.58	0.64	-14
3 years	543	0.56	0.45	-111
4 years	65	0.52	0.37	-272
5+ years	17	0.29	0.29	-177

SOURCE: See below Table 4.1.

Table 4.4. Conditional COLA AND NON-COLA sample probabilities after k periods of doing the action.

# of previous years doing the same action	# agre.	p(COLA)	# agre.	p(non-COLA)
cond. to 1	2303	79.9	2638	76.4
cond. to 2	1392	83.6	1619	81.2
cond. to 3	823	87.4	986	82.5
cond. to 4	475	89.7	530	84.3
cond. to 5	247	89.9	272	85.3
cond. to 6	114	91.2	127	86.6
cond. to 7	34	100.0	45	95.6
unconditional	2856	47.6	3142	52.4

SOURCE: See below Table 4.1.

Table 4.5. The COLA clause decision. 1985-1991.

Variable	PROBIT (1) coef.	t-stat	Marginal contribution
CONSTANT	-1.59	(2.99)	-0.441
$COLA_{-1}$	1.48	(34.6)	0.412
DELY	-0.54	(0.64)	-0.015
CCOO	-0.06	(0.72)	-0.015
USO	0.02	(0.11)	0.005
OTHERS	-0.15	(2.01)	-0.042
INDEP	-0.43	(4.15)	-0.119
EMP	0.14	(8.46)	0.071
IDEL	0.35	(4.22)	0.097
IDEL*IDEL	-0.12	(5.16)	-0.032
MULTIYEAR	0.24	(4.96)	0.067
U_j	0.26	(1.36)	0.071
u_r	-0.22	(2.46)	-0.061
P_j	-0.02	(0.04)	-0.005
$IPROD_j$	-0.31	(1.04)	-0.085
$IPROD_{j-1}$	0.29	(0.86)	0.085
$STRIKE_j$	-0.01	(0.40)	-0.003
P^e	0.02	(1.72)	0.007
UN_INF_{-1}	.003	(0.31)	0.001
σ_P	0.22	(1.81)	0.060
Time_dummies	Yes		--
Industry_dummies	Yes		--
Time_Span	1985-1991		--
Observations	4941		--
Cola>0	2461		--
Log_L	-2441.6		--
%Correct Prediction	78.3		--

Table 4.6. The non-COLA wage increase equation. 1985-1991.

Est. method	(1) NLS coef. t-st.	(2) 2S-NLS (IV) coef. t-st.	(3) NLS coef. t-st.	(4) NLS coef. t-st.	(5) 2S-NLS (IV) coef. t-st.
Constant	3.10 (2.17)	3.11 (2.18)	3.15 (2.20)	3.14 (1.87)	3.19 (1.89)
P_e (μ)	0.05 (1.93)	0.04 (1.90)	0.05 (2.02)	0.05 (1.95)	0.05 (1.92)
PCU (θ_A)	0.02 (0.91)	0.02 (0.93)	0.02 (0.97)	----	----
PCU (θ_B)	----	----	--	0.02 (0.22)	0.03 (0.19)
$IPROD_{j-1}$	0.51 (1.21)	0.56 (1.25)	0.54 (1.27)	0.52 (1.24)	0.58 (1.30)
U_j	-0.13 (0.42)	-0.11 (0.34)	-0.10 (0.31)	-0.11 (0.37)	-0.09 (0.27)
IP_j-$IP^{\ddagger}_{j-1}$	-0.18 (0.17)	-0.78 (0.33)	-0.22 (0.20)	-0.19 (0.17)	-1.00 (0.42)
iw_j^{m-1}	0.25 (2.26)	0.25 (2.27)	0.24 (2.19)	0.24 (2.24)	0.25 (2.25)
u_r^{-1}	0.01 (0.43)	0.01 (0.52)	0.02 (0.66)	0.01 (0.47)	0.02 (0.56)
EMP	-0.09 (2.56)	-0.08 (2.37)	-0.06 (1.40)	-0.09 (2.46)	-0.08 (2.25)
ΔEMP	0.34 (2.42)	0.33 (2.37)	0.34 (2.42)	0.34 (2.41)	0.33 (2.36)
DEL	0.33 (4.04)	0.32 (4.00)	0.35 (4.11)	0.33 (4.07)	0.33 (4.02)
DEL*DEL	-0.05 (2.52)	-0.05 (2.47)	-0.06 (2.62)	-0.05 (2.58)	-0.05 (2.53)
C_PROD‡	-0.09 (1.15)	-0.13 (1.36)	-0.08 (1.07)	-0.09 (1.12)	-0.13 (1.34)
C_ABS‡	0.01 (0.16)	-0.05 (0.44)	0.01 (0.15)	0.02 (0.18)	-0.05 (0.43)
XH_{-1}	0.05 (1.92)	0.05 (1.92)	0.05 (1.89)	0.05 (1.89)	0.05 (1.89)
CCOO	0.10 (0.84)	0.10 (0.82)	0.09 (0.77)	0.11 (0.86)	0.10 (0.84)
INDEP	0.30 (1.95)	0.28 (1.84)	0.23 (1.37)	0.29 (1.91)	0.27 (1.80)
OTHERS	0.20 (1.64)	0.19 (1.59)	0.17 (1.36)	0.20 (1.64)	0.19 (1.58)
COLA⇒NOCOLA	--	--	0.35 (0.88)	--	--
$\hat{\lambda}_C$	0.07 (0.56)	0.06 (0.53)	0.42 (1.01)	0.12 (1.08)	0.12 (1.09)
Time dum.(6)	Yes	Yes	Yes	Yes	Yes
Ind dum.(22)	Yes	Yes	Yes	Yes	Yes
Obs	2119	2119	2119	2119	2119
Log_L	-3917.6	----	-3917.2	-3918.0	----
R^2	0.305	0.304	0.305	0.305	0.304
σ	1.55	1.55	1.55	1.55	1.55
Haussman(DF)	----	3.01 (38)	--	----	2.63 (39)

‡: Instrumented variables (by using lags) in both, columns (2) and (4).

Note: t-statistics have been obtained from sample covariance of θ.

Table 4.7.a. The COLA wage increase equation for a sample of Spanish' manufacturing firms. NLS estimates. 1985-1991.

	(1)	(2)	(3)	(4)
θ pred.from⇒	T_A.2.(1):$\hat{\theta}_A$	T_A.2.(1):$\hat{\theta}_A$	T_A.2.(1):$\hat{\theta}_A$	T_A.2.(2):$\hat{\theta}_B$
Price alt:	**AP1**	**AP1**	**AP2**	**AP1**
	coef.t-st.	coef. t-st.	coef.t-st.	coef.t-st.
Constant	1.80 (1.66)	1.54 (1.41)	1.31 (1.21)	1.69 (1.33)
AP1:P^e (μ_1)	0.11 (4.64)	0.10 (4.11)	---	0.11 (5.87)
AP2:P_1^{**} (μ_1)	---	---	0.23 (4.96)	--
AP1:$\hat{\theta}P^e$ (μ_2)	0.16 (4.49)	0.13 (3.29)	---	1.20 (9.94)
AP2:$\hat{\theta}P_1^{**}$(μ_2)	---	---	0.53 (4.96)	--
AP1 :PU-dum	0.28 (9.08)	0.28 (9.00)	---	0.26 (8.34)
PCU	0.06 (4.94)	0.06 (5.18)	0.07 (4.22)	0.11 (1.49)
$IPROD_{j-1}$	-0.01 (0.05)	0.01 (0.04)	-0.05 (0.17)	0.06 (0.22)
U_j	-0.09 (0.38)	0.01 (0.05)	-0.06 (0.29)	-0.07 (0.32)
IP_j-IP_{J-1}	0.82 (1.22)	1.02 (1.08)	0.98 (1.45)	0.76 (1.15)
iw_j^{m-1}	0.21 (2.25)	0.20 (2.10)	0.27 (3.11)	0.16 (1.73)
u_r^{-1}	0.01 (0.55)	0.02 (1.08)	0.01 (0.71)	.003 (0.19)
EMP	-0.04 (1.66)	0.01 (0.14)	-0.05 (2.39)	-0.02 (1.12)
ΔEMP	0.50 (3.87)	0.51 (3.97)	0.50 (3.93)	0.48 (3.80)
DEL	0.67 (8.24)	0.78 (8.13)	0.80 (10.9)	0.50 (6.33)
DEL*DEL	-0.17 (6.24)	-0.21 (6.38)	-0.20 (7.70)	-0.14 (5.36)
C_PROD	-0.07 (1.22)	-0.06 (1.13)	-0.06 (1.09)	-0.04 (0.69)
C_ABS	-0.09 (1.45)	-0.09 (1.46)	-0.11 (1.95)	-0.09 (1.47)
XH_{-1}	0.02 (1.88)	0.02 (1.80)	0.02 (1.69)	0.02 (1.27)
CCOO	0.13 (1.46)	0.11 (1.24)	0.16 (1.69)	0.17 (1.85)
INDEP	-0.07 (0.52)	-0.22 (1.38)	-0.02 (0.01)	-0.06 (0.41)
OTHERS	0.08 (0.91)	0.05 (0.49)	0.15 (1.65)	0.05 (0.51)
NOCOLA⇒COLA	--	-0.61 (2.06)	--	--
$\hat{\lambda}_C$	-0.28 (3.57)	0.40 (1.19)	-0.22 (2.96)	-0.13 (1.90)
Time dum(6)	Yes	Yes	Yes	Yes
Ind.dum(22)	Yes	Yes	Yes	Yes
Obs.	2182	2182	2182	2182
Log_L	-3323.0	-3319.8	-3322.0	-3288.4
R^2	0.486	0.487	0.486	0.502
σ	1.12	1.12	1.12	1.10
$\mu_1=\mu_2$ (χ_1^2)	3.54	0.97	24.6	--
$\mu_2=1$ (χ_1^2)	--	--	--	2.815

Table 4.7.b. The COLA wage increase equation for a sample of Spanish' manufacturing firms. Instrumental variables NLS estimates. 1985-1991.

θ pred.from⇒ Price alter:	(1) T_A.2.(1):$\hat{\theta}_A$ **AP1** coef. t-st.	(2) T_A.2.(1):$\hat{\theta}_A$ **AP1** coef. t-st.	(3) T_A.2.(1):$\hat{\theta}_A$ **AP2** coef. t-st.	(4) T_A.2.(2):$\hat{\theta}_B$ **AP1** coef. t-st.
Constant	1.83 (1.66)	0.95 (0.63)	1.27 (1.16)	1.66 (1.29)
AP1:P^e (μ_1)	0.11 (4.56)	0.07 (1.56)	---	0.11 (5.82)
AP2:P_I^{**} (μ_1)	---	---	0.23 (4.94)	--
AP1:$\hat{\theta}P^e$ (μ_2)	0.16 (4.41)	0.05 (0.38)	---	1.19 (9.83)
AP2:$\hat{\theta}P_I^{**}$ (μ_2)	---	---	0.53 (4.94)	--
AP1 :PU-dum	0.28 (9.06)	0.27 (8.28)	---	0.26 (8.32)
PCU	0.06 (4.94)	0.06 (5.44)	0.07 (4.20)	0.12 (1.54)
$IPROD_{j-1}$	-0.01 (0.02)	0.05 (0.19)	-0.08 (0.29)	0.05 (0.18)
U_j	-0.08 (0.35)	0.21 (0.50)	-0.10 (0.41)	-0.08 (0.35)
IP_j-IP_{J-1}†	0.79 (0.55)	0.87 (0.60)	1.54 (1.08)	0.93 (0.66)
iw_j^{m-1}	0.21 (2.23)	0.16 (1.52)	0.27 (3.07)	0.16 (1.72)
u_r^{-1}	0.01 (0.54)	0.05 (1.00)	0.01 (0.72)	.003 (0.18)
EMP	-0.04 (1.63)	0.10 (0.62)	-0.05 (2.30)	-0.02 (1.07)
ΔEMP	0.50 (3.87)	0.54 (3.88)	0.51 (3.95)	0.48 (3.81)
DEL	0.68 (8.22)	1.01 (2.51)	0.80 (10.9)	0.50 (6.34)
DEL*DEL	-0.17 (6.23)	-0.28 (2.04)	-0.20 (7.68)	-0.14 (5.37)
C_PROD†	-0.07 (0.97)	-0.05 (0.74)	-0.05 (0.77)	-0.04 (0.64)
C_ABS†	-0.12 (1.53)	-0.12 (1.61)	-0.15 (1.99)	-0.11 (1.49)
XH_{-1}	0.02 (1.90)	0.02 (1.54)	0.02 (1.97)	0.02 (1.29)
CCOO	0.13 (1.43)	0.07 (0.57)	0.15 (1.67)	0.17 (1.83)
INDEP	-0.07 (0.52)	-0.54 (0.95)	-0.01 (0.02)	-0.06 (0.41)
OTHERS	0.09 (0.92)	-0.04 (0.23)	0.15 (1.67)	0.05 (0.53)
NOCOLA⇒COLA†	--	-2.01 (0.85)	--	--
$\hat{\lambda}_C$	-0.28 (3.58)	1.97 (0.75)	-0.23 (2.98)	-0.08 (1.95)
Time dum.(6)	Yes	Yes	Yes	Yes
Ind.dum.(22)	Yes	Yes	Yes	Yes
Obs	2182	2182	2182	2182
R^2	0.486	0.482	0.486	0.502
σ	1.12	1.13	1.12	1.10
Hausman(df)	0.75(40)	1.21 (41)	1.27(44)	22.11(10)
$\mu_1=\mu_2$ (χ_1^2)	3.45	0.79	26.4	---
$\mu_2=1$ (χ_1^2)	--	--	--	2.597

†: Intrumented variables (by using lags of the variables).

Table 4.8. Findings about ex-ante price elasticity.

		price elasticity			
price variable		$\hat{\theta}_A$ NLS	$\hat{\theta}_A$ IV-NLS	$\hat{\theta}_B$ NLS	$\hat{\theta}_B$ IV-NLS
NON-INDEXED	μ^i	0.05	0.04	0.05	0.05
INDEXED: AP1	μ^i	0.07	0.07	0.04	0.04
	γ^i	0.35	0.35	0.11	0.11
	$\gamma^i(\theta_j=1)$	0.62	0.62	0.59	0.59
INDEXED: AP2	μ^i	0.08	0.08	--	--
	γ^i	0.36	0.36	--	--
	$\gamma^i(\theta_j=1)$	0.63	0.63	--	--

Table 4.9. Estimated wage increase differentials by industry.

Sector	CD_A	UD_A	CD_B	UD_B	mean $\Delta w_{\bar{c}}-\Delta w_c$	mean $\Delta w_c^{ep}-\Delta w_c$
ALL (Sample means)	0.29	0.11	0.28	0.27	0.278	0.756
ALL (1988-1991)	0.45	0.28	0.36	0.35	0.350	0.950
ALL(Low θ)†	0.23	--	0.01	--	0.278	0.756
ALL(High θ)‡	0.38	--	0.44	--	0.278	0.756
.. **Energy**	0.06	-0.07	0.00	0.03	0.044	0.962
1.Extractives	0.24	0.03	0.18	0.15	-0.045	0.839
2.Mineral Oil Refining	-0.62	-0.71	-0.78	-0.72	-0.769	1.151
3.Utilities	0.22	0.16	0.16	0.25	0.361	0.976
.. **Minerals and Chemical**	0.43	0.23	0.41	0.38	0.428	0.852
4.Extraction of Metalic Ores	0.32	0.13	0.35	0.34	0.634	0.779
5.Iron and Steel	0.34	0.16	0.29	0.29	0.820	1.221
6.Ext. Non-metalic Minerals	0.68	0.48	0.63	0.60	0.619	0.866
7.Chemical industry	0.25	0.10	0.23	0.25	0.110	0.810
.. **Metal Processing**	0.27	0.09	0.26	0.25	0.214	0.724
8.Manuf. of Metal Products	0.39	0.19	0.43	0.42	0.291	0.611
9.Machinery and mech en'ring	0.11	-0.02	0.09	0.12	0.159	0.784
10.Electrical engineering	0.38	0.23	0.35	0.37	0.198	0.777
11.Electronic engineering	-0.29	-0.39	-0.42	-0.36	-0.425	0.889
12.Motor vehicles	0.22	0.11	0.22	0.27	0.128	0.659
13.Other Transport Equipment	0.33	0.21	0.16	0.20	0.444	1.004
14.Instrument Engineering	-0.17	-0.49	-0.22	-0.32	-0.620	0.617
.. **Other Manufacturing ind.**	0.30	0.04	0.30	0.23	0.157	0.611
15.Food, Drink and Tobacco	0.16	-0.10	0.17	0.11	0.041	0.562
16.Textile industry	-0.04	-0.35	0.00	-0.10	-0.149	0.644
17.Leather industry	-0.25	-0.61	-0.26	-0.39	-0.926	0.344
18.Footwear and Clothing	0.30	0.01	0.42	0.33	0.054	0.364
19.Timber Cork & Wooden Fur.	0.38	0.10	0.44	0.37	0.062	0.408
20.Paper, Printing an Pub.	0.60	0.42	0.55	0.54	0.607	0.779
21.Rubber and Plastic .	0.20	0.04	0.15	0.16	-0.010	0.637
22.Other Manufacturing sec	0.23	-0.03	0.39	0.32	0.103	0.491

†: We use quartile 1 ⇒ θ_A=0.369, θ_B=0.030;

‡: We use quartile 3 ⇒ θ_A=0.693, θ_B=0.153;

KEYS:

CD_j: Corrected differential under θ_j, j=A,B.

UD_j: Uncorrected differential under θ_j, j=A,B.

mean $\Delta w_{\bar{c}}-\Delta w_c$: Sample means difference between ex-ante non-COLA and COLA wage increases (in percentage points).

mean $\Delta w_c^{ep}-\Delta w_c$: Sample means difference between ex-ante COLA and ex-post COLA wage increase (in percentage points).

Appendix A. Proxying the price expectation (P^{**}) and the wage-price elasticity (θ^{I}) forecast.

The most important inconvenience of a COLA contract is induced by its intrinsic nature. As far as it is a contingent contract it is difficult to know its provisions. In fact neither in Spain nor in other countries there is exact information about the provisions of the contract unless it becomes triggered, in which case ex-post wage increase also becomes observable. Having information about ex-post wage increase it is possible to infer an approximate measure of one of the contract provisions, the wage-price elasticity. However, the problem persists since there is a share of contracts for which we know nothing about the implicit wage-price elasticity (for those that the clause is not triggered). We will attempt to avoid this lack of information by means of a simple modelization of the COLA provisions. Additionally, we will take advantage of this modelization to construct a proxy for the driven price variable of the contingent wage increase, P^{**}, which is given in equation [8]. Finally, at the end of the appendix we present a brief description, for illustrative purposes, of the most common contingent clauses in Spain in recent years.

a. The wage-price elasticity forecasting process.

Assume there is an underline linear reduced form model for the log of the wage-price elasticity ($\ln\theta^{*}$) and inflation threshold (PU^{*}) determination.

[4.a.1] $\ln\theta^{*} = X_{\theta}\delta_{\theta} + \varepsilon_{\theta}$

[4.a.2] $PU^{*} = -X_{PU}\delta_{PU} + \varepsilon_{PU}$

where X_θ and X_{PU} are the (assumed) exogenous vectors of variables affecting, respectively, $\ln\theta^*$ and PU^*; δ_θ and δ_{PU} are vectors of parameters and, finally, ε_θ and ε_{PU} are error terms normally distributed with covariance:

$$\mathrm{cov}(\varepsilon_\theta,\varepsilon_{PU}) = \begin{bmatrix} \sigma^2_\theta & \\ \sigma_{\theta,PU} & \sigma^2_{PU} \end{bmatrix}$$

On the other hand, the inflation threshold PU^* is not observable. We observe θ^* if the threshold (PU^*) is lower than inflation rate (P, a random variable). Notice that our model is similar to the wage and participation or hours model (see García (1991) for a description), so the estimation technique will be exactly the same. First we will estimate a probit model for the probability that $PU^* \leq P$. Rewriting [4.a.2] as:

[4.a.2'] $P\text{-}PU^* = X_{PU}\delta_{PU} + P\text{-}\varepsilon_{PU}$

the probability of observing θ^* ($p(Y=1)$) is given by:

[4.a.3] $\mathrm{Prob}(TR=1) = \mathrm{prob}(P\text{-}PU^*>0) = \Phi\left(\frac{X'_{PU}\delta_{PU}}{\sigma_{P\text{-}\varepsilon_{PU}}}\right)$

where TR takes one if the clause is triggered (zero otherwise) and Φ is the distribution function of the standard normal. Estimates of equation [4.a.1] are reported in Table 4.A.1. Given the estimates of the first stage Probit model, consistent estimates of the unknown parameters of equation [4.a.1] might be found by applying, in a second stage, LS to the following extended equation (for taking into account the selectivity bias expecting to arise in such a model) in the subsample for which we observe $\ln\theta^*$ (i.e., $P>PU^*$):

$$[4.a.4] \quad \ln\theta^* = f_\theta(X_\theta,\delta_\theta) + \sigma_{1\theta}\lambda\left(\frac{X'_{PU}\delta_{PU}}{\sigma_{\{\varepsilon_{PU}-\varepsilon_P\}}}\right) + \varepsilon_\theta$$

where $\lambda = \frac{\phi(.)}{\Phi(.)}$ is the well-known inverse of the Mill's ratio. Once we have estimates for the parameters of equation [4.a.1] we turn our attention to state the correct method for forecasting correctly the wage-price elasticity, θ^*, for the whole sample. Given the fact that the COLA wage increase (Δw_{ic}), the optimal wage-price elasticity and the inflation threshold are jointly determined in the same maximization process, we will follow, an instrumental approach. The purpose of this approach is to obtain a "good" instrument for the wage-price elasticity in the wage increase equation by means of computing an unconditional forecast for all the COLA contracts (without taking into account $\hat{\lambda}$, which may be endogenous). The potential usefulness of such a method is evident, because we are solving simultaneously the unobservability of the wage-price elasticity and we are controlling for its potential endogeneity in the wage equation (see García (1991) for details[117]). Consequently, the forecast method is given by:

$$[4.a.5] \quad \ln\hat{\theta} = X_\theta\hat{\delta}_\theta \qquad \text{for all the COLA contracts}$$

and consequently:

$$\hat{\theta} = \exp(\ln\hat{\theta})$$

Unfortunately, even in the set of triggered contracts it is not possible to know for certain the implicit wage-price elasticity of the contract. To proxy it we tried two different alternatives, θ_A and θ_B, defined

[117] This work is an application of the Nelson and Olson (1978) general method to a two equation model of hours and wages.

as follows,

θ_A= (ex_post Δw - ex_ante Δw)/(inflation rate - inflation threshold)

θ_B=(ex_post Δw - ex_ante Δw)/(inflation rate)

From the definition, it is straightforward to show that $\theta_A \geq \theta_B$. In previous work, mostly done for Canadian contract data, the usual proxy was θ_B (see Christofides et al (1980) and Prescott and Wilton (1992)). But in Spain, indexation clauses often include an inflation threshold, hence, we think that θ_A might be a better proxy. Unfortunately, for building θ_A we need to know the implicit inflation threshold, usually unknown (except for the AES-like clauses). We solve this additional problem by using a search method for the inflation threshold in the sample of 1375 triggered clauses. Given the fact we have two different proxies, θ_A and θ_B, for the wage-price elasticity, we estimate and forecast equation [4.a.4] under these two alternatives which are also considered in the main model for comparative purposes.

b. Proxying P^{**}.

As we stated in section III the relevant price variable for indexed contracts (P^{**}) can be defined as follows:

$$P^{**}=q.E_P[\frac{1}{P}/P\leq PU]+(1-q).E_P\{\frac{(1+\theta^*(P-PU))}{P}/P>PU\}$$

That is, P^{**} is a weighted (by q, the probability that inflation rate is lower than a given threshold) highly nonlinear unknown function of the expected inverse low price and the sum of the expected inverse high price, the wage-inflation elasticity and the inflation threshold. Given the fact that is it rather impossible to know for certain such a variable we opt for by breaking it into pieces and making use of our set of estimates for equations [4.a.1] and [4.a.2]:

AP1: variable 1: P^e

variable 2: PU-dum=(1-TR)•Target+TR•P

AP2: variable 1: $\hat{P}^{**}=\hat{q}\frac{1}{P^e-\sigma_p\hat{\lambda}}+(1-\hat{q})\frac{(1+\hat{\theta}^*(P\text{-}Target))}{P^e+\sigma_p\hat{\lambda}}$

variable 2: PU-dum=(1-TR)•Target+TR•P

where $\hat{q}$ = 1 - prob(TR=1)

P^e being the expectation of the inflation rate at the signing of the contract, σ_p is the inflation rate standard deviation in the 5 years period preceding the signing of the contract; Target is government's beginning of the year inflation rate target; the rest of variables are defined as above.

c. The commonly used indexation clauses in Spain.

The most typical clauses for setting ex-post wage increases (Δw_R) are:

1. $\Delta w_R - \Delta w = \theta_1(P-PU)$ iff $P>PU$

where Δw, is the ex-ante wage; θ_1 is the wage-inflation elasticity; P is the inflation rate (normally December to December) and, finally, PU is a given inflation rate threshold.

2. (AES:85-86) $\frac{\Delta WR}{\Delta W} = \frac{P}{PU}$ iff $P>PU$

which is equivalent to:

$$\Delta WR-\Delta W = \theta_2(P-PU) \ ; \text{ and } \theta_2=\frac{\Delta W}{PU} \qquad \text{iff } P>PU$$

obs: if $\Delta W \lesseqgtr PU \Rightarrow \theta_2 \lesseqgtr 1$

Notice this clause might imply a wage-price elasticity greater than unity, so, in case of generalization, could be extremely inflacionist. In fact, this kind of clause induced inflation pressure on the Spanish economy during those years.

3.(1989 onwards):

$$\Delta WR = P + K \qquad \text{without any ceiling}$$

which is equivalent to:

$$\Delta WR-\Delta W = \theta_3(P-PU)$$

where $\theta_3=1$; $K = iwr-P$; $P-PU = iw-K$

The typical COLA clause in Spain is type 1 (about 37 % of the clause were of this type in 1990-91), although there is also a substantial share of clauses of type 3 (currently about 20 %), although in 1985-1986 the most common was the AES-like clause (in 1985-1986 above 75 % of all the cola contract included it), B type. Since then the share of this special clause has been reduced to less than 5 %.

Table 4.A.1. The triggered COLA clause probit. 1984-1991.

Variable	(1) coef t-stat
Constant	-1.31 (1.16)
DELY	-0.11 (0.74)
EMP	0.08 (3.27)
CCOO	-0.05 (0.43)
USO	-0.38 (1.51)
OTHERS	-0.36 (3.02)
INDEP	-0.48 (2.67)
$COLA_{-1}$	0.15 (2.06)
RENEGOTIATION	0.51 (3.92)
MULTIYEAR	0.21 (2.65)
DEL*DELY	-0.05 (0.36)
DEL^2*DELY	0.02 (0.39)
$IPROD_j$	-0.35 (0.80)
$IPROD_{j-1}$	0.68 (1.34)
ΔIP_j	-0.01 (0.67)
S_j	-0.04 (0.96)
u_j	-0.12 (0.45)
u_r	-0.11 (0.78)
P^e	-0.12 (0.58)
σ_P	0.41 (2.41)
$UNEXP\_INF_{-1}$*DELY	0.01 (0.91)
Time_dummies	Yes
Industry_dummies	Yes
Obs	2461
Cola>0	1380
Log_L	-1098.4
%_Correct Pred.	0.792

Table 4.A.2. The COLA elasticity model. 1984-1991.

Dependent	(1) log θ_A coef.	t-stat	(2) log θ_B coef.	t-stat
CONSTANT	0.50	(0.13)	-2.01	(0.40)
DELY	-0.07	(0.77)	-0.11	(1.39)
EMP	.003	(0.33)	.003	(0.21)
EMP-EMP_{-1}	-0.12	(1.70)	-0.06	(0.63)
CCOO	0.02	(0.42)	0.05	(0.71)
USO	0.05	(0.43)	-0.14	(1.00)
OTHERS	-0.09	(1.74)	-0.20	(2.79)
INDEP	-0.02	(0.30)	-0.05	(0.47)
RENEGOTIATION	0.29	(5.12)	0.45	(6.02)
XH_{-1}	0.01	(1.69)	.002	(0.14)
MULTIYEAR	0.17	(4.70)	0.19	(3.90)
C_ABS	0.02	(0.69)	0.04	(1.02)
C_PROD	0.02	(0.64)	0.05	(1.43)
RH_{-1}	-0.13	(0.26)	-0.16	(0.24)
DEL*DELY	0.01	(0.33)	-0.07	(0.91)
DEL^2*DELY	.005	(0.34)	0.01	(0.58)
$IPROD_j$	-0.12	(0.77)	0.02	(0.10)
$IPROD_{j-1}$	-0.08	(0.42)	0.08	(0.31)
ΔP_j	-0.36	(1.04)	-0.01	(1.69)
S_j	-0.03	(1.64)	-0.03	(1.03)
P^e	.003	(0.35)	-0.02	(1.37)
σ_P	0.36	(4.86)	0.49	(5.03)
UNEXPECTED INF_{-1}*DELY	-.001	(0.17)	0.01	(1.25)
$\hat{\lambda}$ (Table a.1)	0.51	(3.79)	0.62	(3.49)
Time_dummies	Yes		Yes	
Industry_dummies(22)	Yes		Yes	
Obs	1375		1375	
Estimation Method	OLSQ		OLSQ	
R^2	0.19		0.60	
σ	0.44		0.591	

Appendix B. Data and Variables.

All the collective agreements in Spain have to be registered in order to be enforceable. As there are some information requirements we know a small set of basic variables for each bargaining unit. The number of collective agreements in the raw manufacturing firm level dataset (the ECC) is very large (14777). From it we have obtained an unbalanced panel of negotiation units in the 1981-1991 period. In Table 4.B.1 we describe the resulting sample. There we distinguish between the sample resulting from considering consecutive observations (CS), which correspond to the sample used in this chapter [118], and the general sample (GS), which is a 32 per cent larger than the first. The former represents the 76 per cent of the later. Note that any large firm is more likely to be followed across time than any small one. The (corrected) probability of exiting the CS sample[119] ranges from a high of 29 to a low of 17 per cent.

The sample used in estimation result from constraining the CS sample to more than four consecutive observations (because we need some lagged information). The resulting sample is an unbalanced panel of 1290 (6884 observations) manufacturing firms running from 1981 to 1991. The 1981-1983 period is not used in estimation because it has some shortcomings in information. As a result, the sample has 4941 observations. For the sake of

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[118] Constrained to four or more observations.

[119] $p(\text{exit after } i \text{ obs}) = \dfrac{\#BU \text{ with } i \text{ obs}}{\Sigma_{j=i}^{11} \# \text{ BU with } j \text{ obs}} * (1-q)$. Where q is the probability the BU was in the last sample period.

simplicity we only present the definition of the variables used here, although the data questionnaire is available on request. In Table 4.B.2 it can be found some basic statistics for the key variables in each subsample.

Definition of the variables.

Bargaining unit variables: (source: ECC)

ΔW_i: Ex-ante wage increase settlement.

ΔWR_i: Ex-post wage increase (only for effectively revised contract).

JP_i: Annual working hours settlement.

EMP_i: Membership, i.e. number of employees at the settlement date.

XH_{-1}: Number of overtime hours during last year.

RH: Yearly number of regular hours.

PUB_i: 1 if the bargaining unit belongs to the public sector. 0 otherwise.

$MULTIYEAR_i$: 1 if the agreement will last for more than a calendar year.

BY_i: 1 if bargaining finishes before expiratory date of last one.

DEL_i: Mean delay (in days) from the expiratory date of the last agreement until the settlement.

$CCOO_i$: Percentage of workers council that represents the CCOO union.

UGT_i: Percentage of workers council that represents the UGT union. (omitted)

USO_i: Percentage of workers council that represents the USO union.

$INDEP_i$: Percentage of workers council that does no represent a union.

$OTHERS_i$: Percentage of workers council that represents other unions.

$COLA_i$: 1 if agreed any cost of living allowance clause.

C_PROD_i: 1 if agreed any productivity clause.